

AEM 653: FARM MANAGEMENT



NATIONAL OPEN UNIVERSITY OF NIGERIA

AEM 653: FARM MANAGEMENT

COURSE GUIDE



NATIONAL OPEN UNIVERSITY OF NIGERIA

INTRODUCTION

Farm Management course is for Post Graduate Diploma in Agricultural Extension and management students. The course will consist of 17 units which involves basic knowledge about principles and application of farm management.

This Course Guide tells you briefly what the course is about, and how you can work through these units. It suggests some general guidelines for the amount of time you are likely to spend on each unit in order to complete it successfully. It also gives you some guidance on your tutor-marked assignments.

What you will learn in this course

The overall aim of this Farm Management course is to introduce the fundamental principles and their applications in farm management. During this course you will learn about the meaning and scope of management, how to gather relevant information for making decision on the farm and how to use some tools of analysis in the decision making process. Farmers take decisions under risk and uncertainty as a rule rather than exception. You will learn the implications of risk and uncertainty on making decisions and precautions that farmers take against them.

Course Aims

The aim of this course is to give you an understanding of farm management principles, tools and techniques which will assist you in decision-making

This will be achieved by

- 3 Introducing you to the basic principles of farm management.
- 4 Demonstrating how tools and techniques can be used to analyse gathered information to arrive at farm decisions.
- 5 Illustrating the use of the problem solving approach in the decision making process.
- 6 Demonstrating the practicability of these farm management theories to livestock and crop farming, and in managing land, labour and capital.

Course Objectives

In order to achieve the aims set out above, certain overall objectives have been set. In addition, each unit has its own specific objectives. The unit objectives are always included at the beginning of the unit. You should read them before you start working through the unit. You can always refer to them during your study of the

unit to check on your progress. You should always look at the unit objectives after completing a unit. In this way you can be sure that you have done what was required of you by the unit.

Below are the wider objectives of the course as a whole. By meeting these objectives you should have achieved the aims of the course as a whole.

On successful completion of the course, you should be able to:

1. Explain what farm management is all about.
2. Describe the problem solving approach and the decision-making process.
3. Gather relevant data for decision-making purposes.
4. Use basic economic principles relevant to farm decision-making.
5. Determine depreciation of assets and how to value assets for decision-making.
6. Compute net-worth statement and net income statements for the purpose of determining strength and weakness of a farm.
7. Compute and measure financial and capital positions of the farm as well as the measures of size and resource use efficiency.
8. Perform farm budgeting and gross margin analysis for the purpose of making farm plans.
9. Deal with risk and uncertainty situations pertaining to livestock and crop enterprises.
10. Take decisions regards land, labour and capital.

Working through this course

To complete this course you are required to read the study units, read other recommended materials. You will be required to answer some questions based on what you have read in the text to reaffirm the key points.

Answers are provided for these questions so that you can evaluate yourself. In addition, at the end of each unit is placed some Tutor-marked assignments which you are expected to submit for grading to form part of the continuous assessments.

At the end of the course is a final examination. The course should take you about 12 weeks in total to complete. You will find listed the components of the course, what you have to do and how you should allocate your time to each unit in order to complete the course successfully on time.

Course Materials

1. Course Guide
2. Study Units

Study Units

There are seventeen study units in this course. First are the tutor-marked assignments, second is a written examination.

In tackling the assignments, you are expected to apply information, knowledge and techniques gathered during the course. The assignments must be submitted to your tutor for formal assessment in accordance with the deadlines stated in the Presentation Schedule. The work you submit to your tutor for assessment will count for 40% of your total course work?

Tutor-marked assignments (TMAs)

There are 17 tutor-marked assignments in the course. You will need to submit all. Assignment questions are contained in section 8.0 of each unit. Using other references will give you a broader viewpoint and may provide a deeper understanding of the subject.

When you have completed each assignment, send it together with a TMA (tutor-marked assignment) form, to your tutor. Make sure your assignment reaches your tutor on or before the deadline given in the Presentation Schedule and Assignment File. If for any reason you cannot complete your work on time, contact your tutor before the assignment is due to discuss the possibility of an extension. Extensions will not be granted after the due date unless there are exceptional circumstances.

Final Examination and Grading

The final examinations in farm management will be of three hours duration and have a value of 60% of the total course grade. The examination will consist of questions which reflect the types of self-testing, practice exercises and tutor-marked problems that you have previously encountered. All areas of the course will be assessed.

Use the time between finishing the last unit and sitting the examination to revise the entire course. You might find it useful to review your self-text, tutor-marked assignments and comments on them before the examination. The final examination covers information from all parts of the course.

Course Marking Scheme

The following table lays out how the actual course marking is broken down.

Table 1: Course Marking Scheme

Assessment	Marks
<i>NOUN</i>	5

Assignment 1-17	Total maximum score = 1505 marks = 100% For assignment = 40% of total course marks
Final examination	60% of overall course marks
Total	100% of course marks

Course Overview

This table brings together the units, the number of weeks you should take to complete them, and the assignment that follow them.

Table 2: Course Organization

Unit	Title of Work	Periods of activity	Assessment (end of unit) Total Marks	
	Course Guide	1		
1	Meaning and Scope of Farm Management	1	80	14
2	The Problem Solving Approach	1	100	11
3	Data Gathering for Decision Making	2	80	28
4	Valuation and depreciation of Assets	2	130	23
5	Relevant Basic Economic Principles	2	100	21
6	The Networth Statement	1	100	11
7	The Net Income Statement	2	100	15
8	Measures of Financial Success & Capital Positions	1	100	11
9	Measures of Size and Resource Use Efficiency	1	100	10
10	Gross Margin Analysis	1	100	11
11	Farm Budgeting	2	50	15
12	Risk and Uncertainty in Farming	1	90	19
13	Livestock Enterprise Management	1	100	19
14	Crop Enterprise Management	1	80	11
15	Management of Farm Capital	1	50	15
16	Farm Labour Management	1	65	13
17	Management of Land	1	80	12
	Revision	2		
	Total	25*	1505	

This can be covered in 12 weeks if you cover 2 units per week i.e. 3 hours for each unit and devote six hours per week.

How to get the most from this course

In distance learning the study units replace the university lectures. This is one of the great advantages of distance learning; you can read and work through specially designed study materials at your own pace, and at a time and place that suit you best. Think of it as reading the lecture instead of listening to the lecturer facilitator. In the same way that a lecturer might set you some reading to do, the study units tell you when to read your set books or other materials. Just as a lecturer might give you an in-class exercise, your study units provide exercise for you to do at appropriate points.

Each of the study units follows a common format. The first item is introduction to the subject matter of the unit and how a particular unit is integrated with the other units and the course as a whole. Next is a set of learning objectives. These objectives let you know what you should be able to do by the time you have completed the unit. You should use these objectives to guide your study. When you have finished the unit you must go back and check whether you have achieved the objectives. If you make a habit of doing this you will significantly improve your chances of passing the course.

The main body of the unit guides you through the required reading from other sources. This will usually be either from your set books or readings section.

Self-tests are interspersed throughout the units, and answers are given at the ends of units. Working through these tests will help you come to it in the study units, work through these when you come to them, too.

When you need help, don't hesitate to call and ask your tutor to provide it.

1. Read the Course Guide thoroughly.
2. Organize a study schedule. Refer to the "Course Overview" for more details. Note the time you are expected to spend on each unit and how the assignments relate to the units. Important information details of your tutorials and the date of the first day of the semester is available at the National Open University, Study Centres.

You need to gather together all this information in one place, such as your diary or a wall calendar. Whatever method you choose to use, you should decide on and write in your own dates for working on each unit.

3. Once you have created your own study schedule, do everything you can to stick to it. The major reason why students fail is that they get behind with their course work schedule. If you get into difficulties with your schedule, please let your tutor know before it is late.
4. Turn to unit 1 and read the introduction and the objectives for the unit.

5. Assemble the study materials. Information about what you need for a unit is given in the “Overview” at the beginning of each unit. You will always need both the study unit you are working on and one of your set out books on your desk at the same time.
6. Work through the unit, the content of the unit itself has been arranged to provide a sequence for you to follow.
7. Keep in mind that you will learn a lot by doing the assignments carefully. They have been designed to help you meet the objectives of the course and, therefore will help pass the exam.
8. Review the objectives for each study unit to confirm that you have achieved them. If you feel unsure about any of the objectives, review the study material or consult your tutor.
9. When you are confident that you have achieved a unit’s objectives, you can then start on the next unit. Proceed unit by unit through the course and try to pace your study so that you keep yourself on schedule.
10. When you have submitted an assignment to your tutor for marking, do not wait for its return before starting on the next unit. Keep to your schedule. When your assignments returned, pay particular attention to your tutor’s comments, both on the tutor-marked assignment form and also written on the assignment. Consult your tutor as soon as possible if you have any question or problems.
11. After completing the last unit, review the course and prepare yourself for the final examination. Check that you have achieved the unit objectives and the course objectives listed.

Tutors and Tutorials

There are some tutorials earmarked for this course. You will be notified later about the date, venue and time. You should try your best to attend the tutorials. This is the only chance to have face-to-face contact with your tutor. Prepare a question list before attending the tutorials. You will learn a lot from participating in discussions actively.

Summary

This course intends to introduce you to the principles and applications of Farm Management. Upon completing this course, you will be equipped with basic knowledge of how to deal with risk and uncertainty in farming.

1. You will be able to answer these kinds of questions:

2. What is the meaning and scope of farm management?
3. How is the problem solving approach used in the decision-making process?
4. How do you gather relevant data for decision-making?
5. What basic economic principles are relevant to farm management?
6. How do you determine depreciation and valuation?
7. How do you compute net worth and net income statement?
8. How do you complete measures of Financial and capital positions of a farm?
9. What is budgeting and how is it done?
10. How do farmers deal with risk and uncertainty?
11. What decisions do farmers make concerning land, labour and capital?

Even to your everyday life, you should apply principles of farm management. We wish you success in this course.

AEM 653: FARM MANAGEMENT

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MODULE 1**UNIT 1****Meaning and Scope of Farm Management****Table of Contents**

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1.0 Introduction:

The study of farm management is crucial and central to the whole discipline of agricultural economics. The extension agent working with the farmers at the grass root level must be conversant with the principles and applications of farm management. The agricultural data recorder must appreciate why he/she is being requested to collect certain information from the farmer. This appreciation comes from the knowledge of farm management. The research scientist that goes out to collect data needs to apply the tools of farm management in analyzing the data. This unit therefore elaborate on the breadth and depth of the area of coverage of farm management to enable you appreciate its usefulness to overall economic development of a nation.

2.0 Objectives

It is hoped that by the end of this unit, you will be able to:

- Define economics, agricultural economics and farm management.
- Explain the scope of farm management
- Describe management functions.
- Explain managerial performance.
- Identify characteristics of a good manager.
- Explain the importance of farm management in developing countries.

3.1 Definitions

Economics is the study of the principles that determine the allocation of scarce resources among competing ends, for the maximization of those chosen ends over time. Agricultural Economics is the application of techniques and principles of economics to solve agricultural problems. Farm Management – a branch of Agricultural Economics – deals with the economics of individual farm units. Farm management is concerned with the organization of factors of production – land, labour and capital for the production of farm products. It is concerned with the operation of the farm firm so as to achieve certain predetermined objectives.

You must have known from elementary lessons of economics that the objectives of a firm may be to maximize profit. In this case, profit can be defined as the total value of production less the total cost of production, while the total value of production is the product of total and the price. Profit maximization is not the only objective that a farm firm may want to pursue.

The numerous small farm operators scattered across the length and breadth of this country may likely be pursuing other objectives. These could be maximization of objectives like food, security, stability of cash income and use of most limiting resource. Provision of sufficient staple food for family members is paramount in a farm family decision-making process. This is why in Farm Management attention is focused on the decision-making processes of individual farm units.

However, the achievement of the profit maximization does not necessarily contradict the achievement of the food security objective. Each farm unit is an economic entity whose survival may depend on the attainment of the two objectives in the long run. Farm Management, as a discipline, critically examines the attainment of these objectives by the individual economic units.

3.2 What Management Produces

Management produces decisions. Decisions are made on what to produce, how to produce and how to utilize the produce as well as what amount of resources should be allocated to each of these stages. The three basic factors of production – land, labour and capital – cannot on their own result in production of any product unless they organized by management. Management, sometimes considered as the fourth conventional input, is the one that coordinates the use of the three factors. Hence management is basically not an input. It produces decisions on what to produce with the three factors, how much of each to use in production, when to use them and how to distribute what is produced between consumption, sale and storage.

3.3 Scope of Farm Management

Farm Management is a branch of Agricultural Economics, Agricultural Marketing, Agricultural Policy and Development and Agricultural Financing.

However, Farm Management is broader than any of the other areas of Agricultural Economics since knowledge of production economics, marketing, financing and government policy is useful in order to solve a farm management problem. The farm manager when confronted with a problem may require information from other disciplines like Sociology, Psychology, Mathematics and Law. Therefore, there is the need to be knowledgeable beyond the subject matter of Agricultural Economics per se. Farm management could be called a “Jack of all trades” discipline involving a knowledge of the arts and sciences and harmonizing them into a useful amalgam for the purpose of solving a particular problem.

Farm management as an art basically calls of both physical and mental activity. It involves a careful scrutiny of the thought processes the theories and practice of the skills which the farmer uses while carrying out his many tasks. As a science, Farm Management involves a statement of research objectives, the development of a method of collecting and collating data and analyzing such data so as to find solutions to present problems.

Self Assessment Exercise I:

Give three reasons why Farm Management is broader than any of the areas of Agricultural Economics

3.4 Managerial Functions

Management is a decision-making process which coordinates the factors of production to produce desired output. The functions of management includes planning, organizing, directing and controlling. These are explained in detail below.

Planning is the establishment of organizational goals and a strategy for accomplishment. Plans that are made may be concerned about short, medium or long run goals of the organization. Setting up a goal as well as devising workable strategy for its attainment are important attributes of good management.

Organizing is an operational function which depends heavily on the coordinated efforts of an entire organization. Management directs the operations to achieve desired goal through motivation. Management seeks to obtain a high level of production from employees through motivation and proper guidance by maintaining a high level cooperation.

The control function deals with the supervision of the achievement of goals and compares actual results with those envisaged in the plans and the actual performances in past periods. The results are directly estimated and related to the plans and performance standards established by other managerial functions.

Decision-making is the most important responsibility of a manager. These decisions form the life-wire of the farm business. A successful manager is one who has the skill to choose between alternatives fast. In doing so he uses the problem solving approach. This is the content of Unit 2.

3.5 Managerial Performance

Successful managerial performance rests on three basic elements – leadership, motivation and communication. In the subsistence setting where family members work and eat together in the same pot the leader is usually the household head. In cases where the husband has died, the oldest son or the more senior wife may become the leader of the household depending upon the circumstances. Leadership characteristics of the farm manager, among other factors, determine the success or otherwise of the farm business. His style of leadership (autocratic, democratic or *laisefaire*) depends upon his own personal goals, needs and aspirations of his subordinates who are also involved in the production process. There is no rule of thumb for leadership for choice of leadership style since each has its merits and demerits. However, it is not uncommon to find an effective managerial style which reflects a mixture of approaches or which is as a result of choosing the right approach for each situation that arises.

Motivation is a modern concept. It refers to the process of creating working conditions that stimulates employees to perform at their best. The small-scale farmer as the manager, must make his family members and other employees (of any) feel that they are valued in the total effort. The social, psychological self-fulfillment and other personal needs of the workers must be effectively satisfied in order for them to perform at high levels.

The manager must therefore present a clear picture of what is expected of the family members and other employees. He must provide them with necessary guidance and give them the feeling that their work is not only important but contributes significantly to the achievement of the set goals.

Effective communication creates understanding between the leader and his subordinates. Lack of effective communication, however, creates artificial barriers between them. It is therefore essential that the manager in order to provide effective leadership and motivation must be able to communicate effectively. He should create effective feedback mechanisms so that he could gauge the feelings of his subordinates.

Self-Assessment Exercise 2

Give three reasons why a manager must possess leadership characteristics.

3.6 Characteristics of a Good Manager

A successful manager is one who performs the above functions efficiently. In order to efficiently perform these functions, a manager must possess, among many others, the following characteristics:

- a) Be a goal oriented individual
- b) Possess a keen sense of observation.
- c) Possess an enquiring mind.
- d) Have analytical ability
- e) Be able to take initiatives
- f) Be a risk taker.
- g) Be a good leader.
- h) Be able to motivate workers.
- i) Be an effective communicator.
- j) Be technically competent, i.e. know what to do and how to do it.
- k) Be able to manage his time.
- l) Define his problems clearly after identifying them.
- m) Sort out problems into big and small, urgent and pending.
- n) Be able to take corrective steps.
- o) Be full of vigour, energy and readiness to face risk and uncertainty.

- p) Be flexible knowing the today's decision may be wrong for tomorrow.
- q) Face challenges of new technology and be ready to learn and adapt if possible.

3.7 Importance of Farm Management in Developing Economics

You will recall it was earlier said that management produces decisions. The millions of small farms scattered throughout the country take decisions daily regarding their farm operations. The quality of these decisions determine to a large extent the outcome and productivity of the agricultural economy. Efficient farm management decisions can lead to increased agricultural output and enable agriculture to make its rightful contribution to the development of the country in terms of food, labour, savings, foreign exchange earnings and meeting the demand for industrial products.

One of the major constraints to increased production in a subsistence farming situation is labour. Farm Management tools are useful in determining how labour can be more productively used through the introduction of new crops, introduction of different resource combinations, introduction of different systems or different enterprise combinations.

4.0 Conclusion

In this unit you have learned about the discipline of Farm Management and its broad scope. You should have learned the four managerial functions and what managerial performance means. Furthermore, the characteristics of a good farm manager enumerated in this unit would have helped you to understand what it takes to perform these functions effectively. The role of Farm Management in the economic development of your country must be clear to you by now.

5.0 Summary

What you have learned in this unit is that Farm Management is a branch of Agricultural Economics that deals with the application of economic principles to individual farm units. In scope, you have learn however, that Farm Management is much broader than the other branches because it uses information from all of them as well as from other discipline.

You should always remember that Management produces decisions on what to produce, how to produce, when to produce and how to distribute and utilize what is produced. Farm Management is both an art and a science because it involves the skilful practice and use of scientific knowledge to

solve various problems on the farm using the Problem Solving Approach. This is the subject matter of the next unit.

Answers to Self Assessment Exercises

Self-Assessment Exercise 1

1. Farm Management requires information from agricultural marketing, production economics, financing and government policy for the purpose of taking decisions.
2. Farm Management requires information from other disciplines such as sociology, psychology, mathematics and law.
3. Farm Management involves knowledge of both arts and sciences unlike the other branches of agricultural economics.

Self-Assessment Exercise 2

A manager must possess leadership characteristics because:

1. He must be able to motivate others.
2. He must be able to communicate effectively.
3. He must be able to take initiatives.

6.0 Tutor Marked Assignment

Write short notes on the following:

- a. Significance of farm management to Africa agricultural development.
- b. Three basic elements of successful managerial performance.
- c. Why Farm Management is considered both an art and a science.
- d. Relationship between Farm Management and Economics.
- e. Why a farm manager should possess (i) analytical ability (ii) initiative.
- f. Factors of production
- g. What management produces?

7.0 references and Further Reading

Olukosi, J. O. and P. O. Erhbor (1987). **Introduction to Farm Management Economics: Principles and Applications**, AGITAB Publishers Zaria, P. 1-5

UNIT 2

The Problem Solving Approach

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3.5	Action Taking or Implementation of Chosen Alternative
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1.0 Introduction

You will recall that in Unit 1 that we learnt that management produces decisions and that decision-making is the most important responsibility of a manager. These decisions form the life-line of the farm business. A successful manager is one who has skill to choose between alternatives. In doing so he uses the problem solving approach which is the focus of this unit.

2.0 Objectives

It is hoped that by the end of this unit, you will be able to:

- Explain the six steps in the problem solving approach.
- Explain the interrelationships between the steps of the problem solving approach.
- Determine how decisions are made.

3.0 The Problem Solving Approach

The six steps of the problem solving approach are shown in Figure 2.1. You will notice that the steps are connected by arrows which point in both directions. This implies that the manager can move from one step to another either forward or backwards. For example, he may find at the analysis stage that the problem has not been clearly defined. He can then go back to the problem identification and definition stage.

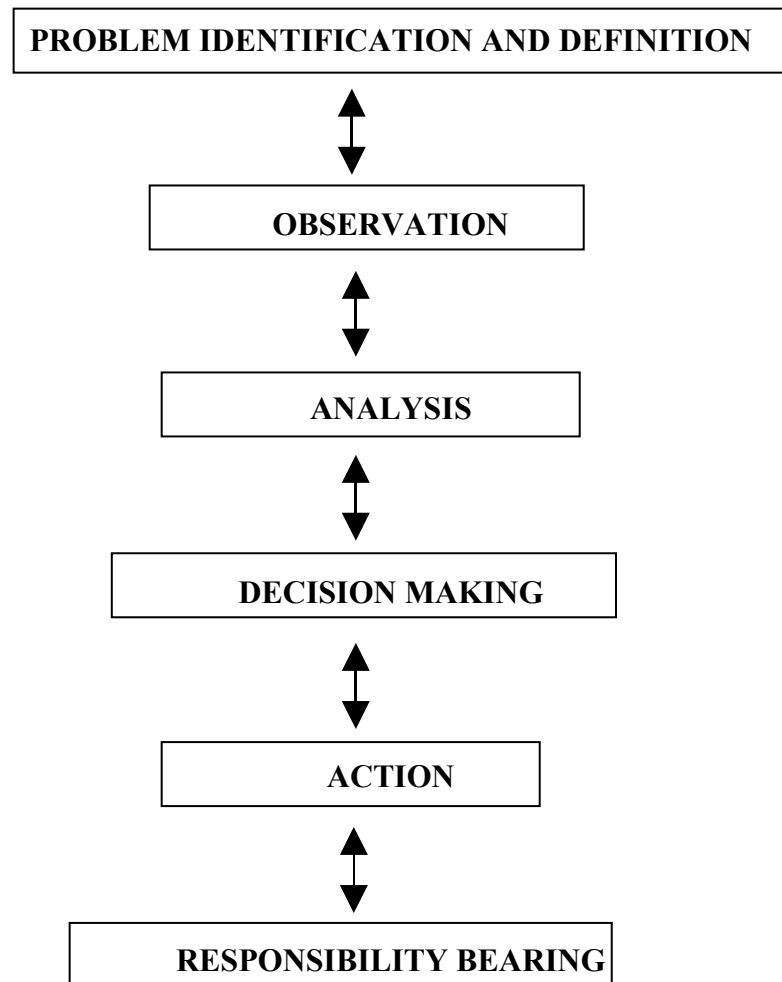


Figure 1:1 The six steps in problem solving approach.

3.1 Problem Identification and Definition

In your own experience, how do you know you have a problem? A problem exists when “what ought” differs from “what is”. “What is” refers to the situation at hand or what exists while “what ought to be” refers to the situation that is expected. When what is expected differs from what exists, there is a problem. For example, if the field of maize is expected to tassel by a certain time and it does not, there is a problem. When you planted your maize field and there is no germination at all after the fifth, sixth and seventh day, there is a problem.

The first step is to recognize there is a problem. It is necessary for the decision maker to know when there is a problem otherwise he cannot solve it. It calls for knowledge of what is expected. Someone once said that you know a counterfeit coin only if you know the features of the genuine coin. The recognition of the standard or what is expected is essential to be able to discern there is a problem. The question to ask is “Does what exist differ from what right to be?”. If the answer is “yes” the manager has recognized the problem.

Problems that have been identified must be properly defined to enable solutions to be proffered. Defining the problem in operational terms is the second step.

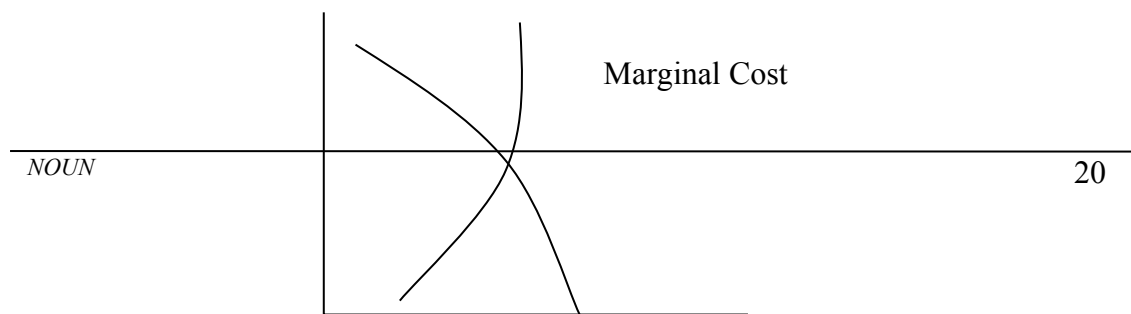
The problem can be sorted into big or small, short term or long term, urgent or pending cases. The problem must be stated in clear, unambiguous terms by the manager.

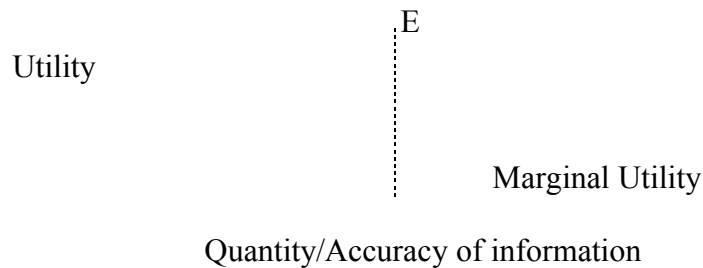
3.2 Observation or Information Gathering

This is the stage when the manager observes facts about the problem and conceive ideas about its solution. Making relevant observations depends on the ability of the individual manager. The manager must set objectives to gather relevant information and record information for future use.

Unit 3 deals specifically on this stage of the approach. You will recall that in unit one, we mentioned that a good manager must have enquiring mind and keen sense of observation.

From economic point to view, it must be said that the manager cannot just continue to amass information. What is the point for him to stop? The manager must recognize that the marginal utility or satisfaction of an additional unit of information decreases while its marginal cost increases. Figure 2.2 shows that at point E where the marginal cost equals the marginal utility of additional quantity or accuracy of information, the equilibrium point is reached. The manager should stop gathering more information or improving of the accuracy of data when $MU = MC$.





There are two source of information, namely communicative and non-communicative sources. Communicative sources are those which require the use of written or spoken word e.g. newspapers, TV speeches and experiment station publications. Non-communicative sources of information do not require the use of the written word and include experimentation on a limited scale, experience, reasoning out of answer from information known or assumed to be true and observing the experience of others.

Self Assessment Question 1

At what point should the manager stop gathering more information or improve on the accuracy of data?

There are two basic reasoning processes used in analysis. These are deduction and induction. Both processes use the same kind of logic.

- a. Deduction may be defined as the process of reasoning to specific conclusions from general propositions which are known or assumed to be true. It usually involves the use of theory to interpret observations. Some of the analytical techniques used by managers include budgeting, linear programming, fixed asset use approach and marginal analysis of continuous functions. Managers also use the theories from other discipline such as statistics, physical sciences, humanities and accounting.
- b. Induction may be defined as the process where a proposition is inferred from observation and experience. It is usually used when choosing between hypotheses and when making estimates. There are two types of inductive processes namely, single sampling and sequential analysis.

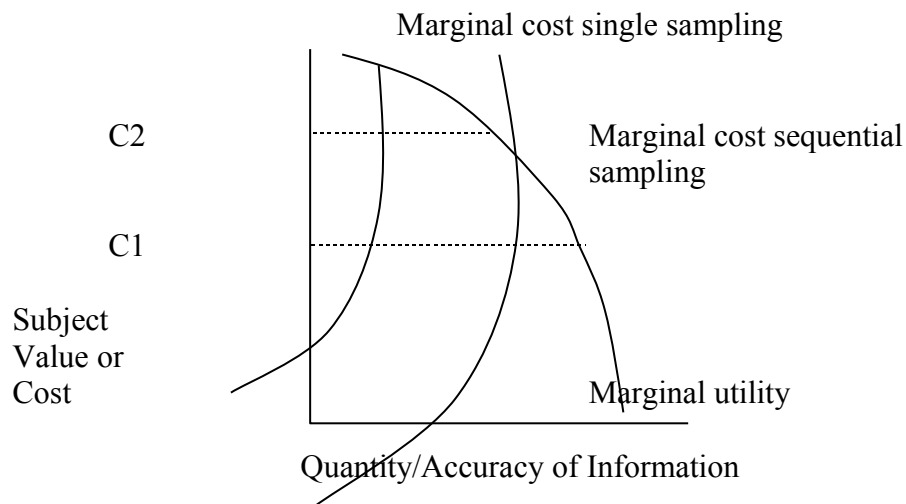
In single sampling analysis the size of the sample is specified on the basis of the size of error and the probability of error. The procedures of single sampling analysis makes it possible to construct an estimate and/or make a choice between a pair of hypothesis subject to the given specifications provided the sample size has been specified.

For sequential analysis the size of sample is not computed in advance. Instead, the sequential analyst draws a relatively small sample and analyses it, after which he answers one of these three questions with respect to a choice between alternative hypothesis.

The first question is: Can I accept the first alternative subject to the errors in the specification for the decision?

The second question is: Can I accept the second alternative under the same condition?

The third question is: Or do I have to conclude that I cannot accept either the first or the second alternative and have to conclude that it will be necessary to gather more information before I can choose between the two alternatives. Sequential sampling is more efficient and reduces the cost of accuracy from C2 to C1 as shown below.



Self-Assessment Question 2

What are the three questions you would ask as a sequential analyst if you want to choose between alternatives?

3.3 Decision Making or Choice or Best Alternative

The first step is to evaluate alternative solutions to the identified problem. The tools of analysts stipulated above are used in doing so. For example, the farm manager has the option of either using hand hoes to weed his farm or use herbicides or have it done mechanically using oxen-drawn implements. All the possible alternatives would be considered so as to arrive at the most visible one.

3.4 Action or Implementation

Execution of chosen alternative is an important function management performs. There is little or no formal theory in this area but many rules of thumb exist. For example, there should not be more than three people reporting to the chief executive. Poor planning and poor performance in the other managerial functions can be compensated for the ability to perform the action function.

3.5 Responsibility Bearing

This means accepting the consequences of the decisions and actions. Unlike beauracrats who do not bear the responsibility of their decisions, farmers as decision makers must face the consequences of their decisions. Responsibility bearing is related to many psychological patterns which change with age, education, health family size, net worth and debts. Farmers sometimes fail to adapt new technologies that are not sure of because they will face consequences of their decisions.

4.0 Conclusion

The six steps of the problem solving approach can be viewed as interrelated parts of the whole process which has continuity through time and is hardly divisible except for expository purposes. For example, to get to the responsibility bearing one does not have to go through decision. Both positive and normative information are needed to perform each of these functions. There is a pragmatic loop linking the normative and positive aspects of these functions to indicate that these two aspects may not be independent of each other.

2.5 Summary

The six steps of the problem solving approach are problem definition, observation, analysis, action and responsibility bearing. These six steps are interrelated parts of the whole process.

Answers to Self Assessment Exercises

Self-Assessment Question 1

The manager should stop gathering more data when the marginal cost of additional unit of information is equal to the marginal utility derived for that additional unit of information.

Self-Assessment Question 2

The three questions are:

1. Should I accept the first alternative subject to the errors in the specifications for choice?
2. Can I accept the second alternative under the same condition?
3. Do I conclude that I cannot accept either the first or second alternative and gather more information?

6.0 Tutor Marked Assignment

Write short notes on the following:

Deduction, Induction, Recognizing a problem, Communication sources, Types of information.

Difference between single sampling and sequential sampling.

How responsibility bearing affects adoption of innovation.

Interrelationship in the six steps of the problem solving approach.

How quality implementation performance can make up for poor performance in other functions.

7.0 References and Further Reading

Bradford, L.A. and G.L. Johnson (1953) **Farm Management Analysis**.
John Wiley and Sons Inc., New York.

Olukosi, J. O. and P. O. Erhabor (1987) **Farm Management Economics: Principles and Applications**. AGITAB Publishers Ltd. Zaria.
Chapter I.

UNIT 3

DATA GATHERING FOR DECISION MAKING

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1.0 Introduction

You will recall that unit 1 emphasizes that Management produces decisions. Unit 2 describes the problem solving approach starting with problem definition and identification. No decisions can, however, be taken without adequate information being made available to the farm manager. The observation stage in the problem solving approach is our concern in this unit. Just as a scientist records observations about his specimen in the laboratory, the farm manager needs to amass information concerning his farm operations.

2.0 Objectives

It is hoped that by the end of this unit, you will be able to:

- Explain the need for data gathering for decision-making.
- Describe the basic information needed for farm records.
- Explain the various types of records needed to be kept for decision-making
- Describe the various methods used in gathering farm data.
- Improve upon collection of farm data for decision-making

3.1 Need for data

Data is a necessary ingredient for decision-making. Planning for the Development of a country cannot be adequately done without appropriate data. For example, a planner needs to know that the average yield of open pollinated maize varieties is 2.5 tons per hectare to be able to project the total production in the next few years. Any decision maker either on the farm firm or any business enterprise must be equipped with accurate data in order to make forecasts or plans about the future.

The following are some advantages of keeping farm records:

- i. resettlement schemes, irrigation projects and agricultural development project in general need baseline data for successful planning and implementation. These types of data are obtained from farm records.
- ii. Financial institutions favour farm managers who keep good records of their operations because it is easy to determine the strengths and weaknesses of farm managers who keep good records of their operations.
- iii. Farm records keeping afford farm managers opportunity to determine the profit or loss of his enterprises.
- iv. Keeping farm records enables the manager to determine the needed adjustments in terms of input use on the farm.
- v. Farm records give guidance in making farm production recommendations
Which are based on costs and returns of production.
- vi. Successful teaching at all levels of agricultural education depends upon good farm records keeping.

Self-Assessment Exercise 1

Discuss how farm records aid

- a) the research process
- b) teaching
- c) extension
- d) in controlling family expenditures.

3.2 Basic Information Needed for Farm Records

The Farm Map

A farm map gives a record of the location, size of farm, soil types, land use and possibly past soil treatments. In most rural areas the farms are fragmented and in such cases it might be a good idea to map out the farms of all farmers in the sample in a particular rural community or village. This will give a clear picture of the location of each farmer's fields in relation to each other and other farmer's fields. It is possible to carry out soil tests and analysis for such rural community farms as an entity so that fertilizer recommendations can be made based on the results of the analysis.

Labour

In most cases family labour is used for carrying our operations like planting and weeding while some hired labour may be used in addition. The daily record of family and non-family labour by age, sex, type of work done and the number of hours spent by each category of worker should be kept. The cost of hired labour in kind or cash should also be recorded.

Supplies

Farm supplies such as seeds, cuttings, fertilizers (organic and inorganic) would be recorded by type, source, cost and quantities used by data and by field.

Output

The total number of unit harvested from a specific field on a particular day, condition of the crop (whether threshed or not), the number of units harvested, the weight per unit and purpose of harvest (sold, consumed, stored or given as gift) are to be carefully recorded. The threshing and shelling percentage of crops are determined and can be used to estimate the actual yield per hectare of crops harvested in cobs (e.g. maize) pods (e.g. cowpeas) and sheaves (e.g. sorghum).

Sales and Marketing Costs of Farm Products

For each type of farm produce sold the record should include the name, condition and number of units of the produce sold, place of sale and revenue received. The mode and cost of transportation and the distance to the place of sale would also be recorded.

Prices

The farm gate prices of every farm produce should be kept by month in addition to the retail prices in local markets.

Land Tenure

The land tenure arrangement should be recorded by field, method and cost of acquisition as well as the number of years each field has been under the control of the current cultivators.

Cropping Pattern

The types of crops or crop mixtures grown by field should be recorded as well as the crop pattern.

Conversion Ratios

Certain items might be recorded in local measures such as in mudu (Hausa), perese (Yoruba) of sorghum or basket of yams. The weight of the local measures should be determined by taking several samples of each unit of measure and physically weighing them together with the contents. The average of the sample weights can then be used as a proxy and conversion factor for that unit of measure used.

Self-assessment Exercise 3

- a) Construct a table for Adamu's labour record. Fill in the figures approximately using the information provided below:

Fields 1,2, 3, 4 used 10, 14, 20, 10, Mondays of adult male family labour respectively.

Field 1 used 30 Mondays of male and female hired labour hired labour respectively.

- b) If Adamu's family members fell sick or are indisposed, what will be the effect on Adamu's family farm business?

3.3 of Records to be kept Types

There are different types of records that are important for decision-making. These include farm tools and equipment inventory records, income or receipts records, home consumption records, farm expense records, durable assets, depreciation records and farm profit records. These are detailed below:

Inventory Records

i) Farm

Inventory is the listing of assets owned by the farming business. The farm tools and equipment inventory contains information on the name of asset, the year of purchase, the cost price, the expected years of life, the annual depreciation and the beginning and end of year values. Most small-scale instead of heavy farm machineries.

Table 3,1: Farm tools and equipment inventory January 1 to December 31, 2001

Item No.	Asset Name	Year of Purchase	Cost Price	Expected Years of life	Annual Depreciation (N)	Beginning Of Year Value (N)	End Year Value (N)
1	Cutlass	2 1998	5000	10	500	3000	2500
2	Weeding Hoes	2 1999	500	5	100	300	200
3	Axe	1 1998	500	10	50	350	300
.
.
.
.
.
.

The crop inventory (Table 3.2.) includes information concerning the quantity and value of crops at the beginning and end of the accounting period. The livestock inventory record (table 3.3) shows the number of each type of livestock owned and their value at the beginning and end of the accounting period.

Table 3.2: Crop inventory between January 1 and December 31 2001

Item No	Crop Name	<u>Beginning of year</u>		<u>End of year</u>	
		<u>Quantity (Kg)</u>	<u>Value (₦)</u>	<u>Quantity (Kg)</u>	<u>Value (₦)</u>
1	Cowpea	1000	4800	2000	9,600
2	Cassava	800	800	1200	1,200
3	Yams	4000	20,000	2000	10,000
4	Rice	2000	12,000	3000	18,000
5	Groundnut	400	1,000	200	500
Total value		-	38,600	-	39,300

Table 3.3? Livestock inventory between January 1 and December 31, 2001

Item No.	Type of Animal	<u>Beginning of Year</u>		<u>End of Year</u>	
		<u>No. of Units</u>	<u>Value (₦)</u>	<u>No. of Units</u>	<u>Value (₦)</u>
1	Cattle:		250,000		
	Cow	10	250,000	15	15,000
	Bulls	5	15,000	10	30,000
	Calves	5	50,000	6	60,000
2	Other Live stocks:				
	Sheep	15	180,000	10	20,000
	Pig	10	160,000	5	80,000
	Goat	20	140,000	10	70,000
3	Chicken:			-	
	Broilers	100	30,000	150	
	Layers	300	105,000	150	52,500
	Cockerels	150	60,000	100	40,000
Total Value		-	1,125,000	-	872,000

Table 3.4: feed and Supply Inventory between January 1 and December 31, 2001

Item No.	Type of Feed or Supply	Quantity (bags)	Value (₦)	Quantity (bags)	Value (₦)
1	Fertilizers:				
	CAN	10	20,000	-	-
	Super	3	5,400	-	-
	Compound	15	37,000	5	7,500
2	Chicken Feed:				
	Layers Mash	10	7,000	15	10,500
	Chick Mash	10	8,000	15	12,000
	Growers Mash	20	12,000	30	18,000
3	Livestock feed Stuff				
	Corn Stalks	10 bales	500	5	250
	Groundnut haulms	11 bags	11,000	6	6,000
	Cowpea haulms	12 bags	12,000	5	5,000
	Cowpea Dry Matter	15 bales	1,500	10	1,000
	Groundnut Dry Matter	20 bales	2,000	10	1,000
	Total value	-	116,900	-	61,250

Table 3.5: farm Improvement and Building Inventory between January 1 and December 31, 2001

Item No.	Improvement Buildings	Beginning of year		End of Year	
		No. of Units	Value (₦)	No. of Units	Value (₦)
1	Poultry house	1	40,000	2	80,000
2	Animal house	1	30,000	1	30,000
3	Storage barn	5	10,000	5	10,5000
4	Farm house	1	25,000	1	30,000
5	fencing	200 metres	40,000	400 metres	80,000
Total value		-	145,000	-	230,000

Table 3.6: Crop Receipts between January 1 and December 31, 2001.

Item No.	Types of crops	Customer	Quantity (kg)	Unit Price (N/kg)	Total Value
1	Cowpeas	Moses	2000	4.8	9,600
2	Sorghum	Abba	5000	3.4	17,000
3	Maize	Emma	6000	4.0	24,000
4	Millet	Dorcas	4000	3.3	13,200
5	Tomatoes	Chieze	1600	30	48,000
6	Onions	Akande	2400	40	96,000
Total Value		-	-	-	207,800 ^a

^a total value used in Table 3,1.3

Table 3.7: Livestock and Livestock Products receipts Record between January 1 and June 30, 2001

Date	Livestock or Livestock Product	Customer	Quantity	Unit Price (N)	Total Value (N)
2/2/2001	Goats	Eze	2	1,500	3,000
1/2/2/2001	Eggs	Kada Stores	150 crates	320	48,000
4/3/2001	Sheep	Bala	1	2,000	2,000
14/3/2001	chickens	Bakut	10	300	3,000
1 - 31/3/200	Eggs	Kada Stores	100crates	3,000	30,000
16/5/2001	Bull	Haruna	1	25,000	25,000
1-30/6/2001	Eggs	Baba Stores	120 crates	300	36,000
30/6/2001	Chickens	Nanet stores	100	300	36,000
Total Value					171,000 ^a

^a Total value for the year = ₦208,000 (used in Table 3.13)

Table 3.8 Home Consumption record for the month of February, 2001

Date	Item	Quantity	Unit Price (₦)	Total Value (₦)
------	------	----------	-------------------	--------------------

1-6/6/2001	Cassava	20 kg	1.0	20
	Yam	60 kg	5.0	300
	Cowpeas	10 kg	4.0	48
	Eggs	3 dozens	140.0	420
7-14/6200	Sorghuum	40 kg	3.2	128
	Millet	30 kg	3.0	90
	Yams	60kg	5.0	300
	Cowpeas	20 kg	4.8	96
15-21/62001	Chicken	3no	350	1050
	Eggs	3 dozens	140.0	
	Cowpeas	20 kg	4.0	420
	Yams	65 kg	5.0	96
				325
22-/30/6/2001	Millet	30 kg	3.0	
	Sorghum	40 kg	3.2	90
	Cowpeas	10 kg	4.8	128
	Cassava	30 kg	1.0	48
	Yams	100 kg	5.0	30
				500
Total Value				4088 ^a

^a Total for the year = ₦49,086 (used in table 3.13)

Table 3.9: Crop Expense Record for April, 2001

Date	Fertilizer		Production Chemicals		Seeds/Seedlings	Value	Other Expenses	Total Value
	Quantity	Quantity	Quantity	Value	Quantity		₦	₦
1- /6/2001	10 bags	8,000	—	—	10 kg maize	1000	—	9000
3/4/2001	—	—	3 satchets seed dressing	600	—	—	—	600
6/4/2001	8 bags	7,200	10 litres Vetox	2000	—	—	—	9200
Total		15,200		5600		1000		18,800^a

^a Total for the year = ₦120,790 (used in Table 3.13)

Table 3.10: Livestock Expenses Record for February, 2002

Date	cattle Purchase		Poultry Purchase		Feed Purchase		Veterinary Medicine		Total Value (₦)
	Quantity	Value (₦)	Quantity	Value (₦)	Quantity	Value (₦)	Quantity	Value (₦)	
2/2/2002	1 cow	20,000	—	—	20 bales of hay	2,000	—	—	22,000
14/2/2002			250 pullets	30,000	5 bags chicks mash	3,750	20 packets Floxaid	860	34,610
21/2/2002	6 ewes	3,000			10 bags chicks mash	7,500	200 Gumboro vials	1000	11,500
Total	—	23,000	—	30,000	—	13,250	—	1860	68110 ^a

^a Total for the year = ₦103,056 (used in Table 3.13)

Table 3.11: Farm Labour Record for April, 2002

Date	Field No.	Enterprise	Operation	No.	Hired Labour	Unpaid Labour	Family	Total Value	
					Total Man-hour	Total Wage (₦)	Total Man-hour	Total Wage (₦)	(₦)
2/4/2002	1	Millet/Sorghum	Land Clearing	3	24	1,600	24	1,600	3,200
6/4/2002	2	Millet/Sorghum/Cowpea	Land Clearing	6	48	3,200	36	2,400	5,600
10/4/2002	1	- do -	Planting				36	900	900
11/4/2002	2	- do -	Planting				48	1,200	1,200
					___	4,800	___	6,100	10,190 ^a

^a Total value for the year = ₦130,800 (used in Table 3.13)

Table 3.12: Durable Assets Depreciation Record for 2001

Type Of Asset	Date of purchase	Condition When Purchased (new or old)	Pur-Chased value (₦)	Salvage Value (₦)	Pur-Chased Minus Salvage Value (₦)	Expected Life (years)	Dep. Rate %	Total Dep. Allowed In past Years (₦)	Dep. Allowed This year (₦)	Present Worth (₦)	
Weeding											
Hoes 2	1999	New	700	100	600	10	10	120	60	420	
	3	2000	New	900	150	750	10	10	75	600	
Ridging											
Hoes 2	1998	New	1600	200	1400	10	10	280	140	980	
	3	1999	New	2700	300	2400	10	10	480	1680	
Cutlasses											
	3	1997	New	3600	750	2850	8	12.5	1425	356	1069
	4	2000	New	6000	1000	1000	8	12.5	625	625	3750
Baskets											
	4	1996	New	2000	50	1950	5	20	1560	390	0
	2	1998	New	1200	50	1150	5	20	690	230	230
Axes											
	1	1999	New	800	100	700	5	280	140	280	
	1	2000	New	850	100	750	5	150	150	45	
			20,350	2,800	17,550			5,685	2,406	9,459 ^a	

^a Total value used in Table 3.13.

Table 3.13: Net farm Profit Record for 2001

Receipts		₦	Expenses		₦
1	Total crop receipts; (Table 3.6 last column)	207,800	5	Total crop expenses (Table 3.9 total of last column for the year)	120,790
2	Total livestock and Livestock products Receipts (Table 3,7 last column summed up for the year)	208,000	6	Livestock expenses (Table 3.10 total of column 12 for the year)	103,056
3	Value of home consumed Products (Table 3.8 last Column summed up for the year)	49,056	7	Farm labour expenses (table 3.11 Total of last column for the year)	130,800
4	Gross farm receipts (items 1 + 2 + 3)	464,856	8	Total operating expenses (item 5 + 6 + 7)	354,646
			9	Depreciation (Table 3.12 last column)	91,459
			10	Total farm expenses (items 8 + 9)	364,105
			11	Net farm profit (item 4 – 10)	100,751

ii) Income or Receipts Records

Income or receipts records can be classified by enterprise with details of each transaction like product sold, unit produce and total value. An example of the crop receipts record is shown in Table 3.6 while table 3.7 contains a livestock receipts record.

iii) Home Consumption Record

The home consumption record (Table 3.8) usually contains the product, price per unit, total weight and the value. In subsistence small scale farming the proportion of home consumed products out of the total production could be substantial.

iv) The Crop And Livestock Expenses Record

The crop or livestock expense record, which is similar to the direct Expense record shoes date of purchases, the seller, the quantity purchased, unit price and the total cost. Tables 3.9 and 3.10 contain examples of crop and livestock expense records respectively.

v) Farm Labour Record

Table 3.11 is an example of a farm labour record which often includes both family and hired labour components. On enterprise basis the number or workers, the hour spent by each person and the wage are recorded. Hired labour costs are often transferred to the general expense record.

vi) Durable Assets Depreciation Record

The methods of determining the depreciation of farm durable items are detailed out in Unit 4. However, the features of depreciation record is given here in Table 3.12 for you to see the complete feature of net farm profit record. Salvage value, given in column 5 of Table 12, is the value of the assets at the end of its useful life i.e. scrap value. The total value of farm durable assets at a particular point in time is the sum of figures in the last column of the depreciation record.

Vii Net Farm Profit Record

Table 3.13 shows the component part of the net farm profit record. The source of each item in this table from the proceeding tables are indicated. For example, the total crop receipts figure is obtained from the last column of Table 3.6. The net farm profit is the difference between the gross farm receipts and the total farm costs.

Self – Assessment exercise 3.

Construct the net farm profit record for Bashiru’s farm from where you obtained the following information for the farming operations in year 2000:

Receipts from livestock and livestock products sales	₦19,710
Home consumed products valued at	₦74,440
Crop sales amounted to	₦48,000
Value of crop and livestock products in gifts	₦10,000
Expenses incurred on livestock	₦48,000
Expenses incurred on crops	₦14,489
Farm labour expenses	₦16,000
Depreciation for the year	₦ 1,009

3.3 Methods of Data Gathering

Data can be gathered by several methods depending on the type, source, ease of gathering, funds available and the use. There are basically two sources of data, namely, primary and secondary. Secondary source of data is obtained from various sources other than what the researcher collects by himself. The secondary data might have been collected for a different purpose at same period in the past. Primary data is collected first hand by the person who intends to use it.

Primary data can be obtained from farming families whereas secondary data may be obtained from Federal Office of Statistics, Food and Agriculture (FAO) and other external sources.

3.3.1 Record Keeping

Data can be obtained from farmer’ records. Record keeping is the most direct way of accessing data. You will recall that the advantages of keeping farm records are enumerated earlier. These advantages are lost when the farmers fail to keep records. In fact, you may already know that farmers do not keep records.

3.3.2 Reasons for going out for the data

Farmers do not keep records of their activities in written form. Researchers, extension workers or whoever needs data will have to go out to them to collect the data. Reasons why farmers do not keep farm records include illiteracy. Majority of Nigerian farmers cannot read or write even in the vernacular. In developed countries, farmers can mail in their farm records or send it by phone or fax. All these highly sophisticated means are not available at the farm level in Nigeria. Data collection therefore becomes

cumbersome, expensive and difficult. Methods of gathering data from the farmers have therefore been developed overtime.

3.3.3 Methods of gathering data

Cost Route Approach

In the 1960s, detailed farm management studies were conducted in several parts of Nigeria using the cost route approach. Several farming families were interviewed twice a week continuously for a period of one year or more recording the activities of each member of family both on-farm and off-farm. Massive data collected formed the basis for determining average figures for yield, costs and returns, labour input, capital input, etc for the various locations.

These socio-economic surveys were not only tedious but expensive.

Self – Assessment Exercise 4

Give three reasons why you think researchers needed to use such extensive methods to gather data.

i. Diagnostic Surveys

By the 1970s, a cheaper, shorter duration methodology was discovered. It was called Diagnostic Survey method in which a multi-disciplinary team of scientists would pay about ten days visit to the fields to identify farming problems. The visit would be conducted at the beginning middle and end of the cropping season. Information was gather rapidly and report writing completed as soon as possible.

Self-Assessment Exercise 5

State what you perceived as the criticism of the diagnostic surveys as compared to the cost route approach.

ii. Rapid rural Appraisal (RRA)

By the early 80s, the diagnostic surveys method was gradually modified to remove its “tourism outlook” and the “not-enough-attention² paid to proffering solutions to problems identified during the surveys. Rapid Rural Appraisal became the order of the day. The emphasis was still on “rapid” generation of data as in the diagnostic survey method but taking more time with the farmers. The multi-disciplinary team lives in the community for about five nights interviewing various groups, segments and classes of people

and individuals using visual, easy-to-use and do-it-yourself tools and techniques.

The data gathered would be taken away by the team for further analyses while leaving a tentative report with the community. Methods, such as transect walks, semi-structured interview, mapping, time lines, ranking, seasonal calendars etc are used in a triangulating manner to confirm information collected between different groups such as men, women and youth.

Self-assessment exercise 6

State three reasons why RRA is an improvement over the diagnostic surveys approach.

ii. Participatory Rural Appraisal (PRA)

PRA was criticized for being extractive in that the “experts” take away the data to carry out the analysis. By the early 90s, emphasis was shifting to the “participatory” aspect. Participation on the part of the farmer or local people became paramount in terms of not only identifying the problems but being part of the analysis of the data to proffer solutions. PRA used and expanded on the RRA techniques and methods but encouraged more of local people’s involvement.

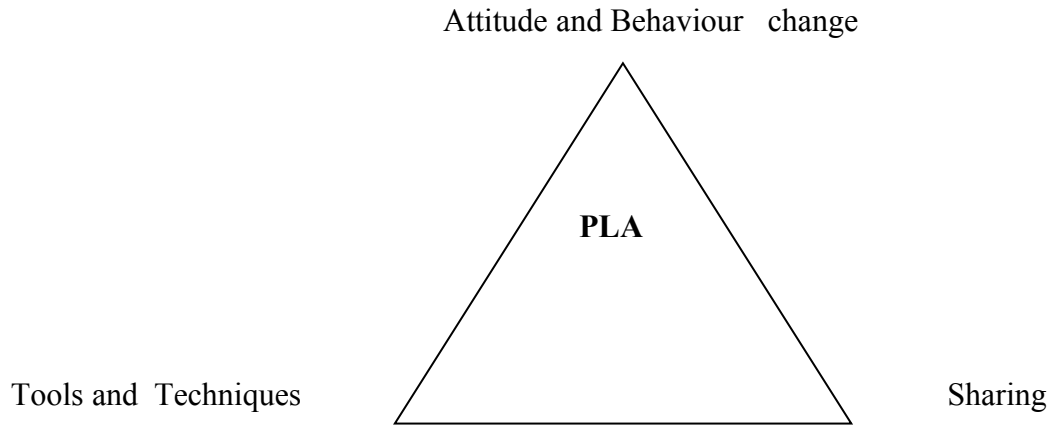
It will interest you to know that today, PRA is not only used in “rural” as the name suggests, but in urban setting as well. It is not only used in agriculture but health, environment, education and other sectors.

Self-Assessment Exercise 7

State two ways PRA differs from RRA.

Participatory Learning and Action (PLA)

Towards the end of 1990’s, PLA started coming to lime light. Participation is not only emphasized as in PRA but the learning and Action aspects are of great concern. PLA focuses on the plan of action formulated by the community to solve the problems identified. The execution of the action plan is to be done by the community members themselves while the outside acts only as a facilitator. PLA has become a strong method for development workers while emphasizing the key elements of the triangulation – attitude and behaviour change, tools and techniques and sharing as shown below.



The attitude and behavioural change means that there should be a “reversal of learning”. The “educated” outsider should accept the rural community members as equal partners in development. Sharing of experiences and ideas should be freely allowed between the insiders, between the outsiders and insiders and among outsiders.

Self-Assessment Exercise 8

State three ways PLA differs from PRA.

3.3.4 Updating of Farm Records

As you read through this unit you cannot help but notice that farm records are very important as sources of data for taking decisions on the farm. Stale record will result in stale decisions. One of the attributes of a good manager as you see in Unit 1 is that a good decision today may be bad for tomorrow. Good data today must be updated to give good decision tomorrow. The necessity for updating farm records is dictated by the vagaries of weather that cause fluctuations in yields and prices of farm products over time.

3.4 Problems of Recall

Certain data stick to farmers’ memory more than others. One of the problems of interviewing farmers is making them recall information on an event or activity that happened some time in the past. Since these types of information are not recorded, it is an arduous task on the part of the farmers to recall them accurately.

3.4 Single Registered Data

Data can be classified into four types based on the ease of recall. The easiest form to recall is the single registered data. An activity or an event that takes

place only once and is easy to remember is in this category. For example, the farmer may easily recall information on the date of planting of his millet which is one activity occurring immediately after the first rain. Fertilizer application is also in this category.

3.4.2 Single Non-registered Data

Some event or activities take place once but are non-registered. This type of information is more difficult to recall than the first type. An example of single non-registered data is the date of a cow calendar the seed date of a minor crop.

3.4.3 Continuous Registered Data

Some activities occur continuously but get registered very easily in the mind. The herd return from the field at about a particular time of the evening is a continuous event. But it has re-occurring nature about it that makes it easy to recall. Major food crop harvesting or money for hired labour are examples of continuous registered data.

3.4.4 Continuous Non-registered Data

The most difficult type of data to recall is the continuous non-registered data. How many tubers of yam did the children bring home on a particular day last week? During the yam eating period, bringing yam home is a continuous, almost an everyday affair. But the farmer may not remember the exact number of yams brought each day. The use of family labour is an example.

Self-Assessment Exercise 9

List the types of data in the order of difficulty of recalling them.

3.4.5 Improving Accuracy of Data Collection

You must pay special attention to obtain accurate labour data because it is difficult to recall. There may be several categories of people going to the farm from the same family on a particular day. Each sex may be carrying out different operations and on different fields. Some people may perform same operation on the same field but put at different hours. It is necessary to keep track of each member by field, by operation, by time taken on each operation and whether hired or family labour.

The easiest way to do this is to keep different column for male adult, female adult and child for family labour separated from hired labour. This is shown

in section 3.2 (iv). It is necessary to specify it by operation for each field owned by the family.

Similar problems arise with yield of yam and maize which is brought home piece meal almost on daily basis. It is better to trace each harvest to the house and weigh before they are consumed. Different yield estimates are made for the same field of a particular family in order to secure accurate yield data. For example, the yield from a 10 m X 10 m yield plot can be weighed separately and extrapolated. You can weigh five baskets of each produce from each yield and then ask the farmer how many baskets in total he got from the whole field. This is apart from trying to keep track and weighing every yield from the same field.

Self-assessment Exercise 10

Describe how you would improve the accuracy of estimate of cassava yield from a farmer's field.

4.0 CONCLUSION

Data gathering is a necessary ingredient for decision-making. It is necessary to keep detailed farm records on land labour, capital and output generated in a systematic way for easy accessing. You must be up to date in the method of data gathering particularly in the PLA/PRA techniques. Your record must also be updated and ensure to pay particular attention to data that farmers cannot easily remember.

5.0 SUMMARY

The unit has established the need for gathering data particularly for use in making decisions. The unit traced the history of data collection from cost route to diagnostic surveys, RRA, PRA and PLA and point to the need for you to be updated on these techniques. In particular you must pay attention to continuous non-registered data to ensure accurate data is obtained.

6.0 TUTOR MARKED ASSIGNMENT

1. Discuss each of these in your own words.
 - a. Reasons for keeping farm records.
 - b. Cost route approach
 - c. Participatory learning and action (PLA).

- d. Triangulation.
 - e. Why you need to take special case to obtain certain information from the farmers.
 - f. Secondary versus primary data.
2. You have been sent to President's Obasanjo's farm to gather data about the farm. Give detailed enumeration of the types of data you will gather.

7.0 FURTHER READING AND REFERENCES

OLukosi, J.O., P.O, Erhabor (1989). Introduction Management Economics: Principles and Applications

Valuation and Depreciation of Assets

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1.0 Introduction

In unit 3 you will recall that we discussed the various of records that needed to be kept. Records on assets comprising of farm tools and equipment are shown in Tables 3.1 and of durable assets and depreciation in Table 3.12. This unit will give details on how assets can be valued for the purpose of deciding what to pay for them. Depreciation of assets is also discussed for the purpose of determining its remaining value after some years of use in a production process.

2.0 Objectives

It is hoped that by the end of this unit, you will be able to:

- Explain the various types of resources and the reasons for managing them.
- Describe how assets are acquired.
- Use various valuation methods.
- Use various depreciation methods.

3.1 Types of Resources

Resources are the means available for producing goods which in turn are used to satisfy wants. There are three principal resources land, labour and capital. These resources are also referred to as factors of production. Land is defined as the original and indestructible properties of the earth. This definition of land includes water, sunshine, air and all the soil nutrients that

make the living plants grow. Land can be categorized into cropland, pasture, wood or wasteland and fallow land. In the African agriculture, hired labour is further broken down into contract, daily or hourly paid and communal labour. These types of hire labour are referred to in Hausa (Swahili) as jinga (Kipande), Kwadigo (Leja leja) and gaya (Harambee) respectively.

Labour is defined as work done by human beings. Labour can be classified as operator, family, full-time hired and part-time or seasonal labour.

Capital is defined as anything produced that is used to increase the effectiveness of current productive activity that is not immediately consumed. An African small farmer makes time to produce some capital items such as organic manure and seeds which are used in the production of food crops. These items are referred to as capital because they are produced to increase the productive capacity of the farm business. Other capital items include fences, roads, fertilizer, hoes, cutlasses, tress, footpaths, livestock, calabashes, etc. Some of these may be purchased or produced on the farm by the farmer. Capital, to the ordinary man on the street, means money. This is not strictly correct although the farmer needs money to purchase capital items. Capital, however, may be considered as total investment available for use in the farm operation. Management, although not a physical resource, is conventionally considered as the fourth factor of production. Management is defined as the ability of effectively using the resources land, labour and capital. As mentioned in unit 1 management coordinates other factors of production in order to achieve the laid down objectives.

Resources can be broken down again into two types – variable and fixed resources. Variable resources are those that vary with output and are generally used for one production period.

Examples are labour, seeds and fertilizer which are used up during none production process hence new ones have to be applied to produce at a later period. Fixed or durable resources are those that contribute to the production process over several production periods. They are not used immediately but may depreciate gradually over time as they are being used in the production process. Examples of durable resources include buildings and machinery.

3.2 Why Manage Resources?

The production process requires at least two resources and usually more. All products comes from resources and in resource management we are interested in combining resources to increase output while paying attention to the marginal value of the output and marginal cost of obtaining the output.

The marginal cost is the increase in total cost resulting from a unit increase in the output.

Resources are limited in both quantity and quality hence judicious use and management of whatever is available must be made. The efficient management of resources would aid in achieving the following:

- (i) increase the output with the same amount of inputs.
- (ii) obtain the same output with less quantity of inputs.
- (iii) obtain more output using more input but the input is proportionately less than the increase in output.

3.3 Acquisition of Resources

Acquiring land for farming purposes in some subsistence farming community is a simple procedure of requesting permission from the village or clan head. Some pieces of land are acquired through inheritance passed from one generation to another. Others are either bought or rented. As agriculture becomes more commercial, a shift from communal to private ownership is gradually emerging.

Some capital items like basket, calabashes are produced on the farm while others are purchased. Labour is supplied partly by the family members while the rest is supplied by hiring labour at current wage rate. Except on big commercial farms labour is not hired on a permanent basis because the minimum wage rate which may have to be paid to the labourers may be too high for the farm business.

3.4 Valuation of Resources

Valuation involves getting a realistic measure of the current value of the assets of the farm business. The first step in asset valuation is to list the resources available in physical terms and the second step is placing values on the assets. The various methods of valuation include valuation at cost, market price, net selling price, reproductive value, capitalization of earnings. Detailed discussion of these valuation procedures follows:

i) Valuation at Cost

This method involves entering in the inventory the actual amount invested on the asset when it was originally acquired. A major set-back of this procedure is that after the business has been in operation for sometime, the original cost is no more of much value since the conditions might have changed.

ii) Valuation at Market Price

The market price of an asset at the time under consideration can be taken as its value e.g. land. This method may, however, over or under-estimate the value depending on the states of affairs in the economy. The market price for the land may be based on the price of a similar piece of land or what the owner is willing to sell it for. Generally land appreciates in value.

iii) Valuation at Net Selling Price

Some costs might be incurred when selling an asset such as cost of advertisement and transportation. Whatever price that can be obtained in the market for the asset i.e. market price (P_m) less the cost of selling (CS) is the net selling price (P_{NS}). Notationally,

$$P_{NS} = P_m - CS.$$

iv) Valuation by Reproductive Value

An asset can be valued at what it would cost to produce it at present prices and under present methods or production. This method is more useful for long-term assets and has little or no application for short-lived assets.

v) Valuation by Contribution to Production

Valuation can be considered as the determination of the value of a resource in a certain type of employment. The value of a resource therefore can be said to depend on its contribution to society and is determined by supply and demand in the market place i.e. the value of an input depends on the value of output. For a production function

$$Y = Y(X_1, X_2, X_3, X_4)$$

The marginal physical product of X_1 , (MPP_{X_1}) is the change in output (Y) resulting from a unit increment in variable input (X_1). Notationally,

$$MPP_{X_1} = \frac{\text{change in output} - \Delta Y}{\text{Change in input} \quad \Delta X_1}$$

Similarly, the MPP of each to the other inputs X_2 , X_3 , and X_4 can be determined. The marginal value product (MVP) is the value added to the total output due to an additional unit of input. For factor one (X_1) the MVP_{X_1} is equal to the marginal physical product of X_1 multiplied by the output price (P_Y).

$$\text{Notationally, } MVP_{X_1} = MPP_{X_1} \cdot P_Y$$

The quantity of input X_1 , that maximizes output is determined at the point where $MVP_{X_1} = P_{X_1}$

Where P_{X_1} = price of variable input X_1 i.e. marginal value product is equal to the marginal cost.

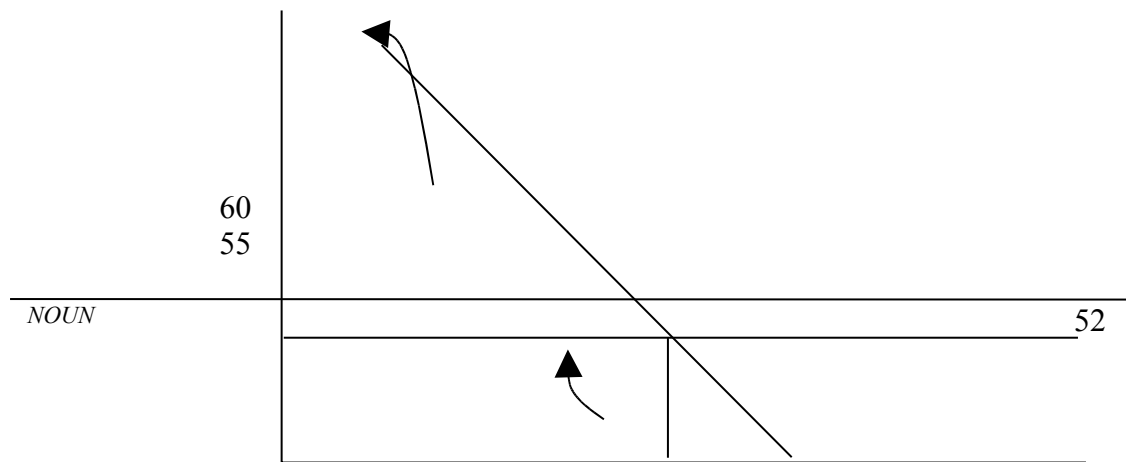
Table 4.1. shows the value of marginal product of sorghum (Y) at various unit levels of fertilizer (X_1). In order to determine the level of fertilizer to use, the MVP_{X_1} is set equal to the price of input (P_{X_1}).

$MVP_{X_1} = P_{X_1}$ when $X_1 = 4$ and the total physical product (TPP) = 124.

When graphed, the MVP_{X_1} is the derived demand curve for the resource X_1 and P_{X_1} is the supply curve. The point of equilibrium is the point of intersection of the two curves. The quantity of X_1 to use is given by the point where $MVP_{X_1} = P_{X_1}$.

Table 4.1 Demand Schedule for Fertilizer Input, X_1

Fertilizer (X_1)	TPP	MPP $_{X_1}$	PY	MVP $_{X_1}$	P_{X_1}
3	70		4		
4	84	14	4	56	16
5	96	12	4	48	16
6	106	10	4	40	16
7	114	8	4	32	16
8	120	6	4	24	16
9	124	4	4	16	16
10	124	0	4	0	16



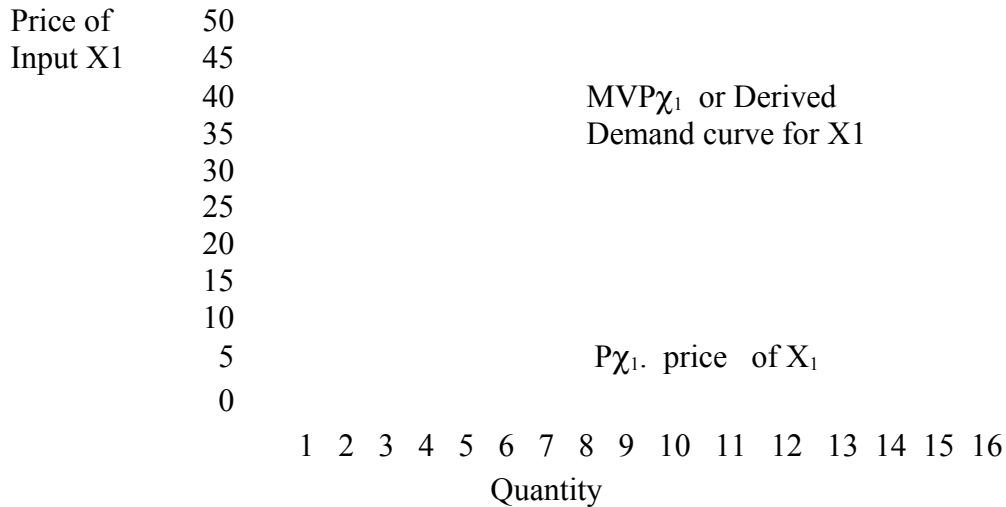


Figure 4.1 Derived demand curve for fertilizer input, X_1

vi) Valuation by Capitalization of Earnings

This method is more suitable for durable capital such as land, which contributes to several production periods. For this type of asset the market

price i.e. the value attached to the land based on prices of similar piece of land could be used in the valuation of this asset.

If a farmer wants to determine whether a piece of land is worth buying or not for his business, the capitalization of earnings method can be used as long as he has access to the expected yearly returns. If the market price is less than the expected returns he should not purchase the piece of land. This method of valuation called capitalization of earnings means “to turn into value”. If a piece of land has an annual return R on a perpetual basis at a going rate of interest (i) the present value of the land V is given by:

$$V = \frac{R}{i}$$

This formula assumes that R is generated annually indefinitely. For example, assuming the market price of a piece of land is N6,000.00 (assuming the land is used in the production of sorghum with a known average yield), the annual return N400, the going rate of interest of 8 percent, should we purchase the land?

$$V = \frac{R}{i} = \frac{400}{.08} = 5,000$$

Since the market price of N6,000.00 is greater than the present value of N5,000.00, the land should not be purchased for growing sorghum. It is unsatisfactory for anyone to pay more than N5,000.00 for this piece of land.

Capital may be obtained from savings or borrowed funds. When the fund is borrowed, the interest which has to be paid is the price paid for using the funds. Under such a condition the borrower has to decide whether or not it is worthwhile purchasing an asset using borrowed funds. He therefore has to compare the marginal productivity of capital with the interest rate. If the interest rate is higher than the marginal productivity of capital it is not worth purchasing. The series of returns can also be discounted to present value using the formula.

$$PV = \frac{R_1}{(1+i)} + \frac{R_2}{(1+i)^2} + \dots + \frac{R_n}{(1+i)^n} + \frac{S}{(1+i)^n}$$

Where PV = The Present Value

R_1, \dots, R_n = expected return in the 1st, 2nd, \dots , nth year

I = discount rate

S = Salvage value

If the cost price of the capital item is greater than the PV, it is not worth buying

If a piece of capital item has the following returns:

$$R_1 = N500$$

$$R_2 = N300$$

$$S = N100$$

$$i = 8\%$$

$$n = 2 \text{ years}$$

$$PV = \frac{500}{1.08} + \frac{300}{(1.08)^2} + \frac{100}{(1.08)^2} = 462.96 + 256.41 + 85.47 = N804.84.$$

If the purchase price of the item is greater than N804.84 it should not be bought.

A set of plough costs N250 and the owner expects a return of $R_1 = 100$, $R_2 = 60$, $R_3 = 40$, $R_4 = 30$, $R_5 = 20$ and a salvage value of N100. Should the item be purchased?

$$PV = \frac{100}{1.08} + \frac{60}{(1.08)^2} + \frac{40}{(1.08)^3} + \frac{30}{(1.08)^4} + \frac{20}{(1.08)^5} + \frac{100}{(1.08)^5}$$

$$PV = \frac{100}{1.08} + \frac{60}{1.17} + \frac{40}{1.26} + \frac{30}{1.36} + \frac{20}{1.47} + \frac{100}{1.47}$$

$$PV = 92.59 + 51.28 + 31.75 + 22.06 + 13.61 + 68.03$$

$$PV = \text{N}279.32$$

Since the PV of N279.32 is greater than the original cost, the plough can be purchased. The values of the denominator, $(1 + i)^n$, are presented in Appendix 1 Table 1. Alternatively the numerator can be multiplied by a factor $\frac{1}{(1 + i)^n}$,

present in Table 2 of Appendix.

Certain considerations may be made by the decision maker because the margin of N279.32 – 250 or N28.28 may not be considered sufficient for his purpose. He may therefore end up not buying the plough because the rate of interest may be higher than 8% coupled with a lot of risk that may be associated with the expected yearly returns. For example, the plough may break down before the fifth year and the salvage value may be less than the expected N100.

Among the methods of valuation discussed there is no single one that is applicable in all cases. The best thing is to choose the method which best suits the nature of the assets and purpose of the farm manager. The most important test of usefulness is whether the inventory figure depicts the present worth or not and whether their use would hurt or mislead any person involved in the business.

Some Rules of Thumb

1. For an asset which can be sold as a product or which can be converted into money the direct valuation based on market price less cost of marketing can be used.
2. For assets which yield a continuous income or series of income over a period of time the capitalization of earnings method is more suitable.

3. For assets which do not yield income directly but provide services which contribute to the income of the enterprise some indirect method of valuation to ascertain the present net value of the anticipated services rendered can be used.

Self-Assessment Exercise 1

- a. Find the rate of interest if a piece of land is valued at N30,000 and the annual earning is N2,500.
- b. The value of a piece of land is N800 and the rate of interest is 5%. What is the annual earning of the asset?

3.5 Depreciation

Depreciation is the loss in value of a capital asset over time due to age, obsolescence and wear and tear. Depreciation therefore is a function of time and use, and it involves prorating the original cost of an asset over its useful life. An important but difficult consideration is the rate at which depreciation should take place. Some managers assume 10%, 20%, etc. but the best choice depends on the depreciation rate that is closest to the actual rate of loss in value for the period under consideration. Different assets lose value at different rates hence different methods of depreciation have been developed. The methods of depreciation that will be considered here are (i) annual revaluation (2) the straight line method (3) the declining balance method and (4) the sum-of-years digit.

i) Annual Revaluation Method

The annual revaluation method is based on the resale value of the asset in the market.

Depreciation = Original Price – Resale Price of the asset today. If the original price of an asset was N2,000 in 1982 and N1,800 in 1983 the depreciation is given by

$$D = N2,000 - N1,800 = N200.$$

The problem with this method is that it may not be easy to find a comparable product being sold. A more serious problem is that losses of resale value are often great in the first few years.

In an economy with run-away inflation, as has been experienced in Ghana, Nigeria and other African countries these past few years, appreciation rather than depreciation of assets might be apparent. An

asset purchased in 1975 for N2,100 was sold for N2,500 in 1983 because the new price of virtually the same asset has gone up to N6,000.00.

ii) Straight Line Depreciation Method

The straight-line depreciation method assumes that an asset value at a constant rate. The method is therefore useful for assets that lose value constantly over their entire life. Depreciation (D) by this method is the difference between the purchase price (P_p) and the salvage value (S) divided by the number of years of life of the asset (n).

$$D = \frac{P_p - S}{n}$$

For an asset costing N4,000 initially, salvage value of N400 and expected life of 10 years, the depreciation is given by $\frac{4000 - 400}{10} = \text{N}360$

The depreciation schedule over the years appears as shown in Table 4.2.

Table 4.2: Straight Line Depreciation for an Asset

<u>Year</u>	<u>Annual Depreciation</u>	<u>Remaining Value</u>
1	360	3,640
2	360	3,280
3	360	2,920
4	360	2,560
5	360	2,200
6	360	1,840
7	360	1,480
8	360	1,120
9	360	760
10	360	400

iii) Declining Balance Method

The declining balance method assumes a fixed rate of depreciation every year. Since the value of the asset is greater at the beginning when the rate is applied the amount of depreciation is also greater at the beginning and less at the end. The salvage value is not subtracted from the initial cost. The rate is applied to the uncovered balance till the salvage value is reached. This

method is therefore useful for assets which loose value fast at the beginning period of its use.

The schedule of depreciation for the declining balance method is shown in Table 4.3

Table 4.3: Depreciation of an asset using declining balance Method

<u>Year</u>	<u>Annual Depreciation</u>	<u>Remaining Balance</u>
1	20% of 4000 = 800.00	3,200.00
2	20% of 3200 = 640.00	2,560.00
3	20% of 2560 = 512.00	2,048.00
4	20% of 2048 = 409.00	1,638.00
5	20% of 1638.4 = 327.68	1,310.72
6	20% of 1310.72 = 262.14	1,048.58
7	20% of 1048.58 = 209.14	838.86
8	20% of 838.86 = 167.77	671.09
9	20% of 671.09 = 134.22	536.87
10	20% of 536.87 = 107.37	429.50

iv) Sum-of-years Digit

The annual depreciation is determined by multiplying a fraction by the amount to be depreciated. The fraction is obtained by summing up the digit 1 to n for an asset with a useful life of n years. For example if the useful life of an asset is 10 years the sum of the digits is 1 + 2 + 3 + 4 + 5 + 6 + 7 + 8 + 9 + 10 i.e 55. This sum forms the denominator for the fraction while the numerator is the remaining useful years of life of the asset at the beginning of the accounting period. Thus the fraction for the first year of the asset is $\frac{10}{55}$. For the second and third years the fractions are $\frac{9}{55}$ and $\frac{8}{55}$ respectively. The depreciation schedule is as shown for the asset costing N4000 and salvage value of N400, the asset therefore looses values at the beginning and then declines at a fairly constant rate.

The sum-of-year digit method has been condensed into a formula for calculating the depreciation schedule. The formula is given by:

$$Da = \frac{2W(n - a + 1)}{n(n + 1)}$$

Table 4.4: Depreciation of an asset using the sum-of-years digits method

<u>Year</u>	<u>Annual Depreciation</u>	<u>Remaining Balance</u>
1	$\frac{10}{55} \times (4000 - 400) = 654.55$	3,345.45
2	$\frac{9}{55} \times (4000 - 400) = 589.09$	2,756.46
3	$\frac{8}{55} \times (4000 - 400) = 523.64$	2,232.82
4	$\frac{7}{55} \times (4000 - 400) = 458.18$	1,774.64
5	$\frac{6}{55} \times (4000 - 400) = 392.73$	1,381.91
6	$\frac{5}{55} \times (4000 - 400) = 327.27$	1,054.64
7	$\frac{4}{55} \times (4000 - 400) = 261.82$	792.82
8	$\frac{3}{55} \times (4000 - 400) = 196.36$	596.46
9	$\frac{2}{55} \times (4000 - 400) = 130.91$	465.55
10	$\frac{1}{55} \times (4000 - 400) = 65.45$	400.10

Where D_a = Depreciation in year a
 W = Value to be depreciated – Salvage value
 n = number of years for depreciated value
 a = year under consideration
 For the same asset considered above.

$$\begin{aligned} \text{Depreciation in the first year} &= D_1 = \frac{2(4000 - 400)(10 - 1 + 1)}{10(10 + 1)} \\ &= \frac{72000}{110} = 654.55 \end{aligned}$$

$$\begin{aligned} \text{Depreciation in the second year} &= D_2 = \frac{2(4000 - 400)(10 - 2 + 1)}{10(10 + 1)} \\ &= \frac{64800}{110} = 589.09 \end{aligned}$$

$$\text{Depreciation in the tenth year} = D_{10} = \frac{2(4000 - 400)(10 - 10 + 1)}{10(10 + 1)}$$

$$= \frac{7200}{110} = 65.45$$

(v) Comparison between the depreciation schedule

Table 4.4 shows the annual depreciation for the straight line method, declining balance and the sum-of-years digit methods. The annual depreciation for each of the three methods is graphed in figure 4.2.

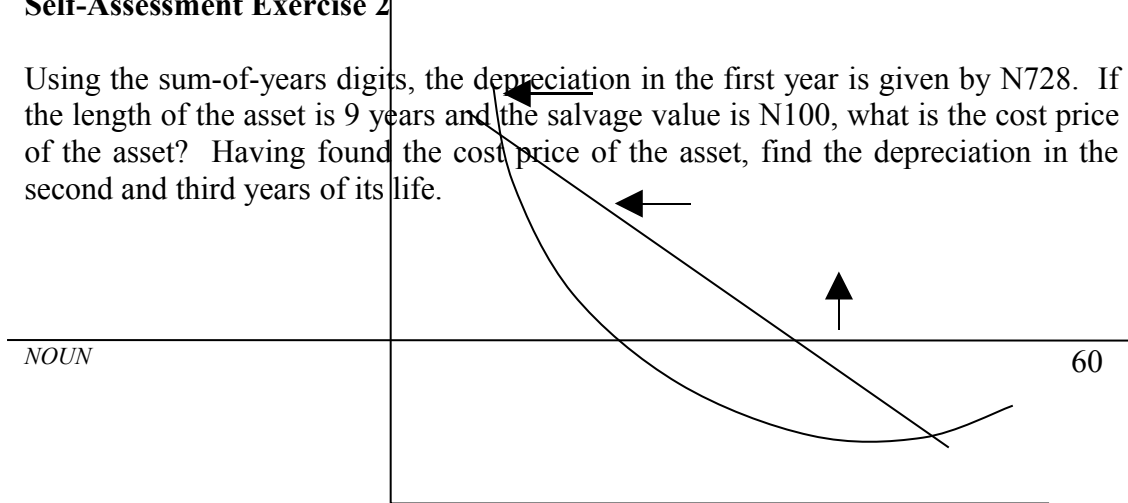
The best method of depreciation to use depends on the type of asset. As a rule of thumb use the method which is easy to compute and one which best approximates the loss of value of the asset concerned.

Table 4.4: Annual depreciation for the three methods of depreciation

<u>Year</u>	<u>Annual Straight Line</u>	<u>Depreciation Declining Balance</u>	<u>Sum-of-years Digit</u>
1	360	800	654.55
2	360	640	589.09
3	360	512	523.64
4	360	409.60	458.18
5	360	327.68	392.73
6	360	262.14	327.73
7	360	209.72	261.82
8	360	167.77	196.36
9	360	134.22	180.91
10	360	107.37	65.45

Self-Assessment Exercise 2

Using the sum-of-years digits, the depreciation in the first year is given by N728. If the length of the asset is 9 years and the salvage value is N100, what is the cost price of the asset? Having found the cost price of the asset, find the depreciation in the second and third years of its life.



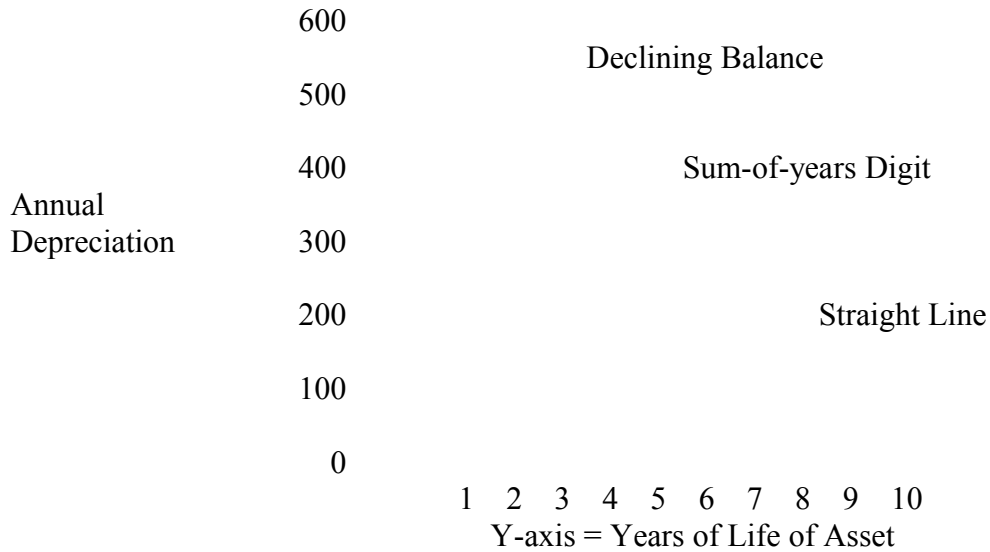


Figure 4.2 Annual depreciation curves for three methods of depreciation.

4.0 Conclusion

It is essential for you to know the six methods of valuation of assets and follow the rules of thumb to guide you in which method to choose at a particular point in time. Likewise, the three depreciation methods are useful to know because one of them fit different rates of loss of value overtime.

5.0 Summary

In this unit, you should have learnt that resources are broken into variable and fixed resources. The variable resources is consumed in one production process while the fixed resources can be used in many production periods. Resources as well should be managed because they are scarce and more output can be obtained from same quantity of resources. In order to achieve the objective of the farming enterprise, managers must allocate their resources in such a way that the marginal cost of additional unit equals the marginal return on that additional unit.

Assets must be properly valued using either the valuation at cost method, valuation at market price, valuation at net selling price, valuation at net selling price, valuation by reproductive value, contribution to production or by capitalization of earnings method. The depreciation can be determined using either the straight line method, the sum-of-year digit or the declining balance method. The method to use will be dictated by the nature of the asset under consideration.

Answers to Self Assessment Exercises**Self-Assessment Exercise 1**

$$a. \quad V = \frac{R}{i}, \quad i = \frac{R}{V} = \frac{2500}{30,000} = 0.083 \times 100$$

$$i = 8\%$$

$$b. \quad V = 800, \quad i = 5\%, \quad R = ?$$

$$V = \frac{R}{i}$$

$$R = V \times i = 800 \times .05 = 800 \times \frac{5}{100} = 40$$

Self-Assessment Exercise 2

$$D_1 = 2w(n-a+1)$$

$$D_1 = 728 = \frac{2(P-100)(9-1+1)}{9(9+1)}$$

$$728 = \frac{(2P-200)(9)}{90} = \frac{18P-1800}{90}$$

$$90 \times 728 = 18P - 1800$$

$$18P = (90 \times 728) + 1800 = 67,320$$

$$P = \frac{67320}{18} = 3740$$

$$D_2 = \frac{2(3740-100)(9-2+1)}{9(9+1)} = \frac{2(3640)(8)}{90}$$

$$= \frac{7280 \times 8}{90} = \frac{58240}{90} = 647$$

$$D_3 = \frac{2(3740-100)(9-3+1)}{9(9+1)} = \frac{2(3640)(7)}{90}$$

$$= 7280 \times 7 = \frac{50960}{90} = 566$$

6.0 Tutor Marked Assignment

1. Decide whether a piece of land with market price of N10,000 is worth buying or not if it is expected that annual earning from the land is N1,000 and rate of discount is 8%.
2. An asset is worth N6,000. If at the end of its useful life it is given a salvage value of N100. Calculate the annual depreciation, remaining balance at the end of each year for 10 years using:
 - a. Straight line
 - b. Declining balance
 - c. Sum-of-years digits.

Draw a graph putting the annual depreciation on the Y-axis and years of life on the X-axis. Do the same putting the undepreciated balance on the X-axis and the years of life on the X-axis. Assume a 20% fixed rate of depreciation for (b).
3. Given the input (Land in hectares) and total physical product as shown below calculate the marginal physical product of land and the value of marginal product of land. The price of output is given as N3 and the price of land is N6 per hectare.

<u>Land Input</u>	<u>TPP</u>	<u>MPP LAND</u>	<u>P OUTPUT</u>	<u>VMP LAND</u>	<u>P LAND</u>
1	70				
2	80				
3	89				
4	97				
5	104				
6	120				
7	125				
8	129				
9	131				
10	133				
11	134				
12	134				

7.0 Further Reading and References

Castle, E.N., M.H. Becker and F.J. Smith. (1972) **Farm Business Management: The Decision-Making Process.** The MacMillan Company, New York. Chapters 3, 8 and 9.

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UNIT 5

Relevant Basic Economic Principles for Decision-Making

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1.0 Introduction

This unit outlines certain necessary economic principles upon which later discussions are based. This is being done to avoid confusing the students when some decision parameters are mentioned in the units later. We are not in any way, however, claiming to cover all economic principles. We are focusing attention mainly on those that are crucial for the student to understand the elements of decision making.

2.0 Objectives

It is hoped that by the end of this unit, you will be able to:

- Explain the law of diminishing returns.
- Explain how prices are determined by supply and demand.
- Explain the relationship between production function and cost curves.
- Explain how the equimarginal returns principle works.

3.1 Individual Farming Unit

The focal point of the study of farm management is the individual farming unit. It is the individual farm owner or manager or household head who possesses values, make choices, and take action. This statement implies that each individual farm firm behaves as an entity or unit, taking its own decisions regarding its resources and output guarded by the desire to maximize its own utility function in time and space.

Developing economies are characterized by millions of these small farm units each producing on a subsistence level to meet the family needs and selling the excess. The atomicity of this type of agriculture is synonymous with the situation of near perfect competition in which no single producer has control over the prices of the products. Prices are determined by the quantity supplied and demanded as each unit makes its own production, consumption and market decisions independently. Unlike in developed economies where group collective actions are possible, the bargaining power of these individual units is weak since collective action is almost absent. Even where group decisions and actions do exist, they can be thought of only in terms of collective decisions or actions of the individual farming unit concerned and not the various farm units brought together to protect their collective interest.

3.2 Rational Behaviour

It is the duty of the individual farm unit to take decisions that lead to the attainment of its set goals. In economics the individual unit is assumed to be “rational” in that it is able to determine within limits what it wants; and will strive to fulfill as many of its wants as possible. The extent to which it is able to accomplish this depends on the resources at its disposal and the intensity of its desire and ability to overcome the environmental, social, and biological forces that would stand in its way. In economics, factors such as the environment are not taken as factors that determine what the decision unit can do but as constraint within which the individual unit’s preference can operate.

This position implies that the individual unit will always choose more of what it wants than less. It will choose less of what it does not want than more. For example if the farmer has a choice to make between two enterprise combinations X and Y, it will be rational for him to choose Y if that combination gives him a higher profit than X. In case there is some uncertainty surrounding the profit margins the individual unit will choose the combination with the greatest expected value. This assumes that the unit derives a greater level of satisfaction from larger profit.

3.3 Opportunity Cost

If the individual decision unit seeks to maximize his utility then it follows that it must make choices among relevant alternatives. In the act of choosing to do one thing, the unit must forgo doing something else. In monetary terms, the cost of doing or having something is that which is forgone. Therefore for every act there is a cost and it is this cost that determines whether or not something will be done. Cost can be considered as the constraint on action. In some transactions money may not change hands but cost is not necessarily money. Money in form of the Naira or cedis, or francs, is just one means of measuring cost. In order to gain something the decision unit will have to give up something in the way of time, psychic benefits, and/or resources that may be used for other purposes.

In this text we shall refer to the question of cost and benefit of alternatives among which the unit may have to make its choice. Cost in whatever form it comes is incurred, with the hope of deriving some benefit from the action taken. The benefit may also be in kind in form of anything apart from monetary. A rational decision maker is again assumed to choose an enterprise combination with lower cost (in terms of cost), and choose one with greater benefit (in terms of benefit), all things being equal. If one takes the difference between the cost and benefit – labeled profit or net loss – the rational decision unit would prefer a higher profit or smaller net loss.

3.4 Marginal Cost

In determining how many units of a given commodity to consume, the individual must focus on the additional cost of each additional unit. The additional cost is referred to as marginal cost. Before the rational decision maker proceeds to allocate the next unit in consumption or production, he must at each step along the way ask how much that additional unit costs.

At each particular point where a choice must be made, the individual is likely to have a whole array of opportunities he can choose to forgo in order to follow a particular course of action. These opportunities are likely to vary in their value to the individual. In making the choice to consume the first unit of a commodity, which opportunity will he give up? The rational decision maker will forgo that opportunity he values last. For example, assume that the individual is faced with making a choice between units of cutlasses and hoes. The individual already owning a cutlass will place higher value on owning the first unit of hoe before owning another unit of cutlass. In this case the opportunity he values least is the cutlass. He will therefore forgo the cutlass in preference to the hoe. The cost, which in this case is the marginal cost, is the value of that opportunity given up. This implies that the cost of the first unit is as low as possible. If the individual then wishes to produce or

consume a second unit, he will have to give up that opportunity that is second to the bottom value. This means that the marginal cost of the second is greater than the first. This phenomenon shows that we should expect that the marginal cost of successive units should rise progressively.

The relationship between the unit of a commodity provided and the marginal cost would depict a curve that is upward sloping to the right as shown in figure 5.1. The graph showing the marginal cost (on the vertical axis) and the quantity of the commodity (on the horizontal axis) is referred to as the supply curve. This relationship shows the (or price) received per unit, the more units of the commodity the individual can justifiably provide.

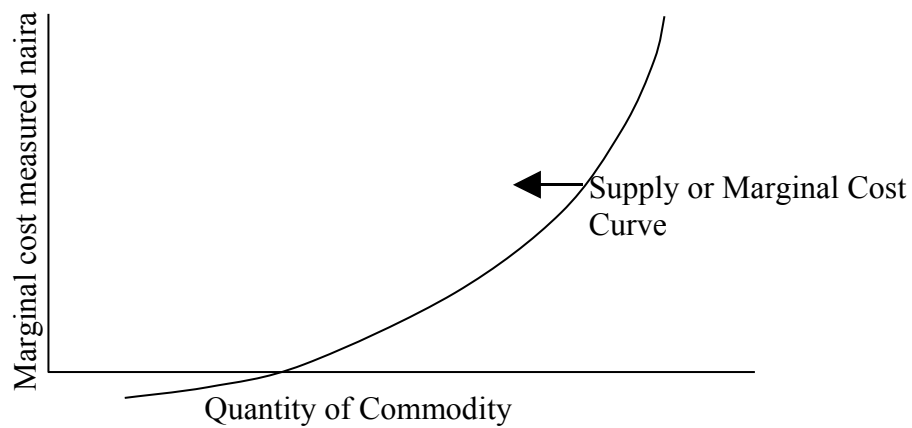
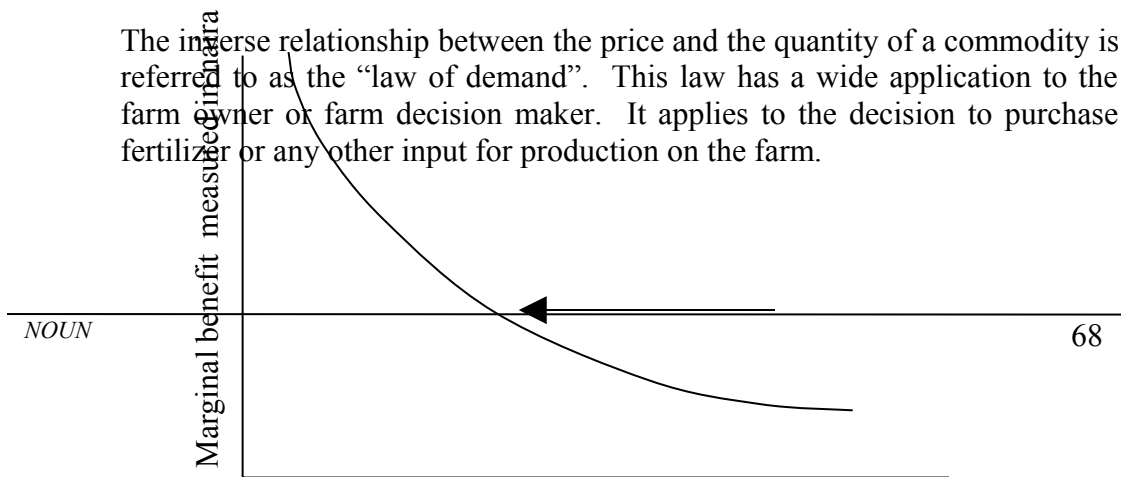


Figure 5.1 Relationship between marginal cost and quantity of a commodity

3.5 Marginal Benefit

Like the marginal cost, marginal utility (or benefit) is the additional utility on each individual unit of a commodity. Unlike marginal cost, as the individual acquires an additional unit of the commodity, the added utility (or satisfaction) decreases. Hence, the graph showing the marginal utility or benefit (on the vertical axis) is downward sloping to the right. This is called the demand curve as shown in Figure 5.2. This relationship implies that as the price of the commodity goes down, the rational decision maker will purchase more of it because his objectives is to maximize his utility.

The inverse relationship between the price and the quantity of a commodity is referred to as the “law of demand”. This law has a wide application to the farm owner or farm decision maker. It applies to the decision to purchase fertilizer or any other input for production on the farm.



Demand Curve

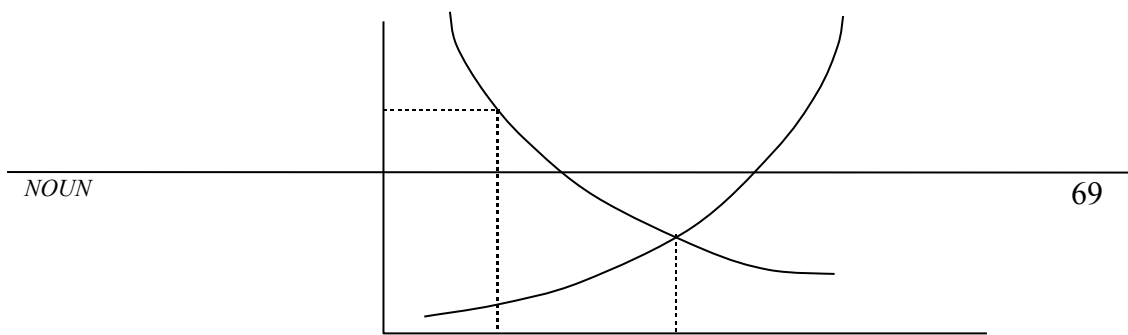
Quantity of commodity

Figure 5.2: Relationship between marginal benefit and quantity of a commodity

3.6 Supply and Demand

A very useful model arises when the supply and demand curves are put on the same graph as shown in Figure 2.3. The supply curve is the marginal benefit (marginal revenue) curve of that commodity. The two curves intersect each other at a point where Q_a units of the commodity is produced and consumed by the individual who is maximizing his utility. At this point marginal cost is equal to marginal utility. If the individual decides to restrict his consumption to Q_b , the marginal benefit indicated by the demand curve and represented by P_a is greater than the marginal cost which is indicated by the supply curve and represented by MC_a . Anywhere between Q_b and Q_a the marginal benefit or marginal utility (MU) is greater than the marginal cost (MC). Hence the individual will strive to increase his utility by consuming more of the commodity till he gets to Q_a where he maximizes his utility, that is, at the point where $MU = MC$. At any point beyond Q_a , the reverse occurs. This means that MC is greater than MU and the individual will have to cut back to Q_a .

An understanding of the interrelationship between supply, demand and price is important in any business including farming. In a situation of perfect competition where there are no guaranteed prices, subsidies etc, when the supply of a commodity falls (shifts upward to the left) while the demand remains fairly constant, the price of the product will rise as shown in Figure 5.4



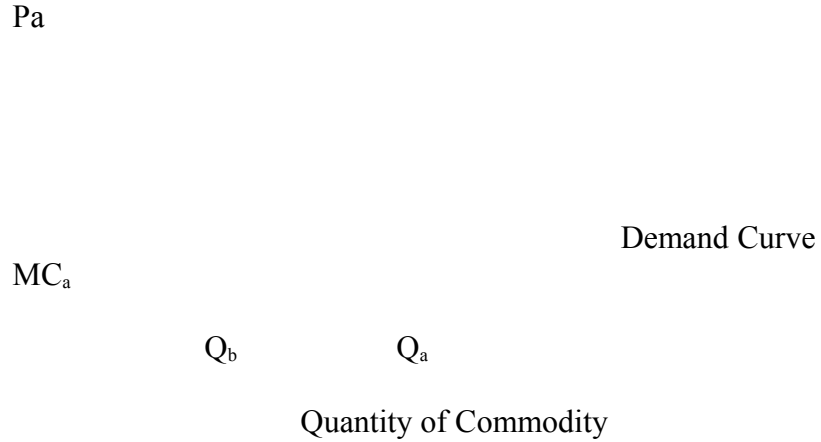


Figure 5.3 Supply and demand curves

There are no guaranteed prices, subsidies etc., when the supply of a commodity falls (shifts upward to the left) while the demand remains fairly constant, the price of the product will rise as shown in Figure 5.4.

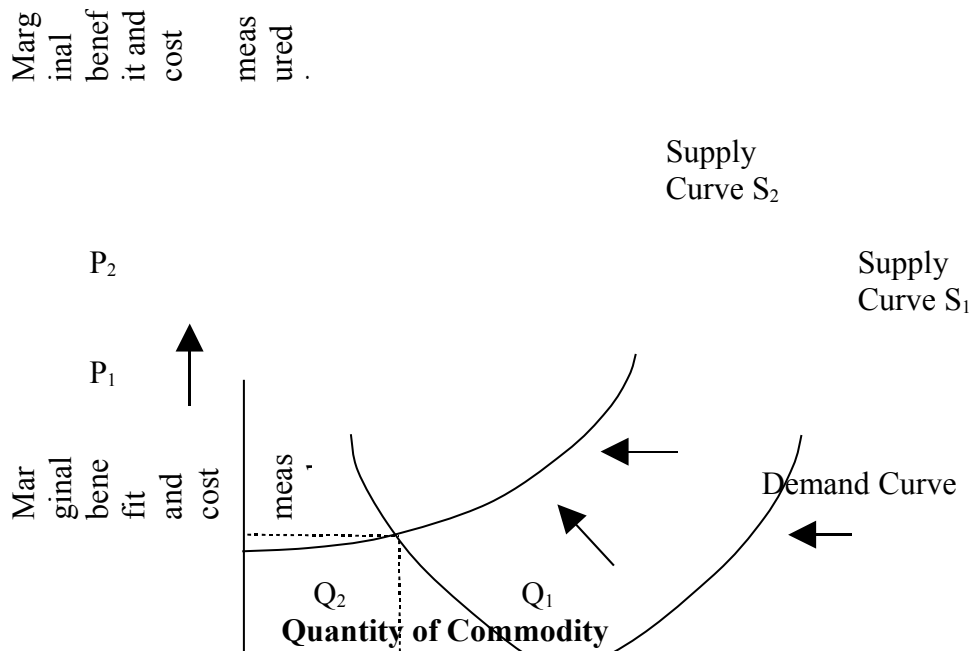
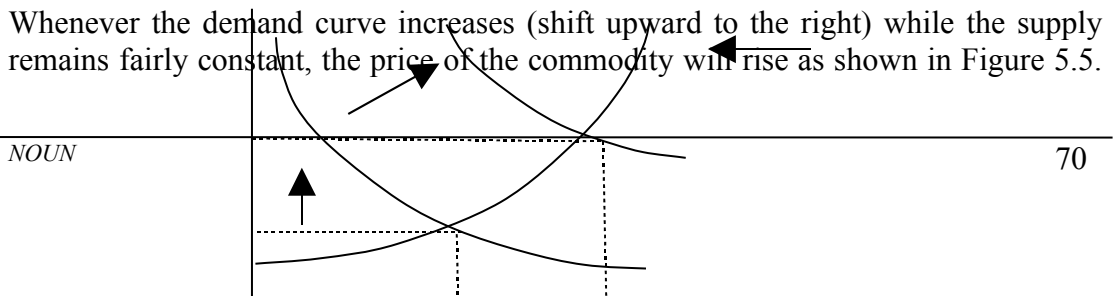


Figure 5.4 Shift in supply curve

If the reserve occurs, in which case supply of commodity rises (curve shift downwards to the right) while the demand remains fairly constant, the price of the commodity will fall.



Whenever the demand curve increases (shift upward to the right) while the supply remains fairly constant, the price of the commodity will rise as shown in Figure 5.5.

However, if the demand shifts to the left, supply curve remaining constant, the price will fall. In cases where both the supply and demand for a commodity rise together the price could remain fairly even.

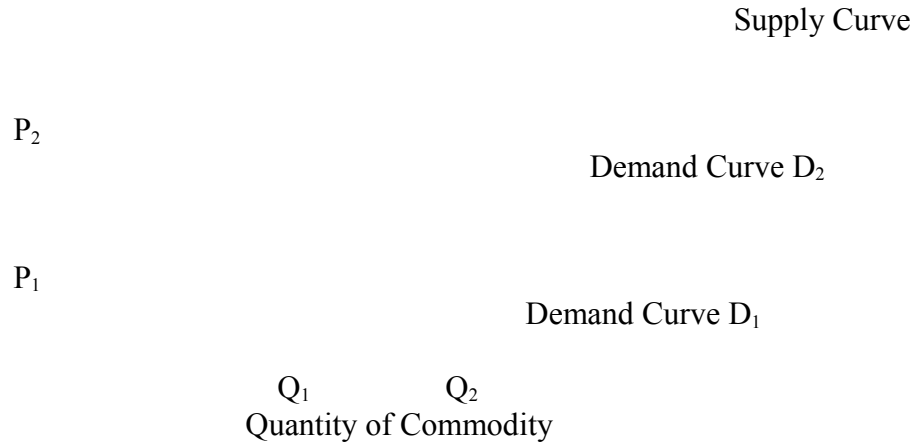


Figure 5.5 Shift in demand curve

Upward or downward shifts in the demand for a commodity can be as a result of population, consumer disposable income, changing consumer tastes and preferences, substitute products, cultural and environmental factors. Shifts in the supply of a commodity may be as a result of factors like weather and changes in technology.

Self-Assessment Exercise 1

By means of diagrams explain what happens when:

- the demand for a commodity rises.
- the supply for a commodity rises.

3.7 Law of Diminishing Returns

The law of Diminishing Returns states that as successive equal units of variable input is added to a set of fixed inputs the total physical product (TPP) first increase at an increasing rate, then increase at a decreasing rate, then increase at a decreasing rate, reaches a maximum and there decreases henceforth. This relationship is shown in Figure 5.6

This physical relationship between the output and input is called a production function. It is important to know that diminishing returns applies to all production processes in agriculture. If, for example, successive quantities of irrigation water are added to the soil for the production of maize given that other factors are held fixed at certain levels.

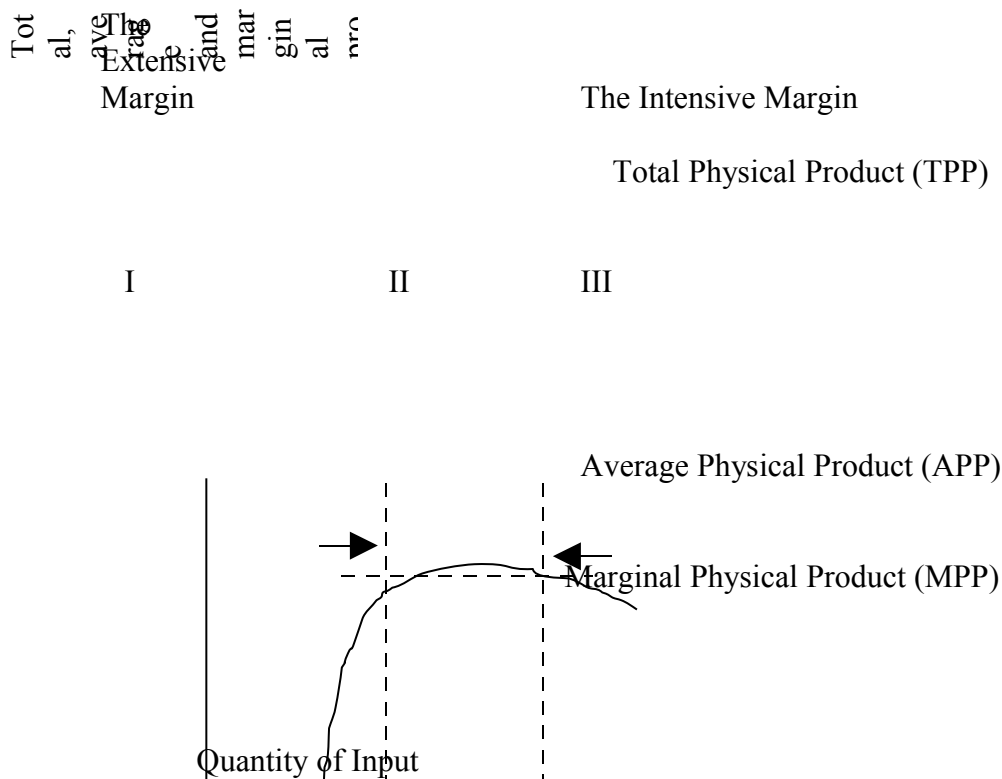


Figure 5.6 Total, average and marginal physical product curves

The total grain yield of maize will obey this law of diminishing returns. This is because the first few successive quantities of water, so much needed for the plant survival, will result in greater proportional increment in output than the corresponding increment in the water applied. As more and more water is supplied, the soil may become saturated and water-logged leading to reduction in the yield of maize.

The law of diminishing returns can also be expressed in terms of the average physical product (APP) and marginal physical product (MPP). The average physical products given by the total product divided by the total input used at that point. This means $APP = \frac{TPP}{X}$

where X is the quantity of variable input used. The MPP is given by the change in output (ΔTPP) divided by the change in input (ΔX) i.e.

$$MPP = \frac{\Delta TPP}{\Delta X}$$

As shown in Figure 5.6 as the successive equal units of the variable input are added to a set of fixed inputs the MPP first increases,

reaches a peak and then decreases to zero. In terms of the APP as the successive equal units of the variable input are added to the fixed inputs the APP first increases, reaches a peak where it equals the MPP and then decreases.

Three stages of production can be identified. In Stage I, the APP is increasing while the MPP reaches a maximum and begins to drop depicting that TPP is increasing at an increasing rate and then starts to increase at a decreasing rate. In Stage II, the TPP is increasing at a decreasing rate and reaches a maximum while APP is falling. MPP is decreasing faster than APP and reaches zero. In Stage III, TPP is decreasing, APP is decreasing while MPP is negative.

In Stage I the quantity of the variable input is small compared to the fixed inputs hence the ratio of variable input to the fixed inputs is low. It therefore pays to keep adding more of the variable input to the fixed inputs. Similarly, as long as MPP is greater than APP, as happens in Stage I, one would continue to add more of the variable input to the fixed input. MPP does not equal APP until APP is maximum at the beginning of Stage II, the extensive margin. In Stage III the quantity of the variable input is large compared to the fixed inputs hence the ratio of variable input to the fixed inputs is large and reaches a maximum at the beginning of Stage III, the intensive margin. As from the beginning of Stage III, the intensive margin, where the ration of variable input to the fixed inputs is maximum, the limiting factor is no more the variable input but one or more of the fixed inputs which might have been stretched beyond their limits. Additional variable input begins to produce no yield advantage. MPP becomes negative and it does not make economic sense to keep adding more of the variable input beyond three intensive margin. Hence production is justifiably restricted to Stage II, which is bounded by the extensive and intensive margins. Given the conditions discussed above, Stage I and III are referred to as irrational stages of production, while Stage II is the rational stage of production. Stage II is the area where the ratio of the variable input to the fixed inputs is high and adjustment between two extremes is possible. One can move between the extensive and intensive margins. If the fixed inputs are expensive relative to the variable input the tendency is to move to the intensive margin. If the reverse is true there will be the tendency to move to the extensive margin Stage II, where diminishing returns occur is the stage of concern for the farmer and it is where profit margins are maximized.

The question facing the farmer or decision maker is: How much of the variable input should he apply to the set of fixed inputs in order to maximize profit? This question cannot be answered by considering the physical quantities of input and output. We need to introduce prices of input and

output to convert the physical quantities into value terms. At each point we can multiply the MPP by the price of the output to derive the marginal value product (MVP). That is: $MVP = MPP \times P_Y$ where P_Y is the price of the output. Similarly, average value product (AVP) is given by $(APP \times P_Y)$ and total value product (TVP) is given by $(TPP \times P_Y)$. In Stage II, the rational state of production, the quantity of variable input to use is determined at the point where the value of marginal product equals the marginal cost of the input, that is $MVP = MC$. The marginal cost of the variable input X is actually its unit price P_x . Profit is therefore maximized where $MVP = P_x$ when input price is constant.

In monetary terms Figure 5.6 can be expressed in terms of costs. The total cost of production the sum of fixed and variable costs. That is: $Total\ Cost\ (TC) = Fixed\ Cost + Variable\ Cost$. Other cost curves are shown in Figure 2.7 are as follows:

Marginal Cost is the cost of producing additional unit of output at a particular level of output.

$$MC = \frac{\text{Change in total output}}{\text{Change in output}}$$

MC curve reaches its minimum when MPP is at maximum and it increases as MPP declines.

Average Total Cost (ATC) is the total cost per unit of output i.e.

$$ATC = \frac{\text{Total cost of production}}{\text{Total quantity of output}}$$

Average Fixed Cost (AFC) is the fixed cost incurred in the production process per unit of output produced i.e.

$$AFC = \frac{\text{Total Fixed Cost}}{\text{Total quantity of output}}$$

Average Variable Cost (AVC) is the variable cost incurred per unit of output i.e.

$$AVC = \frac{\text{Total Variable Cost}}{\text{Total quantity of output}}$$

AVC curve declines as long as APP is increasing and reaches its minimum when APP is at a maximum.

In order to compute these cost functions, we need to know the nature of the production function, the price and quantities of all inputs used and the location of the scale line for the set of fixed factors considered. Figure 2.7 shows the relationship between the production function and the cost functions as well as between the cost functions themselves. The MC curve intersects the U-shaped ATC and AVC curves at their minimum points. As long as the price line dd lies above the minimum point of AVC the firm is making some profit in the short run over the variable cost but not necessarily over the fixed costs. The firm would continue to produce in the short run so long as the variable costs are more than covered.

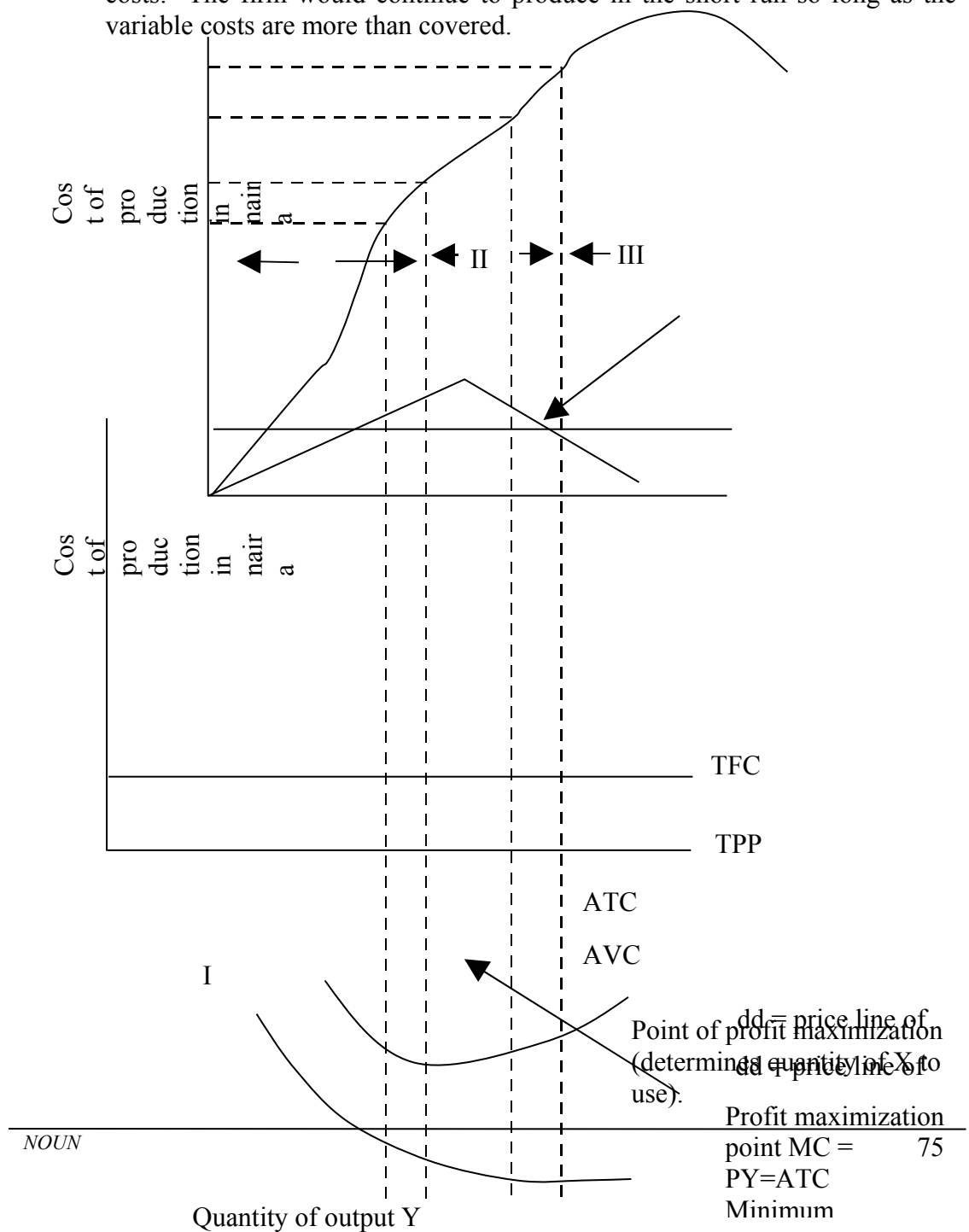
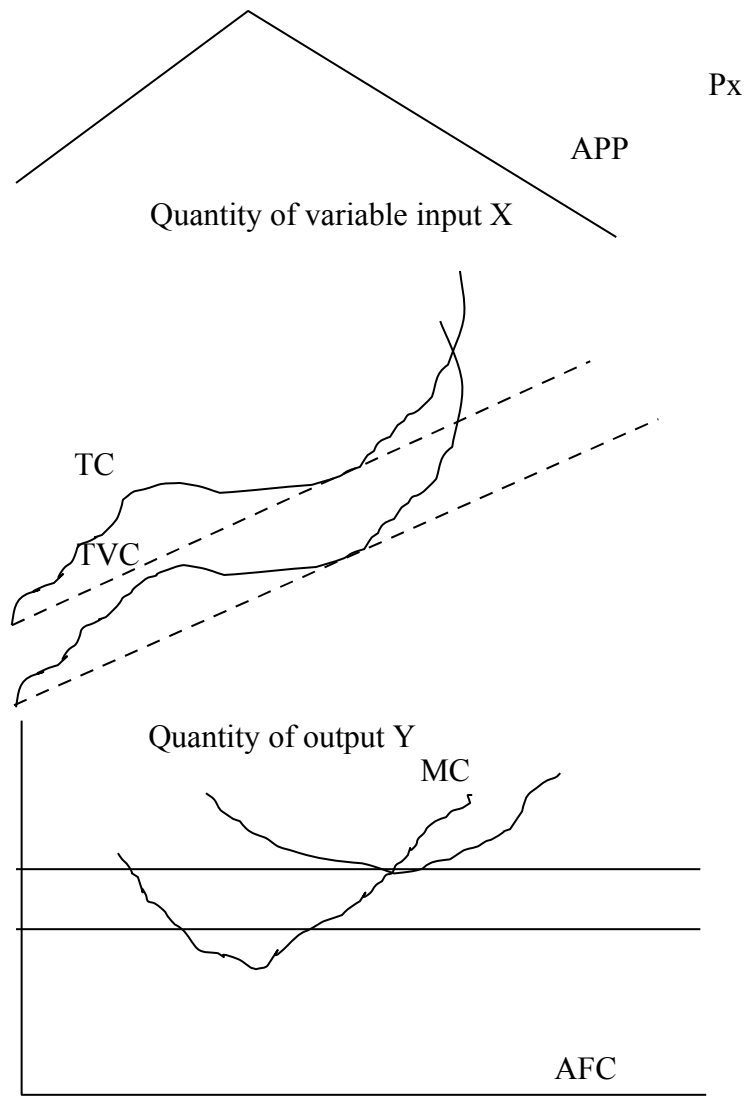


Figure 5.7: Relationship between production function and cost



However, the firm will shift down if P_x falls below AVC 's minimum. If P_x lies above ATC 's minimum the firm is making some excess profit to cover part of the fixed costs.

In summary the quantity of the variable input to add to the set of fixed resources is determined at the point where

$$MVP \text{ or } MPP \times P_y = P_x \text{ as shown in Figure 5.8}$$

The quantity of output to be produced is determined at the point where

$$MC \text{ or } \frac{\Delta TC}{\Delta Y} = P_Y \text{ as shown in Figure 5.9}$$

Self-Assessment Exercise 2

State the law of diminishing returns in terms of (a) total physical product (b) marginal physical product (c) average physical product.

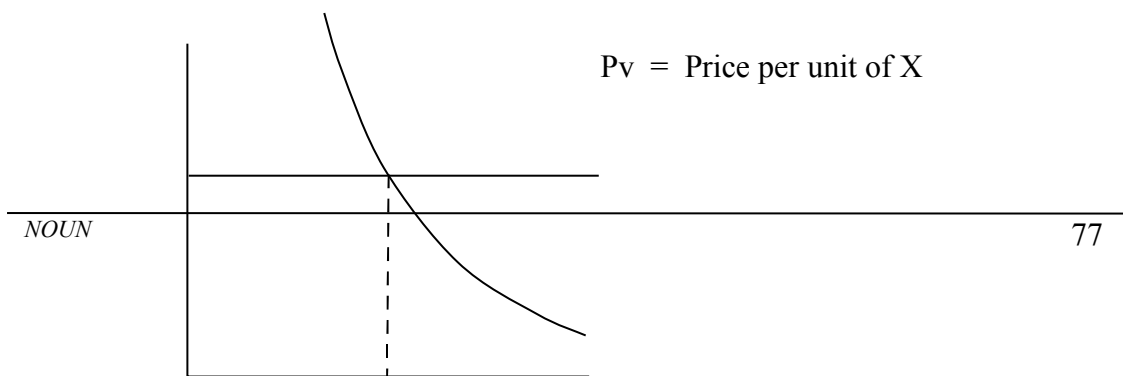
3.7b Equimarginal

It makes for better decision making when a manager is able to distinguish between average and marginal returns to capital. Average returns relate to the returns on all the capital invested in an enterprise while marginal returns relate to the returns on an extra (added or marginal) sum of capital. The difference between the two is illustrated in Table 5.1

Table 5.1 Average and marginal returns on capital different enterprises

	Farm 1	Farm 2	Farm 3
Capital invested	N10,000	10,000	10,000
Return on N10,000	1,000	500	2,000
Average return	10%	5%	20%
Increase in capital investment	2,000	2,000	2,000
Return on extra N2,000	600	200	100
Marginal return on extra N2,000 invested	30%	10%	5%
Total return on N12,000	1,600	700	2,100
Average return on N12,000	13.3%	5.8%	17.5%

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a per
unit
of
output



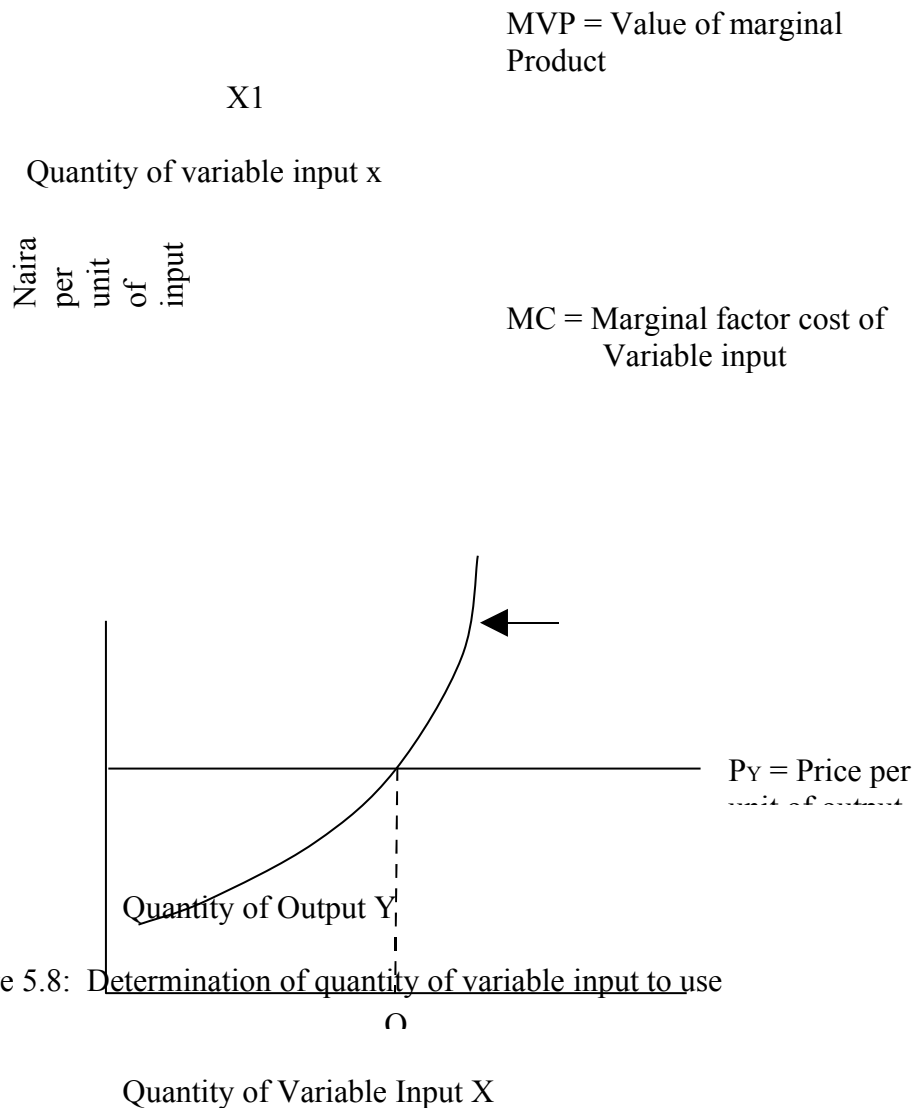


Figure 5.8: Determination of quantity of variable input to use

Figure 5.9 Determination of quantity of output to produce

A particular farmer owns three farms each with its different enterprises or enterprise combinations. Judging from the average returns only, one would think that Farm 3 yields a greater return that is, 20% on N10,000 and 17.5% on N12,000. Farm 1 yields a higher marginal return of 30% than either Farm 2 or 3. The farmer could be tempted to invest the extra N2,000 on Farm 3 based on the average returns only but considering the marginal returns, it should be invested on Farm 1. Therefore average figures taken in isolation can obviously be misleading.

When farmers have adequate capital, input can be employed up to the level where marginal revenue equals marginal cost. If capital is limited then the concept of equimarginal returns is relevant. The principle of Equimarginal Returns states that at least N1 spent on an enterprise or factor production will yield a marginal return exactly equal to the last N1 spent on all other enterprises or factors of production. This means that if N1 is spent buying fertilizers, then the additional feed should be purchased up to that point where the last N1 spent on deed will return exactly the same as the last N1 spent.

Self-Assessment Exercise 3

Show that taking average figures in isolation can be misleading

3.8 Types of Enterprises

Within a farm business there are interrelationships between enterprises. There are basically three classifications, namely: complementary, supplementary and competitive enterprises.

Supplementary enterprises are those which do not compete with other enterprises but may use up superfluous resources available in the farm e.g. pigs and poultry using spare labour and buildings. Competitive enterprises are those that compete with each other e.g. sheep and dairy cows competing for grass; dairy cows and poultry competing for available building space. Complementary enterprises are those that aid or contribute towards the success of each other e.g. pigs being fed cassava or yam peelings: groundnut haulms being fed to cattle.

4.0 Conclusion

This unit highlights basic principles of economics that aid in making decisions regarding the farm business. Your understanding of the elements of decision-making is enhanced by grasping these basic principles and their applications. The marginal cost and marginal utility curves referred to in Unit 2 are explained further in this unit. They help us determine the points of equilibrium where the specifications for choice or making decisions are met.

5.0 Summary

In this unit you must have learnt that the focal point in the study of farm management is the individual farming unit. Each individual farm firm behaves as an entity. It takes its own decisions regarding its resources and output with the sole aim of maximizing its own utility function in time and space. Each individual unit is assumed to be rational, choosing more of what

it derive a greater level of satisfaction. The individual decision unit in attempting to maximize its utility is bound to make choices among relevant alternatives. In order to gain something the decision unit will have to give up something. This is the concept of opportunity cost.

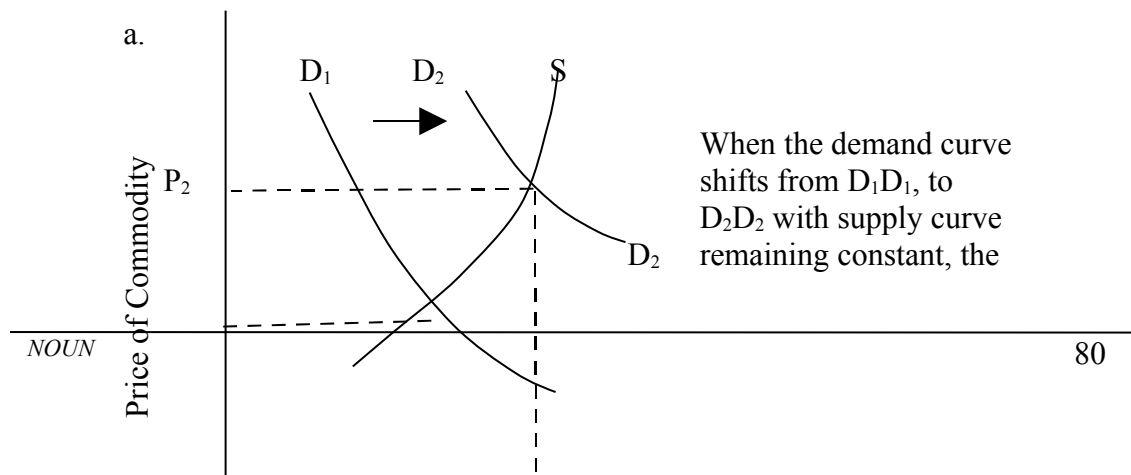
In determining what quantity of a given commodity to consume the individual unit must equate the additional benefit. The law of supply and demand operates along the same line in which the quantity of the commodity to purchase is determined at the point of equilibrium between the demand and the supply curves.

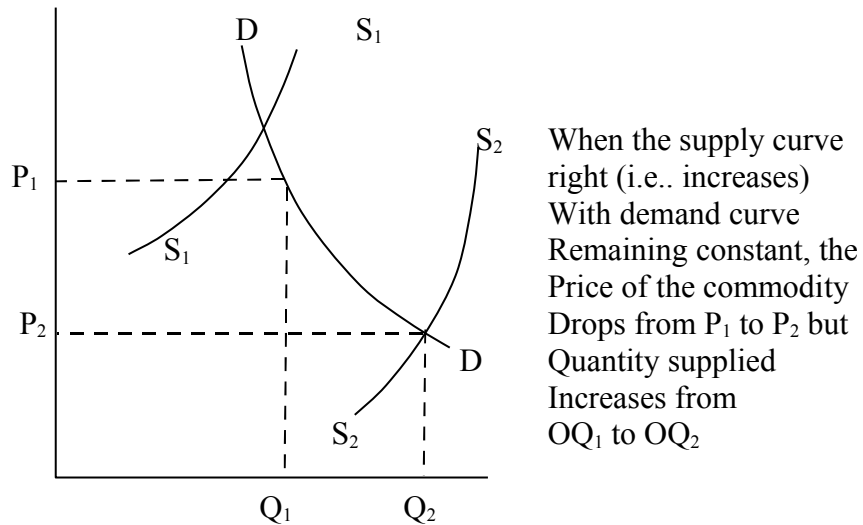
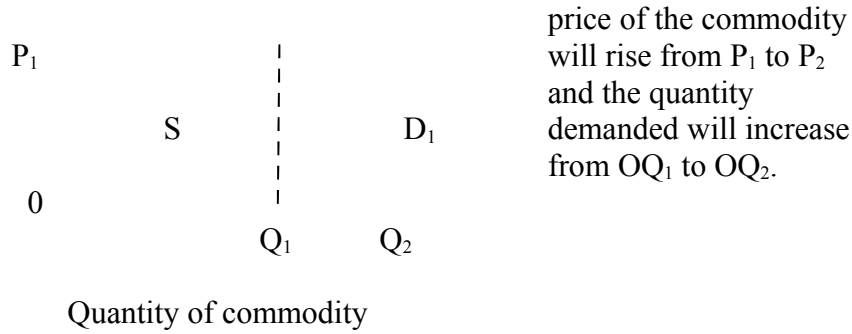
The law of Diminishing Returns teaches that you cannot continue indefinitely to add a variable input to a set of fixed inputs and expect to obtain higher yields. The knowledge of the behaviour of the total physical product, average physical product and marginal physical product in the three stages of production helps you to appreciate the relationship between the inputs and output. The cost curves are related to the physical product curves as shown in the figures. This leads you to know that quantity of output to produce is determined by the point where marginal cost equals the price of output.

Finally, it makes for better decision-making when a manager is able to distinguish between average and marginal returns to capital. The principle of equimarginal returns teaches us that at least One Naira spent on an enterprise or factor of production will yield a marginal return exactly equal to the last One Naira spent on all other enterprises or factor of production.

You must have also learnt that there are complementary, supplementary and competitive relationships between enterprises on the farm.

Self-Assessment Exercise 1





b.

Self-Assessment Exercise 2

- a. The law of Diminishing Returns states that as successive equal units of a variable input is added to a set of fixed inputs the total physical product (TPP) increases first at an increasing rate, reaches an inflection point when it is increases at a decreasing rate, reaches a maximum and then continues to decrease.
- b. The law of Diminishing Returns states that as successive equal units of a variable input is added to a set of fixed inputs, the average physical product (APP) first increases, reaches a peak when it equals the MPP then decreases.
- c. The law of Diminishing Returns states that as successive equal units of a variable input is added to a set of fixed inputs, the marginal physical product (MPP) first increases, reaches a peak at the inflection point of

TPP and begins to decrease to zero at the point when TPP is maximum and then becomes negative.

Self-Assessment Exercise 3

	<u>Farm 1</u>	<u>Farm 2</u>	<u>Farm 3</u>
Capital investment	10,000	10,000	10,000
Return on 10,000	2,000	1,000	1,500
Average return	20%	10%	15%
Increase in Capital	4,000	4,000	4,000
Return on extra N4,000	500	1,000	800
Marginal return on extra N4,000	12.5%	25%	20%

From the information for Farms 1, 2 and 3, one would choose enterprise Farm 1 because it has higher average returns of 20%. But on the margin (when an additional N4,000 is injected in to the business) the marginal return of 25% for Farm 2 is higher. The choice would therefore be Farm 2.

6.0 Tutor Marked Assignment

1. Describe what happens at the three stages of production
2. Define MC, TC, AFC, AVC, MPP, APP, MVP, TFC and TVC
3. By reference to a graph answer the following questions:
 - a) When marginal product is increasing, what happens to (i) MC (ii) AVC?
 - b) When marginal cost first begins to fall, does average variable cost begin to rise?
 - c) What is the relationship between MC and AVC when APP and MPP are equal?
 - d) What happens to AVC when APP is at its maximum? What happens to AVC after this point?
 - e) What happens to TFC as output increases?
 - f) What happens to AFC as:
 - i) MPP increases?
 - ii) MC decreases?
 - iii) MPP decreases?
 - iv) MC increases?
 - v) AVC increases?

4. Define the following and give examples:
 - a. Complementary enterprises
 - b. Supplementary enterprises
 - c. Competitive enterprises

7.0 Further Reading AND References

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MODULE 2

UNIT 6

NET WORTH STATEMENT

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1.0 INTRODUCTION

The data gathered on the farm business needs to be analyzed to be able to determine the strong and weak points of the business. One of such analysis is to determine the net worth of the business at a particular point in time, perhaps at the end of an accounting year.

2.0 OBJECTIVES

It is hoped that by the end of this unit, you will be able to:

- Differentiate between the three categories of assets and liabilities.
- Determine the net worth of a farm business.

3.1 What is Net Worth Statement?

Net Worth statement is often called a balance sheet or financial statement which applies to a point in time and represents a stock concept. It is like taking a snap shot of the business at a particular point in time. The net worth statement shows the value of the assets that would remain if the business were to be liquidated and all outside claims paid. It is sometimes referred to as residual liability or equity.

By definition net worth statement is equal to total assets minus total liabilities, that is, $\text{Net Worth} = \text{total Asset} - \text{total Liabilities}$.

The Net Worth Statement sometimes gives information on the solvency of the business and is used as a basis for credit because it shows the ability of the business to meet short-run financial demands. If the total assets exceed the total liabilities the business is solvent. The greater the net worth, the better the solvency position of the business.

3.2 What are Assets?

An Asset is anything of value owned by a business concern. In order to ascertain the condition of a business with regard to its immediate obligations, its assets are categorized according to their liquidity. A net worth statement requires an inventory of all properties or assets as well as records of all liabilities of the business. There are three classes of assets. They are fixed, working and current assets.

Fixed Assets: Are those assets which cannot be easily converted into cash to meet current obligations. Examples of fixed assets are land, buildings and other permanent improvement like fence.

Working Assets: Are those assets which are used up within the production process of the business. Their values may be regarded as being transferred slowly to the products during the farm operations. They are liquidated at a faster rate than fixed assets. Examples of working assets are farm equipment (like hoes and cutlasses), layers and donkeys.

Current Assets: Are also called liquid assets. Examples of current assets are cash in hand bills receivable within a short time, crops and feeds in hand.

3.3 What are Liabilities

Liabilities are those legitimate claims that can be made against a business. It is useful to have classification of the liabilities correspond to that of the assets. Liabilities are classified according to the time they fall due for payment.

Long-Term Liabilities: Are those that will not fall due for payment in a lump sum within a short period of time. They may fall due to a period, like say, twenty years. Examples of long-term liabilities are real estate mortgages

and long-term land leases. These are not commonly used by subsistence farmers.

Intermediate Liabilities.: Are those obligations that are deferred for the time being but which will be paid within a few years like five years or less. Examples of intermediate liabilities are promissory notes, obligations base on crop or livestock in the process of production and ready to mature within a few years.

Current Liabilities: Are those obligations that are payable with a year. These payment when due demand the immediate attention of the farm manager.

3.4 The Net Worth

The net worth statement is supposed to show absolute equity or the amount by which assets in the business exceed its outstanding liabilities. The term “balance sheet” depicts that the total assets be equal or greater than total liabilities incase the entire business were to close down and all liabilities were to be met. The net worth figure indicates ultimate rather than immediate solvency of the business.

Ultimate solvency means that, total assets are equal to or greater than total liabilities. When total liabilities are not covered by total assets the business is said to be insolvent or bankrupt. The size of the net worth figure therefore gives the farm manger an idea of the distance of the business from solvency. The greater the net worth, the farther away from insolvency. Immediate solvency refers to the relationship between current liabilities and current assets which can be used to pay them off if the need arises. A farmer could be immediately insolvent, that is, unable to pay its immediate debt if current, working and long-term assets exceed the sum of the current, intermediate and long-term liabilities.

It should be noted, however, that the effect of changes in price level on the value of permanent assets such as land, building and livestock might have a marked effect on the net worth. If the market price of a piece of item such as land increases continuously and if this is not reflected in the net worth statement, the true net worth has not been shown. If the net worth statement is being used as a basis for credit, the security of the business is understated. Therefore caution must be taken when looking at net worth statements.

Examination of the individual item to get a true picture of the financial standing of a business is necessary. Also, the net worth does not tell the whole story. A man with larger net worth may have more to worry about

than one with a smaller net worth. It depends largely on the ratio of total assets and liabilities in the form of obligations and the nearness of their maturity.

3.5 Examples of Net Worth Statement

In the example shown in Table 6.1 for Mwangi's farm in Njoro, Kenya, the current asset consisted of cash and crops that could be sold and turned into liquid each while the working capital included supplies and tools. The fixed capital included farm buildings, fencing and land. On the liability side the account payable immediately was 400 shillings → see page 81

Table 6.1 A Net Worth Statement for Mwangi's Farm in Njoro, Kenya as at April 4, 1986

While the intermediate liability payable within three years was 600 shillings. It should be noted that as a balance sheet the last row of the asset column should balance with the liability column. Hence, if the business was solvent (i.e total asset greater than total liability) the last row of the liability column should be the total liability plus the net worth. If the total liability exceeded the total assets, the net worth would be negative and the last row of the liability column should be the total liability less the net worth as we have in table 6.2

Table 6.2 A Net Worth Statement for Mwangi's farm in Njoko, Kenya as at December 12, 1986

	Assets (Kenya Shillings)	₦		Liabilities (Kenya Shillings)	₦
(a)	Current: Livestock		(a)	Current: Account payable now	2,000.00
	Chicken	20.00		Account payable in 6 months.	3,000.00
	Eggs	50.00		Account payable in 12 months	5,000.00
	Crops	160.00			
(b)	Working Capital:		(b)	Intermediate:	
	Bulls	1,000.00		Account payable in 3 Years	5,000.00
	Breeding Stock	2,000.00		Account payable in 5 years	2,000.00
(c)	Fixed Capital:		(c)	Long –Term:	
	Land	2,000.00		Account payable in 10 years	3,000.00
	Building	5,000.00		Total Liabilities	20,000.00
	Fencing	1,000.00		Net Worth	8,590.00
	Total Assets	11,410.00		Total Liabilities + Net Worth	11,410.00

Self – Assessment Exercise I

Prepare a Balance Sheet for a small scale farmer in Borno Village, Zaria Nigeria, who had the following farm records by December 31, 1989:

- i. 3 Large hoes at ₦15.00 each.
- ii. 4 Small hoes at ₦ 7.00 each
- iii. 2 Cutlasses at ₦20.00 and ₦ 18.00 each respectively
- iv. 3 small baskets at ₦ 3.00 each
- v. 2 large baskets at ₦4.00 and ₦5.00 respectively
- vi. 2 farm huts valued at ₦50.00 and ₦60.00 respectively
- vii. 10 clocks: ₦5 valued at ₦15.00 each
 ₦3 Valued at ₦12.00 each
 ₦2 valued at 10.00 each
- viii. 15 hens: 5 valued at ₦14.00 each
 3 Valued at ₦12.00 each
 2 valued at ₦10.00 each
 5 valued at ₦8.00 each
- ix. Goats: 3 he goats at ₦50. 00 each
 4 she goat at ₦45.00 each
 3 young goats at ₦45.00 each
- x. Sheep: 1 ram at ₦70.00
 3 ewes at ₦60.00
 3 lambs at ₦50.00

The farmer owed the village chief a sum of ₦600 payable within 10-20 years and another friend ₦800 payable with the same period.

In addition he owed a friend ₦300 payable in 5 years time. The farmer also owed a friend ₦50 which was payable with the next one year. He borrowed ₦86 payable immediately from his wife for buying yam seeds. He borrowed ₦163 from Musa expected to be paid back at the end of the harvest (3 months hence) and another ₦200 expected to be paid in lump sum not earlier than 6-7 years. Adams owed him ₦350 payable anytime. In his store he had 120 yam tubers valued at ₦1.50 each and 100 sheaves of sorghum valued at ₦4 each, 10 baskets of cassava valued at ₦10 each. He owned 10 hectares of land valued at ₦100 per hac.

Self Assessment Exercise 2

Prepare the Net worth Statement for Mensah's Farm given the information below:

	Cedis
Cash in hand	1,200.00
Crops ready for sale (maize)	3,000.00
Account receivable now from kofi	4,000.00
Eggs	1,012.00
Livestock :	
Hens	400.00
Sheep	2,500.00
Bullocks	4,000.00
Machinery	22,200.00
Land	126,000.00
Building	32,000.00
Account payable now	14,000.00
Long-term loan	113,000.00
Intermediate debt	20,000.00
Owner's equity	44,000.00

4.0 CONCLUSION

The net worth statement or balance sheet gives an indication of the solvency of the business and its ability to meet short-term financial demands. A positive net worth (i.e. value of assets exceed total liability) is an indication that the business is solvent. The greater the net worth, the better the solvency. The information from the net worth statement will be used later in the units that follow for further analysis of data.

5.0 SUMMARY

You have learnt in this unit that the net worth is the total assets minus the total liabilities. Assets are things of values owned by the business concern while liabilities are those legitimate claims against the business. Assets are classified into fixed, working and current assets. Fixed assets are those that cannot be easily converted into cash to meet current obligations. Working assets are those assets which are used up within the production process of the business. Current assets are also called liquid assets.

Liabilities are also classified as long term, intermediate and current. Long term liabilities can be settled over along period of more than five years while the intermediate liabilities are those obligations that are payable within five years or less but current liabilities are payable within one year.

ANSWERS TO SELF ASSESSMENT EXERCISE

Balance sheet for the Borno Small scale farmer as at 31st December, 1986

Assets		₦	Liabilities		₦
A	Current:		Current		
	Money payable to him	350.00	Owed a friend	50.00	
	Yam tubers	180.00	Payable to wife	86.00	
	Sorghum	400.00	Payable to Musa	163.00	
	Cassava	100.00			

		1030.00			₦299.00

B.	Working Capital		Intermediate		
	Hoes		Owed a friend	300.00	
	Cutlasses	73.00	Payable to Musa	200.00	
	Baskets	38.00		-----	
	Poultry	18.00		500.00	
	Goats	297.00		-----	
	Sheep	375.00			
		400.00			

		1,201.00			

C.	Fixed		Long-Term		
	Land		Owed the Village head	600.00	
	Huts	1,000.00		800.00	
		110.00	Owed a friend	-----	
		₦1,110.00		1,400.00	

				2,199.00	
			Total Liabilities (TL)		
	Total Assets				1,142.00
			Net Worth		3,344.00
		3,344.00	TL + Net Worth		

Self Assessment Exercise 2

Net Worth Statement of Mensah's Farm

Assets		Cedis	Liabilities	Cedis
A	Current:		Current	
	Cash in hand	1,200.00	Account payable now	14,000.00
	Crops for sale	3,000.00		
	Accounts payable from kofi	4,000.00		
	Eggs	1,012.00		
		-----		-----
		9,212.00		14,000.00
		-----		-----
B.	Working Capital		Intermediate:	
	Hens	400.00	Account payable in	
	Sheep	2,500.00	the Intermediate	28,000.00
	Bullocks	4,000.00	period	
	Machinery	22,200.00		
		-----		-----
		29,000.00		28,000.00
		-----		-----
C.	Fixed Capital		Long-Term:	
	Land	126,000.00	Account payable on	
	Building	32,000.00	long term basis	113,000.00
		-----		-----
		158,000.00		--
		-----		113,000.00

			Total Liabilities	155,000.00
			Net Worth	41,312.00

			Total Liabilities	196,312.00
			+ Net Worth	
	Total Assets	196,312.00		

6.0 TUTOR MARKED ASSIGNMENT

What is the net worth of Alhaji Kabir's Farm, Kano, Nigeria as at 31st December, 1986 given the following information:

	₦
Milk sold to Central Hotels	13,340.00
Local Milk sales	1,360.00
Livestock Sales	12,200.00
Maize Sales	2,400.00
Crossbred Cows	55,000.00
Crossbred yearling heifers	20,000.00
Crossbred young heifers	15,000.00
White Fulani work bulls	12,000.00
Crossbred young bulls	3,000.00
Machinery	100,000.00
Tools and Implements	50,000.00
Land	100,000.00
Fencing	50,000.00
Building and Stores	600,000.00

Account payable currently to BEWAC, Kano was ₦20,000.00 and ₦10,000.00 to CAPL Lagos. An amount of ₦40,000 was payable to SIMTU, Zaria, within 6 years and ₦50,000 to Zamani Farms within seven years. The sum of ₦5,000 was payable to Uboh Enterprises Kaduna, within five years. Outstanding sums of ₦200,000 and ₦100,000 were payable to Union Bank and First Bank, Kano, respectively within 15 years.

2. Given the following information as at December 31st 1982 make out the net Worth Statement for Adamu's farm.

	₦
Debt payable to Sarkin Borno within one year	20,000.00
Debt payable to Union Bank within five years	10,000.00
Debt payable to First Bank within four years	6,000.00
Debt payable within 20 years in Mortgage Bank	40,000.00
Supplies: Fertilizers	4,000.00
Seeds	3,000.00
Drugs	2,000.00
Cash in hand	1,500.00
Value of tools and equipment	10,000.00
Breeding stock of poultry and cattle	15,000.00
Fencing	5,000.00
Value of land	25,000.00
Value of buildings	45,000.00

TUTOR MARKED ASSIGNMENT

	Assets	₦	Liabilities	₦
A	Current:	(‘000 Naira)	Current	(‘000 Naira)
	Milk to Central Hotels	13,340.00	Payable to BEWAC CAPL	20,000.00
	Local Milk Sales	1,360.00		10,000.00
	Maize Sales	2,400.00		
	Livestock Sales	12,200.00		
		-----		-----
		29,300.00		30,000.00
		-----		-----
B.	Working Capital		Intermediate:	
	Yearlings heifers	20,000.00	Account payable to SIMTU	40,000.00
	Young heifers	15,000.00	Account payable to Zamani	50,000.00
	Fulani White Bulls	12,000.00	Account payable to Uboh	5,000.00
	Crossbred Young	3,500.00	Enterprises	
	Bulls	50,000.00		
	Tools & Implement	-----		-----
		100,000.00		95,000.00
		-----		-----
C.	Fixed Capital		Long-Term:	
	Machinery	100,000.00	Payable to Union Bank	200,000.00
	Land	50,000.00	Payable to First Bank	100,000.00
	Fencing	50,000.00		
	Building & Stores.	600,000.00		
		-----		-----
		800,000.00		300,000.00
		-----		-----
			Total Liabilities	425,000.00
			Net Worth	504,800.00
	Total Assets	929,800.00	Total Liabilities + Net Worth	929,800.00

7.0 FURTHER READING AND REFERENCES

Castle, E. N., M. H. Becker and F. J. Smith (1972): Farm Business Management: The Decision-Making Process. The MacMillian Company, New York. Chapter 3.

Hopkins, J. A. and E. O. Heady (1962): **Farm Records and Accounting**, Iowa State University Press, Ames Iowa, Chapters 7 and 11.

UNIT 7

THE NET INCOME STATEMENT

TABLE OF CONTENTS	
1.0	Introduction
2.0	Objectives
3.1	What is Net Income Statement?
3.2	Gross Receipts
3.3	Total Cost
3.4	Operating Expenses
3.5	Fixed Expenses
3.6	Net Farm Income
3.7	Returns to Factors of Production
3.8	Examples of Net Income Statements
4.0	Conclusion
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7.0	Further Reading and References

1.0 INTRODUCTION

You have learnt about the net worth statement in Unit 6. The net income statement is the other side of the coin of the net worth statement. Neither of them gives a complete picture of the farm business when considered in isolation. The two of them must be examined together.

2.0 OBJECTIVES

By the end of this unit it is hoped that you will be able to:

- Explain the components part of the net income statement.
- Determine the net income of a farm business.

3.1 What is Net Income Statement?

Net income statement is defined as the surplus resulting from business operation which could be withdrawn without reducing the future scale of the business. It is sometimes referred to as farm income or operating statement. An income statement is a low concept which applies to a period of time. For the purpose of constructing the income statement, four types of record are required. These are the farm inventory, receipt records, expense records, and home consumption records. In a nutshell the net farm income is the difference between gross receipts and total cost of production.

3.2 Gross Receipts

The gross receipts, also called total returns or total value product, is defined as the total output multiplied by the price per unit of produce. It is made up of:

- i. Sales of capital (e.g machinery if any)
- ii. Sales of crops, livestock and livestock products.
- iii. Change in inventory of crops, livestock and livestock product.
- iv. Produce consumed in the home.
- v. Accounts receivable.
- vi. Non-farm receipts.

It is necessary to take stock of products in the store at the beginning and end of the year. The difference between the ending and beginning inventory is called “change in inventory” i.e $\text{Change in inventory} = \text{closing Inventory} - \text{beginning Inventory}$.

This change in inventory may be positive or negative.

3.3 Total Cost of production

Total cost of production is the sum of operating costs and fixed costs. This excludes family and operator's labour and management. These elements are excluded here because the farm and family are closely associated in a traditional agricultural setting.

3.4 Operating Costs

Operating costs are those that vary with the level of output and which need to be re-incurred at each period of the production process. Items included in the operating cost are:

1. Cost of hired labour
2. Machinery and equipment repairs and maintenance costs.
3. Crop Expenses.
4. Livestock Expenses.
5. Utilities (e.g Light, water, etc)

3.5 Fixed Costs

Fixed costs are those that do not vary with output in the short run. They are cost that must be met whether the harvest is good or poor. Items included in this list are:

- i. Depreciation on machinery and buildings
- ii. Wages of permanent staff.
- iii. Interest on debt.
- iv. Property tax.
- v. Insurance
- vi. Repairs of buildings
- vii. Improvement on land

Depreciation on machinery and buildings could be derived using any of the methods outlined earlier in Unit 4.

Wages of permanent staff are payments made to full time employees of the farm firm. This is of course, rare among traditional hand hoe farmers where family members supply most of labour.

Interest rate to be charged on the farm capital should be decided on the basis of what it would cost to borrow the capital (opportunity Cost) or what the capital would earn if invested in another way (opportunity return). Although property tax, insurance, repairs on buildings and improvement on land are included as fixed costs, they are inconsequential as far as the peasant farmer

is concerned. However, he may still have to improve his land and effect repairs on thatched huts using crop stalks, palm fronds, tall grasses etc. On large-scale government, some private, commercial and institutional farms, land improvement and repairs of farm buildings are usually undertaken.

3.6 Net Farm Income

The net farm income which measures the return to unpaid family labour, operators land, labour capital and management is traditionally represented as:

The farm income = Gross Receipts – total cost of production + change in inventory. Although the income can be withdrawn from the business without affecting its scale of operation it is generally advisable to plough it back into the farm business.

3.7 Returns to Factors of production

If value can be put on the farmer's labour and unpaid family labour, the return to factor of production can be determined using the following formulae:

- (i) Return to land and management = Net farm income - return to capital - unpaid family labour - operator's labour.
- (ii) Return to capital and management = Net farm income – return to land – unpaid family labour – operator's labour.
- (iii) Return to management = Net farm income – return to land – return to capital – operator's labour – unpaid family labour.

Return to land, operator's labour and capital can be determined separately if arbitrary changes can be made for operator management.

3.9 Net Income Statement

An example, given the following information what is the net farm income and return to the various factions?

Inventory:

	1/1/81	31/12/81
	₦	₦
Sheep	144.00	100.00
Chickens	150.00	350.00
Ducks	50.00	60.00
Grains	240.00	260.00
Fertilizers	100.00	80.00
Goats	120.00	160.00
Sales:		
Livestock	44.00	
Chickens	150.00	
Eggs	200.00	
Crops:		
Cotton	600.00	
Groundnuts	300.00	
Sorghum	400.00	
Operating Costs:		
Seeds	50.00	
Fertilizer	150.00	
Hired labour	200.00	
Feeds	120.00	
Fixed Costs:		
Taxes	10.00	
Permanent staff	300.00	
Repairs on buildings	50.00	
Interest on debt	60.00	
Home Consumption:		
Sorghum	600.00	
Vegetables	50.00	
Maize	42.0	
Solution:		
		₦
Total value of inventory		804.00
Total Value of inventory 31/12/81		1,010.00
Increase in inventory N1010 – 804		206.00
Total farm receipts		1,694.00
Total value of consumed products		1,070.00

Total gross income = 206 + 1694 + 1070	2,970.00
Total operating Cost	520.00
Total fixed cost	450.00
Total cost of production N520 + 420	940.00

The Net Income Statement is provided in table 7.1

- (a) Net farm income = Total gross income – total cost of production = N2,970 – 940 = N2,030.00
- (b) If the average farm capital is 600 and the opportunity cost of using this in an alternative enterprise is 10%, the cost of using capital is therefore 10% of N600.00 = N60.00

Table 7:1: Net Income Statement for year ending 31st December, 1981.

Inputs	₦	Outputs	₦
Variable Costs:		Sales and Receipts	
Seeds	50	Livestock	44
Fertilizer	150	Chickens	150
Hired labour	200	Eggs	200
Feeds	120	Cotton	600
		Groundnut	300
		Sorghum	400
	-----		-----
	520		1,694
	-----		-----
Fixed Costs		Home Consumed Product	
Taxes	10	Sorghum	600
Permanent staff	300	Vegetables	50
Repairs on buildings	50	Maize	420
Interest on debt	60		
	-----		-----
	420		1070
	-----		-----
Total cost of production	<u>940</u>	Total Farm Receipts	<u>2764</u>
Opening Inventory		Closing Inventory	

Sheep	144	Sheep	100
Chickens	150	Chickens	350
Ducks	50	Ducks	60
Grains	240	Grains	260
Fertilizer	100	Fertilizer	80
Goats	120	Goats	160
	-----		-----
	804		1010
	-----		-----

$$\text{Change in inventory} = 1010 - 804 = 206$$

$$\text{Net farm income} = \text{Total Farm Receipts} - \text{total Cost of Production} + \text{Change in inventory} = 2764 - 940 + 206 = 2030.$$

		Home consumed product	
Total	1,744	Sorghum	600
Net Farm Income	2,030	Vegetable	50
		Maize	420

			1,070

	N3774		N3,774
	=====		=====

Hence, return to family and operative land, labour and management is (a) – (b) = N2030 – 60 = N1970. If value of family labour is N1000, operator's labor and management is N500 and the cost of using the land is N200, return to capital = 1970 – 1000 – 500 = 270.00

$$\text{Return per Naira invested} = \frac{\text{(d)} \quad 270}{\text{Average capital} \quad 600} = \text{N0.45}$$

This means that 45 kobo is generated on each Naira invested on capital.

If operator's labour is valued at N300, unpaid family labour at N1000, cost of using the land at N200, management income = 2030 – 60 – 300 – 1000 – 200 = N470.

Self Assessment Exercise I

Prepare a net income statement from the following information for Kwame's farming operations for 1985 in Northern Ghana.

Inventory	Jan. 1, 1985 (Cedis)	Dec. 31 1985 (Cedis)
Tools	120.00	100.00
Millet	100.00	246.00
Cowpea	80.00	195.00
Chickens	100.00	140.00
Sheep	240.00	120.00
Fertilizer	-	60.00

Sales During The Year

Sheep	400.00
Chickens	460.00
Cotton	1000.00
Groundnuts	800.00
Seed	53.00
Fertilizer	166.00
Tools	30.00
Labour	346.00
Taxes	122.00
Feeds	1000.00

Record on Home Consumption:

200 Cedis worth of millet was consumed by the family.

150 Cedis worth of chicken

80 Cedis worth of vegetables were consumed by the family.

Self – Assessment Exercise 2

Prepare a Net Income Statement from the following information for Pam Bot's farm at Vom, Pleateau State, Nigeria.

Inventory	Jan. 1, 1984 (N)	Dec. 31 1984
Sheep	243.00	240.00
Chickens	213.00	213.00
Turkeys	214.00	219.00
Grains	238.25	350.00
Tools	54.00	—

Sales During The Year	
Sheep	272.00
Chickens	266.00
Sweet potato	386.00
Irish Potato	245.00
Acha	252.00
Purchases during the year	
Seed	53.00
Fertilizer	237.00
Depreciation on tools	65.00
Labour	233.00
Taxes	30.00

N190.00 worth of sweet potato was consumed by the family and N130.00 worth of chicken products.

* Estimated remaining life was 3 years and the salvage value was N6. Figure depreciation by straight – line method.

Calculate, the per hectare operator's return to labour, management and capital if total cultivated land was 12 hectares.

(a)	Interest on average farm capital	N400.00	at	10%

(b)	Operator's return to labour & management			

(c)	Value of farmers labour (12 months at N80)			

(d)	Return to management			

4.0 CONCLUSION

The net income statement gives an indication of what the farm business is worth over a cert period of time. It is a flow concept unlike the net worth statement which is a stock concept. The information from the net income statement will be used later in the units that follow for further analysis of data.

5.0 SUMMARY

In this unit you have learnt that the net farm income is the total gross farm receipts minus the total cost of production plus or minus the change in inventory. The gross farm receipt is made up the sales of farm products and the value of the home consumed products. The total cost of production is made up of variable cost and fixed cost. The variable costs are the costs incurred on variable inputs such as seeds, fertilizers and labour that are consumed during a production process. The fixed costs are costs incurred on fixed inputs such as land, buildings and fencing that are last many production processes.

The products in stock at the beginning and end of the year are valued. The difference between the two periods is called the “**change in inventory**”. The change in inventory may be either positive or negative depending upon whether the value in stock is greater or less at the beginning or at the end of the accounting year.

The net farm income is a measure of the return to land, labour, capital and operator’s management input. Return to one of the inputs can be obtained from the net farm income by subtracting the returns of the other inputs.

Answers to Self – Assessment Exercises

Self-Assessment Exercise 1

Net Income Statement for Kwame’s Farm

Inputs	₦	Outputs	₦
Variable Costs:		Sales and Receipts	
Seed	53.00	Sheep	400.00
Fertilizer	166.00	Chickens	460.00
Labour	346.00	Cotton	1000.00
Feeds	1,000.00	Groundnut	800.00
	-----		-----
	1,565.00		1,694
	-----		-----
Fixed Costs			
Tools	30.00		
Taxes	122.00		

	152.50		

Total cost of production	<u>1,717.50</u>	Total Farm Receipts	----- 2,660.00 -----

Opening Inventory		Closing Inventory	
Tools	120.00	Tools	100.00
Millet	100.00	Millet	246.00
Cowpea	80.00	Cowpea	195.00
Chickens	190.00	Chickens	140.00
Sheep	240.00	Sheep	120.00
Fertilizer	-	Fertilizer	60.00
	-----		-----
	730.00		861.00
	-----		-----
		Home Consumed Products	
Total	2,447.50	Millet	200.00
Net Farm Income	1,503.50	Chicken	150.00
		Vegetables	80.00

			430.00

	<u>3,951.00</u>		<u>3,951.00</u>

Self-Assessment Exercise 2

Net Income Statement for Pam Bot's Farm

Inputs	₦	Outputs	₦
Variable Costs:		Sales and Receipts	
Seed	53.00	Sheep	271.00
Fertilizer	237.00	Chickens	266.00
Labour	233.00	Sweet Potato	386.00
		Irish Potato	245.00
		Acha	252.00

			1,421.00
	-----		-----
	523.00		

		Home Consumed Products	
Fixed Costs		Sweet Potato	90.00
Tools	30.00	Chicken	130.00
Depreciation	65.00		-----
			220.00

Total cost of production	<u>618.00</u>	Total Farm Receipts	<u>1,641.00</u>

	Jan.1,1984	Closing Inventory	Dec. 31. 1984
Opening Inventory	243.00	Sheep	240.00
Sheep	213.00	Chickens	213.00
Chickens	214.50	Turkeys	219.00
Turkeys	238.25	Grains	350.00
Grains	54.00	Tools	46.00*
Tools	-----		-----
	962.75		1,068.00

Change in inventory – 1,068.00 – 962.75 = N95.25

Net Farm Income = Total farm Receipts – total Cost of production + Change in inventory = 1641 – 618 + 92.25 = N1115.25.

54 - 6

* Depreciation on tools = ----- = 8. the value of tools decreased only by N8.00 in

3

the year 1994. the remaining balance is (54 – 8) = N46.00

6.0 TUTOR MARKED ASSIGNMENT

- 1.(a) From the following information prepare a Net Income Statement for Chukwuemeka's Farming business in Anambra State of Nigeria for the year ending March 31, 1982.

	₦	
Farm Receipts Records:	Cocoyams	324.00
	Plantain	266.00
	Egusi melon	300.00
	Yams	858.00
	Vegetables	222.00
	Pigs	554.00

	Cassava	250.00
Operating Costs:	Manure	40.00
	Pig Feeds	136.00
	Fertilizer	232.00
	Seeds	114.00
	Hired Labour	358.00
Fixed Costs:	Taxes	27.00
	Depreciation	42.00
	Permanent Staff	400.00
Value of House hold Consumption:	Cocoyam	235.00
	Plantain	100.00
	Yams	496.00
	Chickens	116.00
	Vegetables	60.00
	Cassava	150.00

Inventory of Farm Business:

	April 1, 1981	March 31, 1982
Chickens	210.00	312.00
Cassava	140.00	200.00
Fertilizer	16.00	12.00
Tools	82.00	71.00

- (i) The value of Chukwuemeka's Services for his labour and management skills was N920.00. Find the return to capital for the farm business if there was no unpaid family labour.
- (ii) Chukwuemeka's average farm capital was N2,125. Find the return per Naira invested in capital.
2. Prepare a net income statement form the following information for Adamu's farm:

Inventory	Jan. 1, 1979	Dec. 31 1979
	(₦)	
Sheep	66.00	60.00
Chickens	6.00	6.80
Dicks	8.50	18.60
Grains	16.25	300.00

Tools*	54.00	-
	-	

Sales During The Year

Sheep	24.00
Chickens	12.00
Cotton	350.00
Groundnuts	90.00
Guinea corn	24.00

Purchases during the year

Seeds	6.00
Fertilizer	87.00
Hired Labour	63.00
Taxes	30.00

N180.00 worth of guinea corn and N60.00 worth of vegetables were consumed by the family.

* Assume the tools are new at the beginning of the accounting year. Their estimated remaining life is 3 years, salvage value in N18.00. Calculate depreciation by the straight line method.

- (b) Calculate return per Naira invested if the value of farmer's labour and management is N200.00, unpaid family labour is estimated to be N283.00 and the average capital investment is N500.00

7.7 FURTHER READINGS

Castle, E. N., M. H. Becker and F. J. Smith (1972) **Farm Business Management: The decision-Making Process.** The Macmillian Company, New York. Chapter 3.

Hopkins, J. A. and E. O. Heady (1962). **Farm Records and Accounting.** Iowa State University Press, Ames Iowa. Chapters 7 and 11.

UNIT 8**MEASURES OF FINANCIAL SUCCESS AND CAPITAL POSITION****TABLE OF CONTENTS**

1.0	Introduction
2.0	Objectives
3.1	When Net Farm Income is Low
3.2	Measures of Financial Success
3.3	Measures of Capital Position
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6.0	Tutor Marked Assignment

7.0

Further Reading and References

1.0 INTRODUCTION

Component parts of the net worth statement and the net income statements of the farm business can be used to indicate the strengths and weakness of the farm. An important function of management is the use of these indicators in determining the strength and weaknesses of the farm business. Some of these indicators are considered in this unit.

2.0 OBJECTIVES

It is hoped that by the end of this unit you will be able to:

- Explain step by step what to diagnose when the farm income is low
- Determine various ratios which are indicators of measures of financial and capital position of the farm business.

3.1 When Net Farm Income is Low

You will recall that in Unit 6 and 7 the Net Worth and Net Income Statement were discussed. Below is the complete data for a Shika Demonstration Farm (SDF) for 1986. The Net worth statement and the net income statements have been prepared using the data given. You will be referred to this information throughout this unit.

Data for Shika Demonstration Farm for 1986

	₦
Cash in hand	2,000.00
Groundnuts	2,300.00
Sorghum	1,500.00
Cowpeas	1,300.00
Maize	2,330.00
Poultry: Eggs	1,211.00
Account receivable	1,020.00
Supplies	
Fertilizer	21.00
Seed Dressing	6.00
Layer's feed	1,019.00

Grower's feed	2,145.00
Tools (all)	2,330.00
Poultry:	
Layers	2,500.00
Pullets	960.00
Cockerels	248.00
Turkeys	350.00
Fencing	3,300.00
Land	40,000.00
Buildings	80,000.00
Stores	12,000.00
Poultry cages	10,000.00
Account payable within one year	8,480.00
Account payable within 5-6 years to A.B.U	6,500.00
Account payable to U.B.A Bank within 5 years	2,000.00
Long-term debt payable to Kaduna Co-operative Bank	12,000.00
Account payable with 3 months	1,000.00
Long-term debt payable to Commercial Banks	108,000.00
Total farm investment as at January 1, 1986 and December 31, 1986 Where N170,000.00 and N186,540.00 respectively.	
Value of crop in inventory as at 1/1/ 1986 was	8,000.00
Value of crop in inventory as at 31/12 1986 was	9,000.00
Value of livestock in inventory as at 1/1/86 was	10,000.00
Value of livestock in inventory as at 31/12/86 was	11,000.00

Operating Cost

Livestock:

	₦
Feed	6,000.00
Drugs	1,000.00
Casual labour	3,000.00
Light	1,200.00
Water	1,000.00
Detergents	200.00

Crops:

Seeds	500.00
Fertilizer	1,500.00
Casual Labour	3,000.00
Seed dressing	100.00

Fixed Expenses

Depreciation	4,000.00
Interest on debt	3,000.00
Principal P.A.	23,000.00
Building repairs	1,500.00
Fence mending	500.00
Road repairs	1,000.00

Sales**Livestock:**

Poultry products	48,000.00
Chicken	12,000.00
Turkey	4,000.00

Crops:

Sorghum	7,000.00
Groundnut	4,000.00
Maize	3,000.00
Cowpeas	9,000.00

Unpaid operator's labour and management was valued at N15,000.00 while return to land was valued at N10,000.00. There was no unpaid family labour.

Table 8.1: Net Worth Statement of Shika Demonstration Farm as of 31st December, 1986

Assets	₦	Liabilities	₦
A. Current		A. Current	
Cash in hand	2,000.00	Payable within 1 year	8,480.00
Account receivable	1,020.00	Payable with 3 months	1,000.00
Eggs	1,211		

Crops:			
Groundnuts	2,300.00		
Sorghum	2,500.00		
Cowpeas	1,300.00		
Maize	2,330.00		
	-----		-----
	11661.00		9,480.00
	-----		-----
	-		
B. Working Capital		B. Intermediate	
Tools	2,330.00	Payable to A.B.U.	6,500.00
Layers	2,500.00	Payable to UBA Bank	2,000.00
Pullets	960.00		
Cockerels	248.00		
Turkeys	350.00		
Supplies			
Fertilizer	21.00		
Seed dressing	6.00		
Layer's feed	1,019.00		
Grower's feed	2,145.00		
	-----		-----
	9,579.00		8,500.00
	-----		-----
C. Feeds Capital		C. Long-Term	
Fencing	3,300.00	Payable to Commercial	108,000.00
Land	40,000.00	Bank	12,000.00
Buildings	80,000.00	Payable to Co-operatives	
Stores	12,000.00	Bank	
Poultry cages and Housing	30,000.00		
	-----		-----
	165,300.00		120,000.00
	-----		-----
			137,980.00
			48,560.00
Total Assets	186,540.00	Total Liabilities (TL)	
		Net Worth (NW)	186,540.00
		Total Liabilities +	

Net Worth

Table 8.2: Net Income Statement for Shika Demonstration Farm for 1986

Inputs	₦	Output	₦
Variable Costs:		Sales and Receipts	
Livestock		Livestock:	
Feed	6,000.00	Poultry products	48,000.00
Drugs	1,000.00	Chickens	12,000.00
Casual Labour	3,000.00	Turkeys	4,000.00
Light	1,200.00		
Water	1,000.00		
Detergents	200.00		
	----- 12,400.00 -----		
Crops		Crops	
Seeds	500.00	Sorghum	7,000.00
Fertilizer	1,500.00	Groundnut	4,000.00
Casual Labour	3,000.00	Maize	3,000.00
Seed dressing	100.00	Cowpeas	9,000.00
	----- 5,100.00 -----		----- 87,000.00 -----
Total variable Costs	17,500.00 =====	Change in inventory during the accounting period	

	2,000.00	
Fixed or common costs		
Depreciation	4,000.00	
Interest on debts	3,000.00	
Principal p.a.	23,000.00	
Building repairs	1,500.00	
Fence mending	500.00	
Road repairs	1,000.00	

	33,000.00	

Total Cost of Production	50,500.00	
Net Farm Income	38,500.00	

	89,000.00	

		89,000.00

The net income defined as the gross farm income less gross farm costs for the SDF was ₦38,500. The net farm income could be improved by increasing the gross farm income or decreasing the arm costs or both. If the net farm income, however, is low the manager should examine the gross farm income which is directly related to the yield.

A input factors used in the production of the output needed to be re-examined, for some factors might be over or under utilized by the farm firm. The farmer being a price taker needs to improve the efficiency of use of the resources (factor inputs) as his disposal. If low gross farm income is due to low output price the demand elasticity of the product will be instrumental in determining the revenue position of the far. Logically, the farmer might explore all possible ways of bargaining for better prices for his output through co-operatives, government legislation etc. However, attaining higher product price does not necessarily guarantee higher gross income, for a product with inelastic demand will result in low gross income.

Also a low net farm income might be due to high cost. Examine such cost items as feeds, labour machinery and other supplies might reveal areas of possible waste that need to be avoided to cut down on input costs. However, if waste is minimal a different set of input package might have to be considered.

The net farm income might be misleading because it may not be a good reflection of the amount of capital, labour and management involved in the

production process. It is therefore necessary to examine other measures of financial success such as return to labour, management, land and capital (which have been considered in Unit 7) and three ratios (gross, operating and fixed) which are also obtained from the net income statement.

3.2 Measures of Financial Success

1. The Gross Ratio

The gross ratio (GR) is the total farm expensed (TFE) divided by the gross income (GI) i.e

$$\text{GR} = \frac{\text{TFE}}{\text{GI}}$$

Where the total farm expenses figure is obtained by summing the operating and fixed costs figures. In the case of Shika Demonstration Farm the total operating cost was n17,500 and the total fixed cost was n33,000 while the gross income was N89,000

$$\text{GR} = \frac{17,500 + 33,000}{89,000} = \frac{50,500}{89,000} = 0.57$$

This ratio shows that the total farm costs was about 57% of the income. A less than 1 ratio is desirable for any farm business. The lower the ratio, the higher the return per naira invested. A higher but less than 1 ratio might be tolerated for a large farm involving heavy capital investment. A greater than 1 ratio is disastrous for a farm business and might indicate over utilization of certain resources. If this happens management should consider ways of reducing costs and increasing gross income. The gross ratio measures the overall financial success of a farm. It is a long run planning tool for determining the performance of the entire farm business.

2. Operating Ratio

The operating ratio (OR) is the total operating cost (TOC) divided by the gross income i.e $\text{OR} = \text{TOC}/\text{GI}$.

For the Shika Demonstration Farm, the operating ratio is given by

$$\frac{\text{N}17,500}{\text{N}89,000} = 0.20$$

The operating ratio shows the proportion of the gross income that goes to pay for the operating costs. The operating cost is directly related to the farm variable input usage. An operating ratio of 1 means the gross income barely covers the expenses on the variable inputs used on the farm.

In other words, such a business could survive only in the very short run and could fold up if correct adjustment are not made to improve the usage of variable resources in terms of reducing costs and or increasing gross income. A detailed investigation into the details of such component part will definitely help in identifying the necessary adjustment needed to correct the situation.

3. The Fixed Ratio

The fixed ratio (FR) is the total cost (TFC) divided by the gross income (GI i.e

$$FR = \frac{TFC}{GI}$$

The fixed ratio for the Shika Demonstration Farm is given by N33,000/N89,000 = 0.37. the ratio shows that the fixed expense were 37% of the gross income. If the fixed ratio is close to 1, some of the fixed resources are either left idle or under utilized. However, in the event that these resources are fully utilized the high fixed ratio might be due to the farmer's over estimation of the expected gross returns in his choice of enterprise or due to unpredicted biological conditions militating against yield.

Among the aforementioned ratios measuring the financial success of a farm business, the gross and the operating ratios are the most import. The gross ratio measures the ultimate solvency and success of the farm business. The decision of whether to liquidate the farm or not depends on the gross ratio figure. A greater than 1 gross ratio means that an alternative and more profitable enterprise should be considered. The operating ratio which is directly related to the variable resources is the decision making tool with regards to factor adjustments during a production period. The fixed ratio which is an indication of the percentage of the gross income accruing to the fixed resources is an ex ante decision tool i.e, an important decision parameter before and not during the production period.

In the traditional farm setting, the operating ratio is more important than the fixed ratio in that most of the resources used are variable while fixed items are almost negligible.

Self Assessment Exercise 1

Refer to the worked example in section 3.8 table 7.1 in unit 7. Calculate

- i. Operating ratio ii. Gross ratio and iii. Fixed ratio

3.3 Measures of Capital Position

While the measures of capital position are based solely on the income statement, the measures of capital position are based on the analysis of the net worth statement. The ratios which indicated how solvent the business is over different time periods are the current ratio, working capital ratio, net capital ratio, asset to debt ratio and debt to net worth ratio. Other ratios for measuring the capital position of a farm include debt servicing to gross receipts ratio, the capital turn-over ratio and the profit to total asset ratio which collectively combine the information from both the net income and net worth statements.

1. The Current Ratio

The current ration (CR) is defined as the current asset (CA) divided by the current liabilities (CL) i.e:

$$\text{CR} = \frac{\text{CA}}{\text{CL}}$$

In the example of Shika Demonstration Farm the current assets were worth N11,661, the current liabilities amounted to N9,480 while the current ratio was $\text{N11,661}/\text{N9,480} = 123$. The current ratio generally shows the ability of the business to meet financial obligations in a very short time, i.e immediate solvency. A current ratio of greater than 1 implies that the current assets can be more than pay for the current liabilities. A narrow current ratio shows the at problems exist especially if bills fall due for payment at the wrong time. The current ratio is often called the acid test because it is a test that can be performed quickly.

2. The Working Capital Ratio

The working capital ratio (WCR) is defined as the sum of the working assets (WA) and the current assets (CA) divided by the sum of intermediate liabilities (IL) and the current liabilities (CL).

$$\text{i.e WCR} = \frac{\text{WA} + \text{CA}}{\text{IL} + \text{CL}}$$

$$IL + CL$$

The working capital ratio is a measure of the financial safety over an intermediate period of time. This ratio shows the ability of the business to meet its obligation in the short run. In the Shika Demonstration Farm example, the working capital was ₦9,579, the current asset was ₦11,661, intermediate liability was ₦8,500 and current liability was ₦9,840. The working capital ratio is given by:

$$\frac{₦ 11,661 + 9,579}{9,480 + 8,500} = \frac{₦ 21,240}{₦17,980} = 1.18$$

The greater the ratio, the safer it is for the business. If the ratio is less than 1 the business is insolvent in the intermediate run.

3. The Net Capital Ratio

The net capital ratio (NCR) is defined as the total asset (TA) divided by the difference between the liabilities (TL) and the proprietor's equity (PE).

$$\text{i.e NCR} = \frac{TA}{TL - PE}$$

This ratio shows the overall solvency of the business, and indicates changes that are possible in the future. It shows the degree of safety of the entire farm business and determines the possibility of borrowing more capital. If the proprietor's equity for the Shika Demonstration Farm was ₦ 20,000, the NCR is given by;

$$\frac{186,540}{137,980 - 20,000} = 1.58$$

This ratio shows at a glance by how much the assets on the farm have to decline to be exceeded by the liabilities other than the proprietor's equity. A high ratio is desirable for a risky firm business. A safe ratio depends on the type of farm and the degree of uncertainty and risks involved.

4. The Asset To Debt Ratio

the asset to debt ratio (ADR) is the total asset (TA) divided by the total liability (TL) i.e

$$\text{ADR} = \frac{\text{TA}}{\text{TL}}$$

The asset to debt ratio is a close approximation of the net capital ratio if the proprietor's equity is negligible. The asset-debt ratio is, however, not as useful as the net capital ratio because it may give a distorted position of the business. Using our earlier example the

$$\text{ADR} = \frac{\text{N186,540}}{137,980} = 1.35$$

The asset to debt ratio of 1.35, which is lower than the 1.58 calculated for the net capital ratio, indicates a less solvent capital position of the business. The larger the proprietor's equity the less useful is the asset to debt ratio for measuring the capital position of the farm business.

5. The Debt to Net Worth Ratio

The debt to net worth ratio (DNR) is defined as the total liabilities (TL) divided by the net worth (NW) i.e ;

$$\text{DNR} = \frac{\text{TL}}{\text{NW}}$$

This ratio indicates the ease with which the proprietor can meet financial debts internally when, and if the creditors demand. A less than 1 ratio is preferred to enable the proprietor meet his financial obligations internally. The total liabilities (current, intermediate and long-term) for Shika Demonstration Farm were N137,980 and the net worth was N48,560 the debt to worth ratio was therefore equal to:

$$\frac{\text{N}137,980}{\text{N}48,560} = 2.8$$

This ratio of 2.8 means that the total liabilities were nearly three times the value of the net worth. Hence the proprietor's will find it difficult to meet its debts internally.

6. Debt Servicing to Gross Receipts Ratio

It is usual for business to pay for the cost of borrowing capital from the total gross income generated. This is debt servicing. The debt servicing to gross receipts ratio (DGR) is defined as the sum of the principal (pa) and interest charges (i) divided by the gross receipts (GR).

$$\text{i.e. DGR} = \frac{\text{Pa} + i}{\text{GR}}$$

For our earlier example,

$$\text{DGR} = \frac{\text{N}23,000 + 3,000}{\text{N}87,000} = \frac{26,000}{87,000} = 0.30$$

A low figure is desirable for a high figure might mean that high gross income is needed for debt servicing. Such a situation would not be healthy because the business will be subjected to unnecessary financial pressures if it tries to expand production or increase family living expenses.

7. The Capital Turnover Ratio

The capital turnover ratio (CTR) is defined as the gross income (GI) divided by the average capital investment (ACI). Where the average capital investment (ACI) is the sum of the initial capital (ICI) and the terminal capital investment (TCI) in an accounting period divided by 2

$$\text{Summary, CTR} = \frac{\text{GI}}{\text{ACI}} \quad \text{Where ACI} = \frac{\text{ICI} + \text{TCI}}{2}$$

The capital investment of the Shika Demonstration Farm at the beginning of the year was N170,000 and N186,540 at the end. Since the yearly gross income was N89,000, the capital turnover ratio was equal to:

$$\frac{89,000}{\frac{170,000 + 186,540}{2}} = \frac{89,000}{178,270} = 0.50$$

The capital turnover ratio indicates that the gross farm income is about 50% of the capital investment. Should it be possible for the manager to turnover all the gross income into capital repayment the above ratio suggests, all things being equal, that about 2 years would be needed for the capital to be duly paid for. However, the farm income rather than gross income better

reflects the proportion of income that might be turned over into capital. Therefore the net farm income when discounted is a more appropriate proxy for estimating the length of time for capital repayment.

8. Profit to Total Asset Ratio

The profit to total asset ratio (PAR) is defined as profit (P) divide by the total asset (TA) i.e,

$$\text{PAR} = \frac{P}{\text{TA}}$$

The profit to total asset ratio gives a measure of what the business generates in relations to the total investment in the farm. A ratio which compares favourably with the opportunity returns e.g fixed deposit interest rate is desirable. If we take the profit for the Shika Farm to be N38,500, since the total asset was N186,540, the profit it total assets ratio is equal to $N38,500/186,540 = 0.21$. This ratio means that the business is earning twenty-one kobo for every Naira invested.

9. The Rate of Return on equity or Capital

The rate of return on equity (RRE) is the return to capital (RC) divided by the net worth (NW) i.e

$$\text{RRE} = \frac{\text{RC}}{\text{NW}}$$

Where the return to capital by definition is net farm income less then sum of operator's unpaid labour, unpaid family labour and return to land and management. In the Shika Farm example, $\text{RC} = \text{NFI} - \text{Value of operator's labour and management} - \text{return to land} - \text{unpaid family labour} = 38,500 - 15,000 - 10,000 - 0 = \text{N}13,500$. Hence $\text{RRE} = \text{N}13,500/48,560 = 0.28$. This means that the business makes a return of 28 percent or 28 kobo on every Naira of equity invested on the farm. This can be computed on a yearly basis to indicate the progress that is being made over time. The higher the rate of return on capital the better for the success of the farm business.

Self-Assignment Exercise 2

Refer to the worked example in section 3.5, Table 6.1 Unit 6 calculate: (i) Current ratio (ii) Working Capital ratio (iii) Net Capital ratio if personal equity is N500 (iv) asset to debt ratio (iv) debt to net worth ratio.

4.0 CONCLUSION

You will notice that for the measures of financial success indicators, it is desirable that the ratios must be less than unity. A greater than unity is desirable for some of the measures of capital position except for the debt to net worth ratio and debt servicing to gross receipts ratio.

5.0 SUMMARY

In order to be able to detect the strength and weakness of a farm business, the manager must consider a number of indicators. Some of those indicators such as gross ratio, operating ratio, and fixed ratio are obtained from information contained in the net farm income statement. These are the measures of financial success.

If the manager wishes to establish the situation about the capital, indicators such as current ratio, working capital ratio net capital ratio, asset to debt ratio and debt to net worth ratio are obtainable from the net worth statement. There are other capital position indicators such as debt servicing to gross receipts ratio, capital turn over ratio, profit to asset ratio and rate of return on equity which are derived by using information from both the net worth and net income statements.

Answers to Self Assessment Exercises

Self-Assessment Exercise 1

- i. Operating Ratio = $\frac{\text{Total Operating Cost}}{\text{Gross Income}}$
- $$= \frac{520}{2764} = 0.18$$
- ii. Gross Ratio = $\frac{\text{Total Farm Expenses}}{\text{Gross Income}}$
- $$= \frac{940}{2764} = 0.34$$
- iii. Fixed Ratio = Total Fixed Cost

$$\begin{array}{r}
 \text{-----} \\
 \text{Gross Income} \\
 = \quad 420 \\
 \text{-----} = \quad 0.15 \\
 2764
 \end{array}$$

Self-Assessment Exercise 2

i. Current Ratio = $\frac{\text{Current Assets}}{\text{Current Liabilities}}$

$$\begin{array}{r}
 = \quad 1000 \\
 \text{-----} = \quad 2.5 \\
 400
 \end{array}$$

ii. Working Capital Ratio = $\frac{\text{Working Assets} + \text{Current Assets}}{\text{Current Liabilities} + \text{Intermediate Liability}}$

$$\begin{array}{r}
 = \quad 100 + 30 \quad = \quad 130 \\
 \text{-----} = \quad \text{-----} = \quad 0.13 \\
 400 + 600 \quad \quad 1000
 \end{array}$$

iii. Net Capital Ratio = $\frac{\text{TA}}{\text{TL} - \text{PE}}$ = $\frac{2800}{1500 - 500}$ = $\frac{2800}{1000}$ = 2.8

iv. Asset to Debt Ratio = $\frac{\text{TA}}{\text{TL}}$ = $\frac{28,000}{1500}$ = 1.86

v. Debt to Net Worth Ratio = $\frac{\text{TL}}{\text{NW}}$ = $\frac{1500}{1200}$ = 1.25

6.0 TUTOR-MARKED ASSIGNMENT

1. Refer to Answers to Self Assessment Exercise 2 in Unit 6 on Mensah's farm. Calculate the following:

- (a) i. The Net Capital Ratio
 ii. The Working Capital Ratio
 iii. The Current Ratio
 iv. Asset-debt Ratio
- (b) What can you say about this farm judging from these ratio.
2. The following information pertaining to Mensah's farm in Unit 6 Self Assessment Exercise referred to in question 1. Use appropriate information from Unit 6 in addition to data given below to
- (a) Calculate the (i) Capital Turnover Ratio,
 (ii) Debt Servicing to Gross Income Ratio,
 (iii) Profit to Total Asset Ratio,
 (iv) Rate of Returns on Capital,
 (v) Operating Ratio;
 (vi) Fixed Ratio,
 (vii) Gross Ratio.

Inventory	Beginning (Cedis)	Ending (Cedis)
Yams	3,000	5400
Maize	6500	5900
Cassava	4700	4000
Yam beans	4800	6700
Fertilizers	2000	3000
Sales		Home Consumed
Yam	-	3500
Maize	3000	3000
Yam beans	2000	1000
Cassava	3000	2000
Cocoyam	2000	3000

Variable Cost	(Cedis)	Fixed Cost	(Cedis)
Fertilizer	1000	Depreciation	1000
Casual Labour	3000	Interest on debt	500
Seeds	600	Principal p. a.	5000
		Building repairs	900

Return on capital is assumed to be 6000 Cedis while capital investment at the beginning is 56,000 Cedis and 85,000 Cedis at the end

3. 1. Refer to Answers to Self Assessment Exercise 2 in Unit 6 on Mensah's

farm Calculate the following:

- (a) i. The Net Capital Ratio
 i. The Working Capital ratio
 ii. The current ratio
 iii. Asset-debt Ratio
- (b) What can you say about this farm judging from these ratio.
2. The following information pertaining to Mensah's farm in Unit 6 Self Assessment Exercise referred to in question 1, Use appropriate information from Unit 6 in addition to data given below to
- (a) Calculate the i. Capital Turnover Ratio,
 ii. Debt Servicing to Gross Income Ratio;
 iii. Profit to Total Asset Ratio,
 iv. Rate of Returns on Capital,
 v. Operating Ratio,
 vi. Fixed Ratio,
 vii. Gross Ratio

Inventory	Beginning (Cedis)	Ending (Cedis)
Yams	3,000	5400
Maize	6500	5900
Cassava	4700	4000
Yam beans	4800	6700
Fertilizers	2000	3000
Sales		Home Consumed
Yam	-	3500
Maize	3000	3000
Yam beans	2000	1000
Cassava	3000	2000
Cocoyam	2000	3000

Variable Cost	(Cedis)	Fixed Cost	(Cedis)
Fertilizer	1000	Depreciation	1000
Casual Labour	3000	Interest on debt	500
Seeds	600	Principal p. a.	5000
		Building repairs	900

7.0 FURTHER READING

Castle, E. N., M. H. Becker and E. J. Smith (1972). **Farm Business Management: the Decision-Making Process.** The MacMillan Company, New York. Chapter 4

UNIT 9

MEASURES OF SIZE AND RESOURCE USE EFFICIENCY

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1.0 INTRODUCTION

You will recall that in Unit 8, the measures of financial success and measures of capital position were discussed. Other indicators of the strengths and weaknesses of the farm relate to the measures of resource use efficiency. These are the preoccupation in this unit.

2.0 OBJECTIVES

It is hoped that by the end of this unit, you will be able to

- * identify various measures used in determining the size of farms.
- * Identify the various measures of resource use efficiency.

3.1 Measure of Size

Measures used in identifying the size of a farm business include the physical output, number of livestock, number of cultivated hectares, total annual input, total invested capital, productive man work units and gross income.

1. Physical Output

The physical output from a farm could be compared on a farm unit basis as long as they produce the same product. The physical output could be in terms of kilogrammes of rice, yams and meat or litres of milk. This gives the average physical productivity of the farm which is a measure of efficiency of land use.

2. Number of Livestock

It is possible to compare livestock farms on the basis of the number of livestock provided they have the same type. This measure refers simply to the number of heads irrespective of age, sex, productive capacity or type of production engaged in.

3. Number of Cultivated Hectares

If the land is homogeneous, and type of farming is similar, the number of hectares cultivated can be used as a measure of size. This measure can be misleading, since the productivity of land differs even though they are homogenous.

4. Total Input Cost

The total input cost in the valuation of the input (variable and fixed) used in the production process in monetary terms. This is a good way of comparing the magnitude of money invested in similar farming enterprises. However, the returns per Naira invested is more useful in comparing similar farm enterprises.

5. Total Invested Capital

The total quantity of money invested in land, buildings, machinery, livestock, crops and supplies could be summed up and used as a comparison between farms. However, this suffers like other size measures by failing to give a complete picture of other costs involved such as operating costs, labour etc. It however, can give a good approximation when dealing with capital intensive farms.

6. Productive Man-Work Units

This measure is very useful for comparing farms of the same type with different combinations of enterprises. The productive man-work unit is the amount of work an average man can do under average farm conditions and tasks in a 5 hour-day. Labour productivity is a better measure of efficiency than the productive man-work units.

7. Gross Income

Farms vary according to the gross farm income generated. This gross farm income is a function of many factors like land size, inputs used etc. this makes it a better measure of size than any other single input measure. It is only a step further from the total physical output measure because the latter is multiplied by the price of output to obtain the gross income. The danger, however, lies in the temporal and spatial unstable nature of prices which makes it necessary to deflate to a certain base year to avoid erroneous conclusions. However, net farm income could be a better measure of efficiency.

In summary if there is no single measure of size that is considered very useful for measuring efficiency. It is the use or productivity of any of the resource rather than the magnitude that is of relative importance. The average physical productivity of any of the resources such as land, labour and capital is of greater importance when measuring efficiency than cultivated hectares, productive man work unit, total invested capital or total physical output. The efficiency of use of these resources is discussed in the next section.

Self-Assessment Question 1

Describe the various measures of size. What are the weak points of each?

3.2 Measures of Resources Use Efficiency

Efficiency is generally defined as the quantity of output (Y) per unit of input (X) used in the production process, that is, the average physical productivity (APP). Symbolically, efficiency is measured as $APP = Y/X$. The efficiency of the various inputs labour, capital, livestock and land use are discussed below:

1. Labour Efficiency

Given labour as the input used in a livestock enterprise, the labour efficiency is equal to the output (kg) divided by the unit quantity of labour used in one production period. If a farm produces 1,000kg by using 500 man-hours or total labour, the labour efficiency is given by expressed (1000kg ÷ 500 man-hours) 2kg/man-hour. In the case of poultry, labour efficiency may be expressed in terms of dozens of egg per year or per month or in case of cattle litres of milk per cow per production period. The problem with such measures is that they ignore certain inherent genetic and environmental issues since they do not indicate the equality of the breed in the case of cows or the type of feed used and the structure of the buildings in the case of poultry.

In traditional system of hand hoes and cutlasses, the average male adult works for about 5-7 hours a day. It is assumed that a female can work only 0.75 the capacity of an average male adult in certain farm activities such as land preparation. A child of 7-14 years is assumed to have about 0.5 the working capacity of a male adult. Thus the actual total hours devoted to farm work for these activities is converted to (male adult) man-equivalent hours by multiplying those of males by 1 and those of females by 0.75 and those of older children by 0.5. An assumption is made that average working conditions prevail. Using this procedure, it is possible to convert total labour inputs on a farm for a whole year into man-equivalent hours and dividing it

into the total physical product to obtain the labour efficiency measure either for livestock or crop enterprise. Comparison can be made between years for the same farm or different farms in a single year.

2. Machinery Cost per Hectare

In cases where machinery is used, the total machine cost including depreciation, interest, taxes, housing, repairs, insurance, petrol and grease etc. is determined. This is divided by the number of hectares cropped to obtain the machinery cost per hectare. This measure is useful for making comparison between similar farms but not for different farm types. Sometimes the fixed and variable costs per hectare are calculated separately.

3. Livestock Efficiency

For analyzing individual farm units, livestock efficiency measures such as litres of milk per dairy cow, piglets per litter, livestock return per N100 feed etc. can be calculated. These measures also have their own weakness in that many important external factors such as changes in input and output prices are consumed away.

4. Land Efficiency

Given land as the input used in a crop production enterprise, the land efficiency is equal to the output (kg) divided by the unit quantity of land used. If a farmer produces 2000kg of guinea corn using 2 hectares of land, the land efficiency is equal to 200kg/hac i.e. (2000kg/2 hac.)

Self-Assessment Question 2

- (a) What do you understand by efficiency?
- (b) What measures of efficiency would you use for (i) Livestock enterprise (ii) Crop enterprises?

3.3 Crop Yield Index

The crop yield index expresses yield of crops on a particular farm as percentage of the average. The average could be obtained for many years from the particular farm under consideration or from government record as a five or more years moving average. Table 9.1 illustrates how to determine the crop yield index.

If average yield were obtained it would have required only 9.43 hectares to produce the same output. The same procedure can be used to obtain

livestock yield index and in a mixed farming situation a total yield index for both crops and livestock farming can be determined similarly.

Crops 1	Hectares 2	Actual Yield ha. 3	Total prod. kg 4	Average Yield/ha 5	Hectares at average Yield 6
Sorghum	3.1	1,730	5,363	1,600	3.35
Millet	2.5	1,000	2,500	1,230	2.03
Groundnuts	4.3	1,230	5,289	1,360	3.89
Cotton	0.1	800	80	500	0.16
Total	10.0	-	-	-	9.43

Figures in column (4) are obtained by multiplying figures in column (2) by (3). Column (6) figures are obtained by dividing figures in column (4) by (5).

$$\text{The crop yield index} = \frac{9.43}{10} \times 100 = 94.3$$

Among the measures of efficiency discussed there is none that could be described as the best one. The most appropriate measure depends on the type of farm. If machinery is the most important aspect of production, machinery efficiency measures can be used. If labour is the most important factor of production, labour efficiency measure can be used. The efficiency factors can enable the farm manager to spot potential organizational changes that would enhance the chances of success. However, care must be taken in interpreting them. It should be clear that none among the four classes of measures of success considered in this chapter can be termed the best. In order to identify the weak and strong points of a farm business, all the above measures must be carefully examined and interpreted.

The measure of financial success cannot be substituted for the measures of capital position and vice versa. The importance of each type depends on the situation and problems at hand, the type of farms, the products, the input combinations etc. the measures are intended to show whether the business should be liquidated or whether certain changes need to be made to increase net income or to continue running the business in its present state.

In the course of the analysis of farm business efficiency, the gross margin and budgeting have not been considered. Detailed discussions of these decision tolls are presented in subsequent units.

Self-Assessment Exercise 3

Find the livestock mil yield index from the following information:

Breed of cattle	Number	Actual yield/Cow	Average Yield/Cow
Muturu	250	1,000	1,200
Gudali	350	900	1,000
Adamawa	150	1,000	900
Ndama	250	800	1,020

4.0 CONCLUSION

The various measures of size have got their own limitations and no single one is appropriate for all farming types and conditions. It is best to use the one that best fits the conditions of the business e.g if it is livestock, you should find out the number by type of animals.

5.0 SUMMARY

The measures of resources use efficiency are labour efficiency, land efficiency, machinery cost per hectare and livestock efficiency. The crop yield index also measures the efficiency of a particular farm in relation to a farm that obtains average yield.

None of the measure can be described as the best but the most appropriate depends on the types of farm.

Answers to Self-Assessment Questions

1. Measures of size are as in the lecture notes:

Weakness of each:

Physical output in all apply to quantities that are measurable and different units can be used depending on where it is in liquid or solid form. The weight may vary as a result of better land productivity.

Number of livestock – This does not say which type, sex, age, health condition of the animal.

Number of cultivated hectare ---- A large farm size may have low yield or less productive than a small farm.

Total input costs

The large farm would be expected to use more total input. However, due to non-availability the input use may not be proportional to the far size.

Total invested capital – The facts to give a complete picture of the costs involved.

Productive man-work Units.

This measures deals with what an average man can do under average farm conditions. This will vary with type of operation, whether male, female or large child is doing the work.

Gross income is dependent on the prevailing prices which are not stable over time.

2.a Efficiency is the quantity of output per unit of an input used in the production process.

$$\text{APP}_{\text{labour}} = \frac{\text{Quantity of output}}{\text{No. of units of labour}} \quad \text{i.e.} \quad \frac{Y}{XI}$$

b. For livestock enterprise I will use

- i. Livestock efficiency e.g piglets per litter.
For milk: Litres of milk per cow
Return per Naira invested in feed
Eggs produced/hen or per day or per week

ii. Crop Enterprise:

- Crop yield index
- Machinery cost per hectare
- Land efficiency i.e yield of crop per unit of land
- Labour Efficiency

Self Assessment Exercise 3

Breed of cattle	No.	Actual Yield per	Total prod. Kg	Average yield/cow	No. of Cows at Average Yield
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	Cow				
1	2	3	4	5	6
Muturu	250	1000	250,000	1200	6 = 4 ÷ 5
Gudali	350	900	315,000	1000	208
Adamawa	150	1000	150,000	900	315
Ndama	250	800	200,000	1020	166
					196
Total	1000	-	-	-	885

$$\text{Milk yield index} = \frac{885}{1000} \times 100 = 88.5$$

6.0 TUTOR MARKED ASSIGNMENT

Find the crop yield index for an Ayangba farmer in Kogi State of Nigeria given the following information:

Crops Grown	Hectares	Actual yield per hectares	Average yield per hectare
Groundnuts	3	1,600	1,550
Yam	6	3,700	5,000
Maize	5	1,500	2,000
Cowpea	6	1,000	1,200

2. Write explanatory notes on the following:

- (i) Machinery cost per hour
- (ii) Total invested capital
- (iii) Gross income
- (iv) Labour Efficiency
- (v) Land Efficiency
- (vi) Total input cost
- (vii) Number of cultivated hectares
- (viii) Average physical product

- (ix) Livestock efficiency
- (x) The best measure of size

7.0 FURTHER READING

Castle, E.N., M. H. Becker and F. J. Smith (1972) **Farm Business Management: The Decision-Making Process.** The MacMillian Company, New York. Chapter 3.

Hopkins, J. A. and E. O. Heady (1962), **Farm Records and Accounting.** Iowa State University Press, Ames Iowa. Chapter 7 and 11.

UNIT 10

GROSS MARGIN ANALYSIS

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1.0 INTRODUCTION

You will recall that planning is one of the functions of management as we discussed in Unit 1. For effective planning, certain tools and techniques have been developed which include gross margin, budgeting, discounted cash flow, programme planning, linear programming, and simulation, systems analysis and sensitivity analysis. This unit, however, will discuss the gross margin analysis.

2.0 OBJECTIVES

It is hoped that by the end of this unit you will be able to:

- Define gross margin and its component parts.
- Explain the advantages of gross margin analysis
- Estimate gross margins of farm enterprises.
- Use gross margin as a planning tool and choose between viable alternatives.

3.0 GROSS MARGIN

The gross margin analysis involves evaluating the efficiency of an individual enterprise (or farm plan) so that comparison can be made between enterprises or different farm plans. It is a very useful planning tool in situations where fixed capital is a negligible portion of the farming enterprise as is the case in subsistence agriculture.

Gross margin (GM) by definition is the difference between the gross farm income (GI) and the total variable cost (TVC), that is $GM = GI - TVC$

3.1 Total Cost

The total cost (TC) of production comprises of two component parts – fixed costs (FC) and variable costs (VC), that is, $TC = FC + VC$. Fixed costs are those incurred on fixed inputs which cannot be used up during one production process. Examples of fixed inputs are land, buildings, fences, roads, etc. they are considered as being gradually converted into products during the production process, and as such, they depreciate over time. Fixed inputs may be used on all or some of the enterprises in a given production period. Fixed cost is used to calculate the net farm income from the gross margin.

Variable costs vary according to output and are incurred on variable inputs which can be attributed to specific enterprises. For example, in poultry production, poultry feeds are specific inputs whereas in maize production, inorganic fertilizer is a specific input. Costs incurred on fixed inputs are, in the short run, considered sunk and unchanged while costs incurred on variable inputs vary in proportion to the level of output. For example, once a farmer secures an hectare of land, he can increase the level or fertilizer application, labour, seed rates, etc to increase the output up to a certain point with the variable costs increasing continuously as the quantity of inputs used increase. The variable cost is a major component in the derivation of gross margin.

3.2 Gross Farm Income

The gross farm income, also called total value of production, is the total physical product multiplied by the unit price of product. For example, if an hectare of land yields 2000kg of cotton and the price of cotton is N2.50/kg, the total value product is given by N5,000. Gross farm income is the sum of the total value of products from each hectare of land farmed in a given season or year. If a farmer owns both crop and livestock the gross farm income is the sum of the total value of products from both the crops and livestock enterprises.

3.3 The Usefulness of Gross Margin

There are numerous uses of the gross margin in farm management. The following are some of the usefulness:

- (a) Easy to compute and interpret
- (b) Highly applicable to subsistence system of farming involving small fixed capital component
- (c) Useful where the same capital items are used in many different enterprises in a given farm.

- (d) Used to determine net farm income.
- (e) Serves as a guide to the selection of enterprises by comparing their margins.
- (f) Helps the farm manager to critically examine the variable cost components.
- (g) Helps in building partial budgets for the farm.

The usefulness of gross margin in determining net farm income is discussed briefly below for clarity. The net farm income (NFI) can be determined by subtracting the total fixed cost (TFC) from the total gross margin (TGM) of the whole farm or all the enterprises.

$$\text{NFI} = \text{TGM} - \text{FC}$$

If a farm business is made up of three enterprises rice (r), yam (y) and maize (m), the total gross margin is $\text{TGM} = \text{GM}_r + \text{GM}_y + \text{GM}_m$.

Where $\text{GM}_r = \text{GI}_r - \text{VC}_r$.

$$\text{GM}_y = \text{GI}_y - \text{VC}_y \text{ and } \text{GM}_m = \text{GI}_m - \text{VC}_m$$

GM_r , GM_y , GM_m are the gross margin for rice, yam and maize respectively. VC_r , VC_y , VC_m are the variable costs associated with rice, yam and maize production respectively. If the total fixed cost (TFC) for the farm is known the net farm income (NFI) is given by $\text{NFI} = \text{TGM} - \text{TFC}$.

As discussed in chapter 5 the return to operator's land, labour, capital and management can be determined from the net income statement. In the case of small scale traditional farm with negligible fixed costs, the gross margin is a good approximation of the net farm income.

3.4 Gross Margin Analysis: A Worked Example

Given the information below determine the gross margin for each crop, the whole farm and the net farm income:

Crop	Size of Land Cropped (Hectares)	Estimated value of Crops (N per Hectares)	Variable or Specific Costs (N per hectares)
Yam	4.0	1,450	600
Millet	5.0	800	250
Rice	6.0	1000	470

Assume that the fixed cost of the farm is ₦350.

Solution

- i. Total Gross Margin for yam (GM_y) = $4(1,450 - 600) = N3,400$.
- ii. Total Gross Margin for Millet (GM_m) = $5(800-250) = N2,750$.
- iii. Total Gross Margin for Rice (GM_r) = $6(1,000 - 470) = N3,180$
- iv. Total Gross Margin (TGM) for the 15 hectares farm is $GM_y + GM_m + GM_r = N9,330$
- v. Total Gross Margin per hectare = $N9,330/15 = N622$
- vi. Net Farm Income = $TGM - \text{Fixed Cost} = N9,330 - 350 = N8,980$
- vii. Net Farm Income per hectare = $N8,980/15 = N599$.

3.5 Gross Margin Analysis as a Budgeting Tool

The gross margin can be used as a budgeting tool to compare the profitability of one enterprise with another. If a farmer wishes to substitute the production of 10 hectares of millet for maize, the gross margin of each can be determined on per hectare basis and the crop enterprise with highest gross margin selected.

For example:

		₦
Maize	=	1,350
Value of production/hectare	=	400
Gross margin/hectare	=	950
 Millet	=	
Value of production/hectare	=	800
Variable cost/hectare	=	250
Gross margin/hectare	=	550

Since maize gives a higher gross margin per hectare, the farmer can be advised to turn the ten hectares of land to the production of maize.

The gross margin analysis is useful in comparing the profitability of alternative farm plans. For an example, plan I may contain enterprises like maize, millet, sorghum and cotton, while plan II may contain cotton, rice, yam and cassava. The total gross margin for Plans I and II are given by

$$GM_r = GM_{\text{millet}} + GM_{\text{sorghum}} + GM_{\text{cotton}}$$

$$GM_{II} = GM_{yam} + GM_{cassava} + GM_{Rice} + GM_{cotton}.$$

If GM_{II} is greater than GMI , Plan II can be followed. However, in choosing between enterprises and different farm plans, profitability is not the only criterion that needs to be followed. The risk associated with, and the personal preferences on, each type of enterprise need to be considered.

Self – Assessment Exercise I

1. A farm has the following farm size, revenues and specific costs relating to cowpeas, groundnuts, maize and millet enterprises.

Crop Enterprises	Land size (Hectares)	Estimated value of Crops (Hectares) ₦	Variable or Specific Costs (₦ per hectares)
Cowpeas	3.0	2,000	600
Groundnut	2.0	1,000	250
Maize	4.0	1,450	470
	3.0	850	

What is the gross margin per cropped hectare for each crop?

This farmer has a poultry farm of 320 birds with variable costs totaling ₦300 per month. He estimated his revenue from the birds to be ₦650 per month. He also owns a swine enterprise for which the variable cost per month is ₦200. His estimated annual return is ₦3,600. Compute the yearly gross margin for his livestock enterprises.

Compute the net farm income for this farmer if the fixed costs are as follows:

	Value ₦	Salvage Value ₦	Year of Life
Implements	400	50	5
Equipment	600	50	5
Buildings	2,000	200	10

Permanent labour costs him N2,000 p.a

Self-Assessment Exercise 2

Given the following information should the farmer grow tomatoes or onions? What other factors must the farmer consider before making a choice?

	Tomatoes	Onions
	₦	
Seedlings	120	120
Land Clearing	150	100
Ridging	300	200
Planting	20 man-hours	60 man-hours
Weeding	450 man-hours	240 man-hours
Harvesting	300 man-hours	100 man-hours
Sales	6,050	2,800
Land size	3 hectares	2 hectares
Marketing	199	20
Fertilizer	60	40

Labour is costed at N3 per 8 man-hour day

4.0 CONCLUSION

Gross margin analysis is good, simple and easy to understand planning tool for students for farm management and managers alike. The component parts are the gross farm income and total variable cost, the difference of which is the gross margin.

5.0 SUMMARY

You have learnt in this unit that gross margin is the difference between the gross farm income and the total variable cost of production. The gross farm income is the total value of production which derived by the product of the total physical product and the unit price of the product. The total variable cost is the sum of the expenses incurred on the variable costs.

It is possible to determine the gross margin for different enterprises on the farm. If there are more than one enterprise on the farm, the gross margin of the various enterprises are summed up to arrive at the total gross margin of the farm.

Gross margin is a very useful tool for planning, particularly in situations under subsistence farming where fixed costs are almost negligible. Gross margin is easy to compute and easy to calculate net farm income.

As a planning tool, gross margin is the simplest. The total gross margin is calculated for the enterprises in a plan and this is compared with total gross

margin from the other plan. The plan with the greater total gross margin is preferred and chosen for execution all other things being equal.

Answers to Self Assessment Exercises

i. Gross Margin per cropped hectare:

Cowpeas	₦2,000 - 800	=	1,200
Groundnuts	1,200 - 560	=	640
Maize	1,450 - 450	=	1,000
Millet	850 - 260	=	590

Gross margin for the livestock enterprises:

GM poultry:	₦(640 - 300) x 12	=	₦4,200 p.a
GM Swine:	₦(3600 - (200 x 12))	=	₦1,200 p.a

Fixed Costs:

Depreciation on implements	$\frac{400 - 50}{5}$	=	₦70
Depreciation on Equipments	$\frac{600 - 50}{5}$	=	₦110
Depreciation on Buildings	$\frac{2000 - 200}{5}$	=	₦360
Total Depreciation	=	₦ 540	
Permanent Labour	=	₦2,000	
Total Fixed Cost	=	₦2,540	
Net Farm Income	=	TGM - TFC =	8,830 - 2,540
			₦6,290

2.

	Tomatoes	Onions
	₦	₦
Seedling	120	120

Land Clearing		150		100
Ridging		300		200
Planting	$\frac{20}{8} \times 3$	-	3.75	11.25
Weeding	$\frac{450}{8} \times 3$	=	168.75	90
Harvesting	$\frac{300}{8} \times 3$	=	56.25	18.75
Marketing cost	199		20	
Fertilizer	60		40	
	<u>1057.75</u>		<u>600.00</u>	
Variable cost per hectare	$\frac{1057.75}{3}$	=	$\frac{600}{2}$	$\frac{300.00}{2}$
			352.58	
Sales/ha	$\frac{6050}{3}$	=	2016.67	$\frac{2800}{2}$ = 1400.00
Gross Margin/ha			1664.09	1100.00

Decision: The farmer should be advised to grow tomatoes.

Other Factors to be considered include:

- The labour requirement for tomatoes is much higher than for onions
- Will the labour be available?
- Will the price of tomatoes remain high?

6.0 TUTOR MARKED ASSIGNMENTS

1. Given three farm plans open to Mr. Edi in Ogoja township of Cross River State of Nigeria, Which plan should he choose and why?

Farm Plan I

Maize

	₦
Sales	15,000.00
Variable Costs	5,000.00

Rice

Sales	20,000.00
Variable Costs	8,000.00

Yam

Sales	30,000.00
Variable Costs	13,000.00

Other Variable Costs common to Plan I amount to

Farm Plan II

Sorghum

Sales	16,000.00
Variable Costs	9,000.00

Cowpeas

Sales	22,000.00
Variable Costs	6,000.00

Groundnuts

Sales	28,000.00
Variable Costs	13,000.00

Farm Plan III

Cotton

Sales	20,000.00
Variable Costs	11,000.00

Cassava

Sales	13,000.00
Variable Costs	6,000.00

Sugar Cane

Sales	36,000.00
Variable Costs	12,000.00

Other variable costs common to Plan III amount to ₦ 4,000.00

If the price of sugar cane varies between N140 and N280 per ton and that of yams vary between N500 and N550 per ton which would you advise him to choose if he has to choose between PLAN I and PLAN III? Why?

2. A livestock farmer in Biliri, Bauchi State of Nigeria is considering whether to go into production of poultry or rabbitry. Given the information below what advice would you give him based on the gross margin analysis ?

	Poultry Per Year ₦	Rabbit Per year ₦
Equipment	1,500.00	900.00
Labour Costs	3,000.00	2,000.00
Feed Cost	10,000.00	8,000.00
Drugs	2,000.00	500.00
Utilities – Light	500.00	200.00
- Water	700.00	300.00
Eggs Sale	40,000.00	
Chicken Sale	9,000.00	
Rabbit for meat	-	45,000.00
Empty Feed bag sale	1,000.00	300.00

If the farmer can use a different breed of poultry that will increase the value of egg sale by 5% which enterprise would you advise him to devote his resources to?

7.0 FURTHER READINGS

Upton, M. and O. B. Anttinio (1955) *Farming as a Business*. Oxford Tropical Handbook), Oxford University Press.

Sturrock, F., (1971) *Farm Accounting and Management*. The Pitman Press, Bath. Chapter 13

MODULE 3**UNIT 11****Farm Budgeting****Table of Contents**

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1.0 Introduction

As mentioned in Unit 10 section 1.0, budgeting is one of the tools for effective planning. It is also a simple tool, easily understood and widely used.

2.0 Objectives

It is hoped that by the end of this unit you will be able to:

- Define farm budget.
- Enumerate advantages of farm budgeting.
- Explain the pre-requisites for budgeting.
- Prepare farm budgets using different methods.

3.0 What is a Farm Budget?

A farm budget is a detailed physical and financial plan for the operation of a farm for a certain period. The aim of a farm budget is to compare how profitable different kinds of enterprise combinations can be. There are two major categories of farm budget. There is a total or complete budget as well as a partial budget. A total or complete budget is used when contemplating a complete reorganization of the entire farm enterprise, like introducing irrigation technology to the farm. Partial farm budget, which is more common, is used when introducing a new enterprise or purchasing a new equipment of the farm. The aim of preparing a farm budget is to enable the farm manager to have several alternative plans for analysis so that he would be in a position to know which of them gives the highest net farm income. In a nutshell, farm budgeting involves considering the resources to be used, the choice of enterprises to be pursued and a calculation of expected receipts, expenditures and net farm income.

3.1 Advantages of Budgeting

Some of the several advantages of budgeting are:

1. Budgeting assists the farm manager to select factors of production more wisely. Once some fixed resources are invested in the farm business budgeting can be used to test and compare returns from the whole farm and other added resources.
2. As a planning tool, budgeting causes the farm manager to think more accurately, plan more carefully and completely. Through the process of budgeting, the farm manager refines his ideas and is better able to make more accurate decisions.
3. Bankers favour men who have written plans. A well thought-out budget creates a good impression on people and also gives the impression of a careful scrutiny of one's production and finances.
4. A budget is a money saver because it is cheaper to make mistake on paper than in practice.
5. Budgeting provides an excellent learning device for the student on how to organize and reorganize farms.
6. Lending agencies use budgeting process as a basis for appraising the farm business of their clients.
7. Budgeting helps a farm manager to determine when to borrow money and how much to borrow. It can also help him in setting up repayment schedules.
8. Budgeting makes it possible for one to discover certain items, and therefore costs, that could be easily dropped.

3.2 Budgeting Pre-requisites

Information needed to prepare a farm budget, whether complete or partial must follow the following pattern:

1. Objectives are stated and all the resources available to the farm are listed. It is essential to list all the resources available to the business in terms of land, labour and capital, Making changes which require more resources than the farmer can acquire could be disastrous. The objectives of making the farm plan or planned change must be carefully laid down, properly understood and strictly operationalised within the resources listed.
2. Estimated Cropped Land Size and Livestock Number. The land area available must be worked out and also mapped out, if possible, with

the present crops shown. In the case of crop enterprises, the proposed changes could be sketched out in other map for ease of reference.

3. **Estimating Physical Inputs and Outputs**
The farm manager needs to produce a list of available labour in man-days. The quantity of hired labour, permanent labour and family labour available should be specified by periods preferably on monthly basis. The available capital including farmer's savings and any amount borrowed need to be clearly indicated. The farmer as the manager should examine his ability in effecting any anticipated changes (partial or whole farm).
4. **Estimating Factors and Product Prices**
Current market prices or a few year's moving average could be used as a proxy for factor and product prices.
5. **Decide Which Plan is Possible**
Of a whole range of alternative plans available to the farm manager he can reject outright those plans that do not interest him or those that he cannot manage properly.
6. **Budget the Possible Alternative**
The possible alternative plans are compared on the basis of the gross margin per unit of the most limiting resources. For example, labour is the most limiting resource, the plan with the highest gross margin per man-day should be selected.
7. **Execute the Best Plan**
Once the farmer selects the best plan, it must be put into operation. He should be ready to accept responsibility for the outcome of its implementation.

3.4 Methods of Budgeting

The various methods of making budgets are the Orthodox, gross margin, break-even, block, capital and complete budgeting. The first five methods are sometimes grouped under the broad heading of partial budgeting. These methods are discussed below:

1. The Orthodox Budget

The Orthodox partial budget is the oldest method used in farm planning. It assumes that the anticipated change on the farm has been

initiated. For example, a farmer who intends to devote 5 hectares of his rice field to the production of maize assumes that maize is already under production. The Orthodox method consists of debits which include extra costs incurred and revenue forgone; and credits which include costs forgone and extra revenue generated. The method is summarized as follows:

A. DEBIT	B. CREDIT
1. <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 5px auto;">EXTRA COSTS INCURRED</div>	1. <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 5px auto;">COSTS SAVED</div>
1. <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 5px auto;">REVENUE FORGONE</div>	2. <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 5px auto;">EXTRA REVENUE</div>

A1 represents the costs that will specifically be incurred for growing the 5 hectares of maize.

A2 represents the revenue forgone as a result of not growing rice.

B1 represents the costs saved as a result of not growing rice but growing maize.

B2 represents the extra revenue or added revenue generated as a result of growing maize.

The summary has two sides, the debit side (A) and the credit side (B) derived thus:

$$\begin{aligned} \text{Debit} &= A1 + A2 \\ \text{Credit} &= B1 + B2 \end{aligned}$$

If the credit is greater than the debit, it is worthwhile to grow maize on the 5 hectares of land rather than rice. If the debit is greater than the credit, then the original assumption is rejected i.e. it is not worthwhile to grow maize. The farmer in that case should continue with growing rice.

Example 1

Given the information below the Orthodox partial budget method can be used to decide whether a farmer named Nasiru should change to the production of cowpeas or continue with cotton.

COTTON (15 hectares, 1700 kg/ha yield)

Variable Costs:	(Naira)
Seed	90
Fertilizers	288
Pesticides	3,396
Tractor hire	1,264
Casual labour	2,550
Packaging	128

Fixed costs specific to cotton production:

Depreciation	150
Sales	10,200

COWPEAS 915 hectares, 833 kg/ha yield)

Variable Costs:	(Naira)
Seeds	390
Fertilizers	511
Pesticides	3,415
Tractor hire	2,036
Casual labour	2,694
Packaging	431

Fixed costs specific to cowpeas production:

Depreciation	240
Sales	12,500

SOLUTION:

Assumption: He changed to production of cowpeas

A1. Extra costs incurred for growing cowpeas:
 Variable + Fixed costs = N9,717

A2. Revenue forgone for not growing cotton:
 Gross receipts of cotton = N10,200

B1. Costs saved for not growing cotton:
 Variable = fixed costs = N7,866

B2. Extra revenue for growing cowpeas:
 Gross receipts from cowpeas = N12,500

$$\text{Debit} = A1+A2 = N9,717 + N10,200 = N19,917$$

$$\text{Credit} = B1+B2 = N7,866 + N12,500 = N20,366$$

Since the credit side is greater than the debit side, the change to production of cowpeas should be made.

Self-Assessment Exercise 1

Prepare a partial orthodox budget for the farmer who wishes to substitute 2.4 hectares of rice for cotton.

Yield of rice is		224kg/ha
Yield of cotton		134kg/ha
Seeds:	Cotton	13.47kg/ha
	Rice	61kg/ha
Prices:	Cotton	N2.25/kg
	Rice	N1.15kg

Fertilizer requirements:

Rice	20 bags of superphosphate (SSP)
	10 bags of calcium ammonium nitrate
Cotton	18 bags of superphosphate (SSP)
	10 bags CAN

Price of fertilizer: CAN N10/bag
 SSP N8.50/bag

Spraying Rice: Carbofuran 72kg at N6.5/kg
 Carbaryl 4.8kg at N37/kg

Cotton: Cymbush or decis total cost N195.

Is the change worthwhile?

2. The Gross Margin or Profit Method

The gross margin method consists simply of finding the gross margin for each enterprise and whichever gives the highest gross margin is the best. This was explained in unit 10. If further information is available on the fixed costs, the best enterprise is the one with the highest profit.

In the cotton versus cowpeas example:

$$\text{Gross margin from cowpeas} = N12,500 - N9,477 = N3,023$$

$$\text{Gross margin from cotton} = N10,200 - N7,716 = N2,484.$$

Since the gross margin of cowpeas is greater than the gross margin of cotton, the farmer could change to the production of cowpeas.

Similarly

Profit from cowpeas = N12,500 – N9,717 = N2,783

Profit from cotton = N10,200 – N7,866 = N2,334

Since the profit from cowpeas is greater than profit from cotton, the farmer could change to growing of cowpeas. Irrespective of the method used, so long as the calculations are correct, the same conclusion would be obtained.

Self-Assessment Exercise 2

Given the following information perform a gross margin budget to advise Mallam Gambo who wishes to substitute 30 hectares of sorghum for groundnuts. Sorghum under traditional technology yields 840kg/ha and can be sold at 52k/kg. Groundnut under traditional technology yields 1150kg/ha and can be sold at 75k/kg

Variable Costs of Sorghum

24kg/ha seed

268 man-hours per ha. hired labour.

Variable Costs of Groundnuts

80kg/ha seed

334 man-hours per ha. hired labour (Hired labour costs 50k/man-hour).

3. Break-even Method

The break-even budgeting is used to determine the level of price or yield performance which any given factor must achieve for the profitability of the alternative to be equal. Break-even budgets are necessary as a result of unstable product prices and yields.

It is possible to calculate the extra yield required for a new project to break-even, that is, just cover the additional costs of its introduction. If it costs an extra N5 to adopt a simple improved method of producing a crop which is sold at 5k/kg then the yield of that crop would have to increase by more than 100kg to justify its adoption.

An example of a Break-even Budget

In the cotton and cowpeas example treated earlier (section 8.4.1), the net loss in revenue if cotton is grown is N449. In order for cotton to give the same profitability level as cowpeas the yield of cotton must increase by N449/N2.50 or 179.6kg from the 15 hectares cropped and when cotton is sold at N2.5/kg. On per hectare basis, the yield of cotton must increase by 179.6/15 or 11.97kg in order for cotton to be just as profitable as cowpeas.

Self-Assessment Exercise 3

Carryout a break-even budget using the information provided for Self Assessment Exercise 2.

4. Block Budgeting

In block budgeting similar costs and similar returns are grouped together for comparison among various enterprises. An example of block budget is shown in Table 11.1

On the basis of the gross margin shown in the table, hybrid maize appears to be the most attractive enterprise. As many enterprises as possible can be included in the format and the items can further be broken down into types of chemicals, labour, fertilizer etc.

Table 11.1 Example of block budget for crop enterprises

Items per hectare	ENTERPRISES		
	Open pollinated Maize N	Hybrid Maize N	Groundnut N
Costs			
Seeds	21.00	150.00	40.00
Seed dressing	1.20	1.20	1.20
Herbicide	68.50	68.50	130.00
Fertilizers	144.50	244.50	59.50
Insecticides	97.00	97.00	195.00
Disease control	-	-	-
Labour	67.50	105.00	54.40
Mechanical harvesting, Threshing and bagging	30.00	50.00	30.00
Bags	120.00	320.00	54.00
Hired mechanical operations	60.00	60.00	50.00

Total	609.70	1096.20	614.10
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Returns

Yield (kg)	3,000.00	8,000.00	1,500.00
Price (N/kg)	0.40	0.40	0.40
Gross Income (N)	1,200.00	3,200.00	900.00
Gross Margin (N)	590.30	2,103.80	285.90

5. Capital Budgeting

Capital budgeting deals with the problems of translating capital items into annual flows. These are two procedures used in analyzing capital budgeting: (i) DIRT/H Method and (ii) The Net Present Value Method.

i) The DIRT/H Method

The DIRT/H formula is a simple but crude method used in constructing a capital budget. From the ownership point of view it is assumed that a certain percentage of the original costs is used up gradually in the first and subsequent production processes. This estimates the average yearly costs of the capital items to the owner. The DIRT/H method is a construction from the various letters contained in it.

D	=	Depreciation
I	=	Interest paid on borrowed capital
R	=	Repairs on capital items
T	=	Taxes
I	=	Insurance
H	=	Housing

Depreciation methods have been discussed earlier in Unit 4. Any of the methods can be used but whichever method that best describes the nature of depreciation of the asset must be used.

A Worked Example:

Suppose the cost of an asset is N3,500 with salvage value of N350 and expected life of 10 years. How much can be charged to each production year if the interest charged is only 7%, 7% for insurance, no tax, 0.8% on housing and 5% on repairs? Depreciation (D) (using the straight line method).

$$= \frac{\text{Cost} - \text{Salvage Value}}{\text{Life}} = \frac{3500 - 350}{10} = \text{N315/year}$$

No. of years 10

Average Value of the Asset =

$$\frac{\text{Beginning Value} + \text{Salvage or End Value}}{2} = \frac{3500 + 350}{2} = \text{N1,925}$$

Interest (I)	=	1,925 x 7%	=	N134.75
Taxes (T)	=	0		
Repairs (R)	=	1,925 x 5%	=	N96.25
Insurance (I)	=	1,925 x 7%	=	N134.75
Housing (H)	=	1,925 x 0.8%	=	N15.40
Total	=	D + I + R + T + I + H = N696.15		

The cost is compared with the contribution the capital asset makes to the annual income. If the annual cost is greater than the annual income contribution, it is not worthwhile investing in the said capital item.

ii) The Net Present Value Method

The net present value method of capital budgeting converts the series of future income into the present value as discussed in Unit 4. This method of capital budgeting is more popular because the time value of money is taken into consideration unlike the DIRT/H method which uses undiscounted average figures.

The yearly returns from two types of investments A and B are presented in Table 11.2. In order to choose between the two investments the Net Present Value for each investment is calculated and compared.

Table 11.2: Yearly returns to investments A and B

Investments	Costs	Returns in '000's Naira by Year						
		1	2	3	4	5	6	7
A	10,000	5	5	5	4	3	2	1
B	10,000	1	2	3	4	5	5	5

Assuming A and B have same initial purchase cost but A gives higher returns during the early years while B gives higher returns at the later years. In normal terms the total return for A and B are the same and equal to N25,000. It is through the net present value that we can discover which investment is better.

R_1 R_2 R_n

$$\text{Present Value} = \frac{\text{---}}{(1 + i)} + \frac{\text{---}}{(1 + i)^2} + \frac{\text{---}}{(1 + i)^n}$$

Where R1, R2Rn are series of annual returns while I is the discount rate. If I is 6 percent for the above example.

$$\begin{aligned} \text{PVA} &= \frac{5,000}{1.06} + \frac{5,000}{(1.06)^2} + \frac{5,000}{(1.06)^3} + \frac{5,000}{(1.06)^4} + \frac{5,000}{(1.06)^5} + \frac{5,000}{(1.06)^6} + \frac{5,000}{(1.06)^7} \\ &= 4,716.98 + 4,464.29 + 4,201.68 + 3,174.60 + 2,238.81 + 1,408.65 + 662.25 \\ &= 20,867.26. \end{aligned}$$

$$\begin{aligned} \text{PVB} &= \frac{1,000}{(1.06)} + \frac{2,000}{(1.06)^2} + \frac{3,000}{(1.06)^3} + \frac{4,000}{(1.06)^4} + \frac{5,000}{(1.06)^5} + \frac{5,000}{(1.06)^6} + \frac{5,000}{(1.06)^7} \\ &= 943.40 + 1,785.71 + 2,521.01 + 3,174.60 + 3,731.34 + 3,521.13 + 3,311 \\ &= 18,988.45. \end{aligned}$$

Net Present Value = Present Value – Cost of the Investment

$$\text{NPV}_A = \text{N}20,867.06 - \text{N}10,000 = \text{N}10,867.06 \quad \text{NPV}_B = \text{N}18,988.45 - \text{N}10,000 = \text{N}8,988.45.$$

The net present value of investment A is higher than that of B which means A is better. This analysis infer that investments that yield higher returns earlier in the investment years are preferred to those which yield returns later in the life span of the investment.

Self-Assessment Exercise 4

Which of the following capital investment A and B can you advise a farmer to purchase given the information below? (Show all your work). Assume the rate of discount to be 8%.

Investment	New Costs	Returns in ‘000’s Naira by Year							
		1	2	3	4	5	6	6	
A	10,000	2	3	4	5	5	5	6	
B	12,000	6	6	6	4	3	3	1	

3.4 Complete Budgeting

The complete budget is used when a new farm or when the change contemplated is too big for partial budget. The seven step enumerated in 3.2 are also followed in making a complete budget. The complete budget takes the following form:

Inventory Change

Appreciation or depreciation of livestock
Depreciation of machinery
Change in stock

Expenditure

Fertilizer – (Amount, type, price and enterprise for what it is used).
Casual worker
Machinery
Feeding stuffs – (Amount, type, price, and enterprise for what it is used).
Fixed costs (by items)
Miscellaneous.

Revenue

Number of units x yield x price for each enterprise output.

Net Farm Income

Net Farm Income is the difference between the total revenue and farm expenditures.

3.5 Limitation of Budgeting Techniques

1. Budgeting is a trial and error method. Although it can be used to find the most profitable among two or three plans, budgeting process does not help in the initial choice of plans.
2. Budgeting uses constant average costs and returns and does not take into account diminishing marginal returns and increasing marginal costs.
3. It does not consider supplementarity or complementarity between enterprises.
4. Forecasting future yields, prices and incomes are difficult.

5. When the hand method is used in budgeting there is a limitation to the number of alternative that can be tried at a time as well as the efficiency of performing the budgeting exercise. However, with the use of computers this problem is no more attainable.

4.0 Conclusion

The strengths and weakness of the farm budgeting techniques in planning and reorganizing the farm business have been highlighted in this unit. More sophisticated techniques such as electronic linear programming have been developed over time. Marginal analysis rather than dealing with averages are the strengths of the new techniques. However, these may be too complicated for use by farm managers that are not highly educated.

5.0 Summary

In this unit you have learnt the use of farm budgeting, its advantages and limitations. The different methods of making budgets have been emphasized. These methods can be used as the occasions demand. If the interest is on capital, then the capital budgeting methods can be used. The orthodox partial method requires that you make an initial assumption as to which of the two alternatives you will choose. The four boxes can only be correctly placed when this assumption is clearly stated. You can later reject the alternative chosen initially if the credit side is less than debit side. You must note that it does not matter which assumption you make initially either to choose alternative A or B. If there are no arithmetic errors, you will come to the same correct conclusion either choosing A or B irrespective of the initial assumed choice.

Answers to Self Assessment Exercises

Self-Assessment Exercise 1

Assumption: The farmer chooses to grow rice.

Credit Side

Revenue generated from rice = $2245 \times 1.15 = \text{N}2581.75$

Cost saved for not growing cotton:

Seeds: $13.47 \times \text{N}2.25 = \text{N}30.31$

Fertilizer:	SSP 18 x 8.50 =	153
	CAN 10 x 10 =	100
	Cymbush =	195

N478.31

Total credit side 2581.75 + 478.31 = N3060.06

Debit side

Revenue forgone for not growing cotton:

1347 x N2.25 = 3030.75

Added cost for growing rice:

Seeds:	61 x 1.15 =	70.15
Fertilizer:	SSP 20 x 8.50 =	170
	CAN 10 x 10 =	100
Carbofuran	72 x 6.5 =	468
Carbaryl	4.8 x 3.7 =	<u>177.6</u>
		985.75

Total debit side = 3030.75 + 985.75 = 4016.50

Since Debit side > Credit, therefore the farmer should grow cotton.

Self Assessment Exercise 2.

Gross Margin Budget for Mallam Gambo's farm:

Sorghum:

Variable costs:

Seed:	24 x 0.52 =	N1,248
Labour	268 man-hours x N0.50 =	<u>N134</u>
		N135.25

Gross Income: 840 x N0.52 = N436.8

Gross margin for sorghum = 436.8 – 135.25 = N301.56

Groundnut:

Variable costs:

Seed:	80 x N0.75 =	N60
Labour	334 x N0.05 =	<u>N167</u>
		N227

Gross Income: 1150 x N0.75 = N862.5

$$\text{Gross margin for sorghum} = 862.5 - 227 = \text{N}635.5$$

The farmer should be advised to grow groundnut because the gross margin for groundnut is higher than that for sorghum.

Self-Assessment Exercise 3

The decision is to grow groundnut. However, in order to make sorghum as profitable as groundnut, the yield of sorghum must increase by:

$$\begin{aligned} \text{GM Difference} &= 635.5 - 301.56 = \text{N}333.94 \div \text{price of sorghum} \\ &= \text{No. of kg of sorghum that will bridge the difference} \\ &= \frac{333.94}{0.52} = 642\text{kg} \end{aligned}$$

If sorghum yield can increase by 642kg it will be as profitable as groundnut

OR If the price of sorghum can increase by

$$\frac{333.94}{840} = \text{N}0.40/\text{kg} \text{ then sorghum will be as profitable as groundnut.}$$

Self-Assessment Exercise 4

$$\begin{aligned} \text{PVA} &= \frac{R_1}{(1+i)} + \frac{R_2}{(1+i)^2} + \frac{R_3}{(1+i)^3} + \frac{R_4}{(1+i)^4} + \frac{R_5}{(1+i)^5} + \frac{R_6}{(1+i)^6} \\ &= \frac{2,000}{1.08} + \frac{3,000}{(1.08)^2} + \frac{4,000}{(1.08)^3} + \frac{5,000}{(1.08)^4} + \frac{5,000}{(1.08)^5} + \frac{6,000}{(1.08)^6} \end{aligned}$$

$$= 1851.85 + 2572.02 + 3175.33 + 3675.12 + 3402.98 + 3780.96 = 18,458.26$$

$$\begin{aligned} \text{PVB} &= \frac{6,000}{1.08} + \frac{6,000}{1.1664} + \frac{6,000}{1.2597} + \frac{4,000}{1.3605} + \frac{3,000}{1.4693} + \frac{1,000}{1.5869} \end{aligned}$$

$$= 5555.55 + 5144.03 + 4763.04 + 2940.09 + 2041.79 + 630.16 = 21,074.66$$

$$\text{NPV}_A = \text{PV}_A - \text{Purchasing price} = 18,458.26 - 10,000 = 8,458.26$$

$$\text{NPV}_B = \text{PV}_B - \text{Purchasing price} = 21,074.66 - 12,000 = 9,074.66$$

Since $\text{NPV}_B > \text{NPV}_A$, the farmer should be advised to invest in B.

6.0 Tutor Marked Assessment

1. A farmer wishes to know whether he should buy a new plough or have his ploughing done on custom basis at a cost of N80 per hectare. This farmer normally ploughs 10 hectares per year. You have the following information to help you

Cost of plough	N1,700
Years of use	5
Salvage value	N 200

Extra tractor repairs while ploughing for 5 years is N950.

Fuel and lubrication cost/year is N356

Labour cost of operating tractor pulling plough is N20.80/ha

Interest rate 10% p.a.

Insurance and housing 0.5%

Should he buy the plough or hire? (show your work).

What factors can make the farmer act contrary to your advice?

2. Mallam Yakubu wants your professional advice on whether he should buy a maize harvester or hire local labour for his 500 hectares of maize. On further discussions with him he disclosed the information given below.

Prepare an orthodox partial budget to justify your advice to him.

Maize is sold at a price of N0.70 per kg. He can expect a yield of 2,700kg per hectare. The cost of combine harvester is N45,000 and it is expected to last 8 years with a salvage value of N5,000.

The cost of maintaining the combine harvester averages N70 per hectare per year. The running costs averages N40 per hectare per year. The cost of hire labour for harvesting at the current minimum wage rate is N625 per hectare per year. Enumerate in detail what other factors need to be considered before the final decision is taken by Mallam Yakubu.

7.0 Further Readings and References

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UNIT 12

Risk and Uncertainty in Farming

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1.0 Introduction

You will recall that in Unit 1, it was said that Farm Management is essentially a farm decision-making process. In Unit 5, you will recall we highlighted the economic principles relevant for decision-making. Many of the principles of economics are based upon the assumption, either stated or unstated, that the future can be predicted with a specified degree of accuracy.

2.0 Objectives

It is hoped that by the end of this unit, you will be able to:

- Explain and differentiate between risk and uncertainty.
- Describe method of overcoming risk and uncertainty.
- Enumerate the precautions against uncertainty.
- Explain the causes of price instability in agriculture.
- Determine the effects of price fluctuation on farmers.

3.1 What is Risk?

Risk is defined as the situation which exists when the future can be predicted with a specified degree of probability. With the perfect knowledge situation it is possible to say definitely and positively that an event will happen. In the situation of risk, however, it can be said that the chances are, for instance 50 – 50 or 60 – 40 that an event will occur.

Risk refers to variability or outcomes which are measurable in an empirical or quantitative manner. There are two types of risk according to Knight – the a priori and the statistical risk. A priori probability prevails when sufficient information is known in advance about the general possibilities that the probability of a particular event occurring can be specified. For example, if a coin is tossed, it is known that it must fall with either the head or tail facing up. It is also known that both sides have exactly the same opportunity of turning up. Therefore, on the basis of general principles, the probability of a particular event occurring can be predicted.

When statistical risk occurs on the other hand, the probability of future event can be stated on the basis of results of many previous observations. An example is the mortality tables of life insurance companies. Probabilities are assigned to future events on the basis of recorded experiences as to what has happened in order similar circumstances.

3.2 What is Uncertainty?

In this case of uncertainty, there is no valid basis for assigning any kind of probability to future events. Yet the farmer must make plans for the future even though he is unable to determine the probability of future events from

either a priori or a statistical standpoint. In a quantity sense, the outcome cannot be established. Uncertainty is subjective in nature. It refers to the anticipations of the future and is peculiar to the mind of each individual producer. Examples are variability in yield and weather. Risk is insurable but uncertainty is not.

Self-Assessment Question 1

Distinguish between risk and uncertainty.

3.3 Methods of Overcoming Risks and Uncertainty

i) Risks

There are many situations in agriculture that may be classified as risk. If a possible unfortunate incidence can be insured against, it can be classified as risk. There are various kinds of insurance that are available. The farmer must decide whether to pay to have the risk transferred to some other person, or if he can afford to bear the risk himself. A number of factors will affect decisions. Not all insurance can be viewed in the same way since different amount of protection against unforeseen events are provided. The following classification of insurance are available to the farmer.

- Property insurance – valuable property – fire or damage
- Liability insurance – against large losses
- Yield insurance – against loss of yield due to flood or bad weather.
- Life insurance – against accidental death.
- Health insurance – against sicknesses requiring hospitalization

Certain risk situations cannot be covered by insurance owing to the difficulty of securing reasonable data to establish fair premiums. For example, breakage of eggs, loss by rodents, grain waste. They are regarded as costs of production.

ii) Uncertainty

Uncertainty can be classified as follows:

- a. On-Farm Uncertainties
 - Production – physical or biological
 - Family welfare – farmers and family.
- b. Off-Farm Uncertainties
 - 1a. Markets and prices
 - b. Factor or input prices

2. Technology or means of production
 - a. Obsolescence
 - b. Total production effects

3. Government and institutions
 - a. Price subsidies
 - b. Production control
 - c. Credit policies as they affect interest rates etc.

4. Individuals
 - a. Bankers, landlords and employees.

3.4 Precautions against Uncertainty

1. Flexibility:

Planning in such a way that new information may be taken into account as it becomes available. For example, building plans can be designed to adapt to different uses. One structure can be built to be used for machinery, grain, or livestock depending on need. Machinery that can be used for many different crops by making proper adjustments. Enterprises vary in amount of flexibility they provide. A farmer may fatten some calves or rams for sale during religious festivals when prices are good. Some enterprises are inflexible because of the time involved to realize returns. For example orchards in production may be difficult to convert to some other venture in the short run.

2. Diversification

Diversification to reduce variability of income. The theory behind this is that the prices and yields of different enterprises do not fluctuate together and that a combination of enterprises will tend to stabilize income over what it would be if the enterprises were produced separately.

Growing or producing many crops to stabilize income is a common feature of the traditional farming system in Nigeria and most African countries. Farmers grow up to eight crops in a mixture and there were up to 200 types of crop mixtures found on farms in Zaria area. If one crop fails another one may succeed and therefore providing security for food in periods of drought or other calamities under the control of the farmer.

Growing crops in mixture or different types of livestock enterprises may not necessarily stabilize income. What affects the price or the yield of one must not affect the prices and yield of the other. The total variance of income when two crops A and B are grown in mixtures is given by:

$$\sigma_T^2 = \sigma_A^2 + \sigma_B^2 + 2r\sigma_A\sigma_B$$

Where

σ_T^2	=	Total variance of income
σ_A^2	=	Variance of income of enterprise A
σ_B^2	=	Variance of income of enterprise B
σ_A	=	Standard deviation of enterprise A
σ_B	=	Standard deviation of enterprise B
r	=	Correlation coefficient of enterprise B

This equation states that when 2 enterprises with variance σ_A^2 and σ_B^2 respectively are combined, the variance for the total operation, σ_T^2 , becomes $\sigma_A^2 + \sigma_B^2 + 2r\sigma_A\sigma_B$. This means that the variance for the combined operation is equal to σ_A^2 , the variance of enterprise A, plus, σ_B^2 , the variance of enterprise B, plus the covariance which is defined as $2r\sigma_A\sigma_B$ where r is the correlation coefficient for the two enterprises.

If the income from the two enterprises have a zero correlation coefficient ($r = 0$), the equation becomes $\sigma_T^2 = \sigma_A^2 + \sigma_B^2$. Hence the addition of enterprise B to enterprise A will always increase variance for the combined operation as compared to specialization in A alone.

If $r = +1.0$, the equation becomes $\sigma_T^2 = \sigma_A^2 + \sigma_B^2 + 2r\sigma_A\sigma_B$ and the variance will always increase more than the previous case. If, however, $r = -1.0$, the equation becomes $\sigma_T^2 = \sigma_A^2 + \sigma_B^2 - 2r\sigma_A\sigma_B$. The variation of the total operation can now be less than for A alone. This is also predicted on the covariance, $2r\sigma_A\sigma_B$, being greater than σ_B^2 .

This means that the total variance (σ_T^2) will remain unchanged if $2r\sigma_A\sigma_B/\sigma_B^2$ is equal to 1.0 (i.e. $2r\sigma_A\sigma_B = \sigma_B^2$). The total variance (σ_T^2) will decrease when $2r\sigma_A\sigma_B/\sigma_B^2$ is greater than 1.0 (i.e. $2r\sigma_A\sigma_B > \sigma_B^2$). The total variance (σ_T^2) will increase when $2r\sigma_A\sigma_B/\sigma_B^2$ is less than 1.0.

The implication of the $r = 1.0$ is that the two enterprises not move in the same direction i.e. when income of A increases that of B decreases. If $r = 0$, there is no correlation between the two enterprises and when $r = 1.0$, the enterprises

move in the same direction. In summary the diversification reduces variability when:

1. $r = -1.0$
2. $2r\sigma_A\sigma_B$ is negative and greater than σ_B^2 .

3. Asset Management

The existence of uncertainty in agricultural production has a profound effect on the management of assets in farming. The farmer may hold a higher percentage of his assets in liquid form than if the future were more certain. Liquidity may be defined as that characteristics that of an asset that permits it to be converted into each easily. When necessary, liquid assets can be converted into cash and be used for either consumption or investment.

Uncertainty may also affect the use and quantity of capital in farming. A farmer may restrict available capital in relation to the amount of uncertainty which exists. A lender will tend to restrict the amount of money loaned in proportion to the amount of uncertainty. The farmer may stop short of producing at the point where $MR = MC$. Instead of applying fertilizer at the rate of 90kg of fertilizer, the farmer applies 60kg/hectare which is sub-optimal. But he is willing to accept the sub-optimal level of income at 60kg rather than 90kg and sacrifice the possible income at 90kg to protect himself in the event either of unfavourable yields or prices may occur.

4. Discounting for Risk

Out put is reduced every year in order to reduce losses in bad years.

5. Forward Contracting

Arrangement can be made to deliver products at a given price and time. The disadvantage is that one may lose future gains if prices outlook turns out to be better in the future.

6. Choice of Enterprises

Farmers may prefer more reliable enterprise, with yield and prices that do not fluctuate from year to year, though things may be less profitable. Food crops would normally give enough guarantee for food no matter what happens.

Self-Assessment Exercise 2

Under what conditions will the total variance be less than σ_A^2 for the enterprises A and B.

3.5 Causes of Price Instability in Agriculture

Price of agricultural products fluctuate more than prices of industrial products.

1. Supply of agricultural products is directly affected by natural factors like weather, diseases and pests than industrial products. Farmers therefore have very little control on the conditions under which they produce. There is therefore a difference between planned and actual output as compared with industrial output which can be easily forecast.
2. Once a given amount of crop has been planted it is difficult to interfere with its potential output. Farmers to some extent cannot stop the crop from growing and animals from producing.
3. Price fluctuations depend on the degree to which it is possible to store the products. Producers can retain some products in storage and sell to the market later. But most of the agricultural products are more perishable than the manufactured products.

3.6 Effects of Price Fluctuations on Farmers

Because farmers have limited control over demand and supply of agricultural products, it makes farming a risky business because farmers are always uncertain of their income from a given level of input. They are not sure of the price they will receive for the output from their farms. This affects consumption and investment expenditure. Because incomes are not certain, farmers are unwilling to adopt new supply probably because surplus supply will lower prices.

3.7 Decision Rules and Strategy Models

Different scholars developed various decision rules or strategy models to deal with risk and uncertainty. The simple ones that would not involve sophisticated knowledge are discussed in this section.

1. The Expected Value Theory

The theory assumes that the probability of occurrence of state of nature are known from experience. For example, the probability that state of nature of good weather is .25, and for averagely good and poor weather respectively have probabilities of 0.50 and 0.25. The figures in the boxes mean that 10,000 naira would be the income when state of nature is poor occurs with

treatment level A. The sum of N8,000 would obtain when the treatment is at level B.

Treatment Level	Poor weather (0.25)	Fairly good weather (0.50)	Good family ¹ (0.25)
A	10	20	25
B	8	15	45

Calculate the Expected Value for A:

$$0.25(10) + (0.5)(20) + 0.25(25) = 18.75$$

$$\text{Expected Value B} = 0.25(8) + (0.5) 15 + 0.25(45) = 20.76$$

The decision rule is to choose the enterprise with the higher expected value. Therefore the choice is A.

2. La Place Game Theory

This is also called Bayesian approach. Each state of nature is assumed to have equal probability.

	1	2	3
	0.33	0.33	0.33
A	10	20	25
B	8	15	45

$$\text{Expected Value A} = (.33)(10) + .33(20) + .33(25) = 18.33$$

$$\text{Expected Value B} = (0.33)8 + .33(15) + .33(45) = 22.67$$

Decision Rule: Choose the investment with greater expected value. Therefore we would choose enterprise B.

3. Maximax Theory

The states of nature are not known so well as to calculate the probability of occurrence.

	States of Nature			
	1	2	3	Row max
A	10	12	12	12
B	8	20	15	20
C	-5	25	25	25 ✓

First, create a row maximum by picking the highest figure of the rows. Then the enterprise with the highest income in the newly created row maximum. The decision is to choose enterprise C.

4. Minimax Theory

The probability of occurrence of the states of nature are not known but a row minimum is created by picking the lowest income for each enterprise.

States of Nature			
	1	2	Row max
A	10	12	10 ✓
B	8	15	8
C	-5	25	-5

For enterprise A, the minimum is 10, for B it is 8 and for C it is -5, the decision rule is to choose the enterprise with the highest row minimum. Therefore enterprise A will be chosen.

5. Minimum Regret (Savage Criterion)

There are two stages to this theory. From the initial information provided in the table, another table called minimum regret table is created. This is done by taking the highest value in each column and subtracting the corresponding value in each box to find the difference. This means that if you choose enterprise A the regret is zero since the value of A under state of nature is 10. The regret under enterprise B is $10 - 8 = 2$ for C the regret is $10 - (-5) = 15$. From the minimum regret table you choose a row maximum. The decision rule is to choose the enterprise with the least row minimum. The choice is enterprise B.

Initial Table: States of Nature

Enterprise	1	2
A	10	12
B	8	15
C	-5	25

Derivation of Minimum Regret

Enterprise	1	2
A	$10 - 10 = 0$	$25 - 12 = 13$

B	$10 - 8 = 2$	$25 - 15 = 10$
C	$15 - (-5) = 15$	$25 - 25 = 0$

Minimum Regret Table

Enterprise	1	2	Row max
A	0	13	13
B	2	10	10 ✓
C	15	0	15

6. Pessimism – Optimism Index

This theory assumes that the state of mind of the decision maker concerning the enterprises A, B, C is either optimistic or pessimistic. If α is assigned to optimism, $1 - \alpha$ is assigned to pessimism since the two should sum up to 1. The weighted value is calculated for each enterprise and the decision rule is to choose the enterprise with the highest weighted value.

States of Nature

	1	2	Weighted Value
A	10	12	11.2
B	8	15	12.2
C	-5	25	13 ✓

If $\alpha = 0.4$; $1 - \alpha = 0.6$ then:

$$\begin{aligned} \text{Weighted value for A} &= 0.4(10) + 0.6(12) = 11.2 \\ \text{Weighted value for B} &= 0.4(8) + 0.6(15) = 12.2 \\ \text{Weighted value for C} &= 0.4(-5) + 0.6(25) = 13 \end{aligned}$$

7. Minimum Variance

The aim is to avoid risk hence the enterprise with the minimum variance. A variance column is created by taking the difference between the highest and lowest income given under each state of nature.

States of Nature

Enterprise	1	2	3	Variance Column
A	10	12	6	$12 - 6 = 6$ ✓
B	8	15	23	$23 - 8 = 15$
C	-5	25	11	$25 - (-5) = 30$

The decision rule is to choose the enterprise A with the minimum variance.

The SAE 2

Using the table below which enterprise will you choose using the following strategies:

The enterprises A,B,C, could represent any type of enterprises – crops, livestock etc. It could represent levels of fertilizer treatment, levels of capital, labour use soil types etc. The states of nature could be any number representing rainfall, temperature, humidity, windy condition etc.

4.0 Conclusion

Management becomes necessary because knowledge is imperfect. Yields and prices of inputs and outputs cannot be predicted with accuracy because of imperfect knowledge. The farmer therefore takes decisions under conditions of risks and uncertainty. This unit therefore considered ways and means of improving farmers decision under these conditions that are outside their control.

5.0 Summary

In this unit you have learnt what risk and uncertainty mean and how they affect decision making about the farm business. Risk can be overcome by different types of insurance while uncertainty situations cannot be insured. Certain precautions that can be taken against uncertainty include flexibility, diversification, asset management, discounting, forward contracting and choice of enterprises.

Agricultural product prices fluctuate more than prices of industrial products because of the effect of natural factors like weather, diseases and pests. Also, once a crop is planted it is difficult to interfere with its potential output. Price fluctuations also depend on storability of the products.

Decision rules or strategy models that are used under uncertainty conditions include the expected value theory, minimum regret strategy and optimism – pessimism index.

Answers to Self-Assessment Exercises

SAQ 1: Distinguish between risks and uncertainty.

1. For risk situations, the probability of occurrence are known but unknown for uncertainty situations.
2. For a risk situation you can take insurance but not for uncertainty condition.

3. Risk situations are based on measurable and quantifiable data but for uncertainty, it is subjective and refers to the peculiarity of the mind of the individual producer.

SAE 2: Total variance is given by:

$$\sigma_T^2 = \sigma_A^2 + \sigma_B^2 + 2r\sigma_A\sigma_B$$

The condition which will make σ_T^2 to be less than are:

1. r must be negative i.e. A and B move in opposite directions.
2. $2r\sigma_A\sigma_B$ will be negative as a result of r being negative.
3. $2r\sigma_A\sigma_B$ in absolute term must be greater than σ_B^2 so that it takes some value away from σ_A^2 such that the right hand of the equation becomes less than the left hand i.e. σ_T^2 .

6.0 Tutor Marked Assignment

Using the table below which enterprise will you choose using the following strategies:

- i) Minimum regret
- ii) Minimax strategy
- iii) Maximax strategy
- iv) Minimum variance
- v) If $P_1 = 0.2$, $P_2 = 0.3$ and $P_3 = 0.5$ for states of nature 1,2,3
- vi) Use the expected value theory
- vii) La place game theory.

States of Nature

Enterprises	1	2	3
Layers	20	30	45
Beef cattle	60	30	40
Piggery	30	50	50
Turkey	15	40	70

7.0 Further Reading and References

Castle, E.N., M.H. Becker and F.J. Smith (1972) *Farm Business Management: The Decision-Making Process*. The MacMillan Company, New York. Chapter 7.

UNIT 13

Livestock Enterprise Management

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1.0 Introduction

Nigeria is endowed with a vast variety of livestock breeds in form of cattle, goats, sheep, pigs, poultry, donkeys, camels and horses. The management of livestock enterprises particularly cattle is left largely in the hands of the Fulani nomads. Those animals constitute the source of protein for the nation and therefore it is essential to deal with their management.

2.0 Objectives

It is hoped that by the end of this unit, you will be able to:

- Identify factors affecting selection of livestock enterprises.
- Identify factors affecting the profitability of milk production, egg production and pig production.
- Explain tips for making profit in livestock production.

3.1 Selection of Livestock Enterprises

The effect which each livestock enterprise will have on available resources must be considered in considering different livestock enterprises. Although profitability can be tested by budgeting procedures, the major decision is which alternatives are feasible to be tested by budgets. The land, labour, capital and management resources will not be equally well adapted to all livestock enterprises. The resource that is most limiting will play an important role in the planning process.

Use of Principal Resources:

Land: Farm acreage may be limiting on some farms and the prospect of expansion may not be bright. Enterprise that provides high gross return per hectare of land should be included in the budget. With this limitation, poultry, dairy and cattle feeding would be preferable to beef cattle with calves.

Labour: Poultry and dairy enterprises require labour nearly all the year round. These enterprises may not be the best choice where labour is limiting. Some livestock enterprises that require seasonal feeding operations may be chosen to allow integration of crops. The kind of skill of labour required should be considered. Adoption of livestock of a large scale may require hired labour.

Capital: Different types of livestock enterprises have different capital requirements. Certain enterprises might be suitable for a farm but may be ruled out because of capital limitation. For example, feeder cattle requires higher capital outlay than Swine enterprise. Broiler enterprise may be financed by contract farming.

Management: Demands of different livestock enterprises on management must be considered. All enterprises are not the same in management requirement. Livestock care is regarded as an 'art'.

Systematic plan for evaluating the possibility of different livestock enterprises for a particular farm might be developed.

The essential idea is to determine the resources that are limiting and to select enterprises that make the best use of those limiting resources.

If only limited land and capital are available, poultry would be a better choice than feeder cattle. If labour is limiting, feeder cattle would be the logical choice.

3.2 Risk and Uncertainty

Price: Some livestock and livestock product prices vary considerably. These types of enterprises may be avoided by farmers who cannot afford a loss in a particular year.

Production: Because biological and physical forces such as disease and weather do not affect all livestock in the same way, production of different livestock enterprises varies differently. Risk and uncertainty, associated with livestock production should be considered.

Cost Structure: An important factor influencing the riskiness of enterprises is the cost structure associated with an enterprise, e.g. Feeder cattle Vs. Poultry feeding.

When fixed costs are a large proportion of the total costs, it is possible to remain in business for a longer period than when most of the costs are in cash and variable in nature. Assuming high fixed costs, it is possible for a farmer to lose money for a long time but not be aware of it. While someone with higher variable costs would have been out of business for a long time. For example, feeder cattle farmer is of long time, heavy fixed costs than production of poultry which has a short gestation period.

The operator who is in a position to survive one or two lean years probably should choose the enterprise that will offer the greatest profit in the long run.

The farmer who cannot survive poor years should consider livestock enterprise that minimize loss prospects while holding the prospect more certain for substantially less profit.

Size of enterprise: Unit costs vary considerably as the size of farm is increased. The same principles apply to livestock enterprises. It is important to understand the relationship of the size of flock to the cost of production. Economic size of livestock changes from time to time and place to place. Economic size of the herd depends upon technological and economic conditions.

3.3 Supplementary and Complementary Enterprises

There is always a need to select livestock enterprise that would be supplementary or complementary to other farm operations. Such enterprises use resources that would otherwise go to waste e.g. Livestock raised during the slack period; Manure on crops; Sheep and goat enterprises could utilize remains after harvests.

It is better to evaluate carefully each farm's resource and determine the size and types of livestock enterprise best adapted to the farm through the use of budget to estimate the effect of different sizes of a given livestock enterprise on income.

Once the type and size of livestock have been determined the following operating decisions are necessary.

3.4 Criteria for Decision to raise Livestock

- i) **Excess labour:** When excess labour exists, livestock enterprise can be introduced to make use of the excess. This is especially true during the slack period.
- ii) **Rotation:** Not all lands can support profitable cropping, livestock can be introduced to make use of grazing land.
- iii) People like to keep livestock to diversify cropping programme. If crops fail, livestock may do well.
- iv) **Manure:** Serves as fertilizer. Although the nutrient analysis is low, but the organic matter put in the soil helps to build the soil structure,

and water holding capacity of the soil. Nutrient requirements of crops are so high for high yield that manure should be supplemented with commercial fertilizer.

- v) **Scavengers:** to provide additional income.
- vi) Introduction of livestock to utilize all the resources better – e.g. Housing, buildings and scavengers.
- vii) When grain is profitable converted into livestock production, costs of marketing and transport are reduced.
- viii) **Source of Power:** Some livestock can be used as draft animals.

SAQ 1: People will like to diversify cropping programme. If crop fail, livestock may do well. Under what conditions are diversified conditions met?

3.5 Feeding

Feeding costs represent a substantial portion of the Production costs for all livestock enterprises. Nutritional and economic principles are brought together to determine the most profitable rate of feed and composition of the ration. Different feeds contain varying quantities of essential materials not present in all feeds. The farm manager is therefore faced with the problem of supplying the needs of the animals from variety of feeds that contain varying proportions of the essential material. Feeds are classified into nutrient groups: protein, carbohydrates and fats.

The economics of nutrition depends on the relationships between feeds. The extent that one feed can be substituted for another at a constant rate has some economic importance.

The substitution ratio is determined as follows:

$$\frac{\text{Kg. of replaced resources}}{\text{Kg. of added resource}}$$

In order to obtain the most economic combination, it is necessary to know the prices of the two feeds. The most economic combination is achieved when the substitution is set equal to the inverse of the price ratio of the two feeds thus:

$$\frac{\text{Kg. of replaced resources}}{\text{Kg. of added resource}} = \frac{\text{Price per kg. added resource}}{\text{Price per kg of replaced resource}}$$

Major consideration not covered here is quality and time.

The alert manager should be aware of substitution possibilities for livestock enterprise.

SAQ 2: Why should the manager be concerned with substitution possibilities?

3.6 Labour Efficiency

Labour costs constitute a significant part of total costs in livestock production. This is true because mechanization for livestock production has not developed as in the case of crop production.

Possibilities for efficiency are:

- 1) To combine labour with proper amount of capital – e.g. Milking machines, Automatic feeder.
- 2) To make labour more productive by the same amount of capital by studying livestock chores to be performed with the objective of simplifying them.

When capital in form of labour machinery is added, the size of livestock enterprise should be increased; if not increased, labour may be released to expand some part of farming operation.

3.7 Markets and Timing of Production

There are seasonal variations in demand for livestock and livestock products. Managers should make use of seasonal demands for certain items such as broilers and turkeys at Christmas and rams during Ramadan festivals which may influence seasonal prices.

3.8 Tips for Profit Making in Livestock Enterprise

1. Good working knowledge of the data about livestock enterprise.
2. Decision to buy feeding stock or breeding stock must be based on sound consideration of available resources.

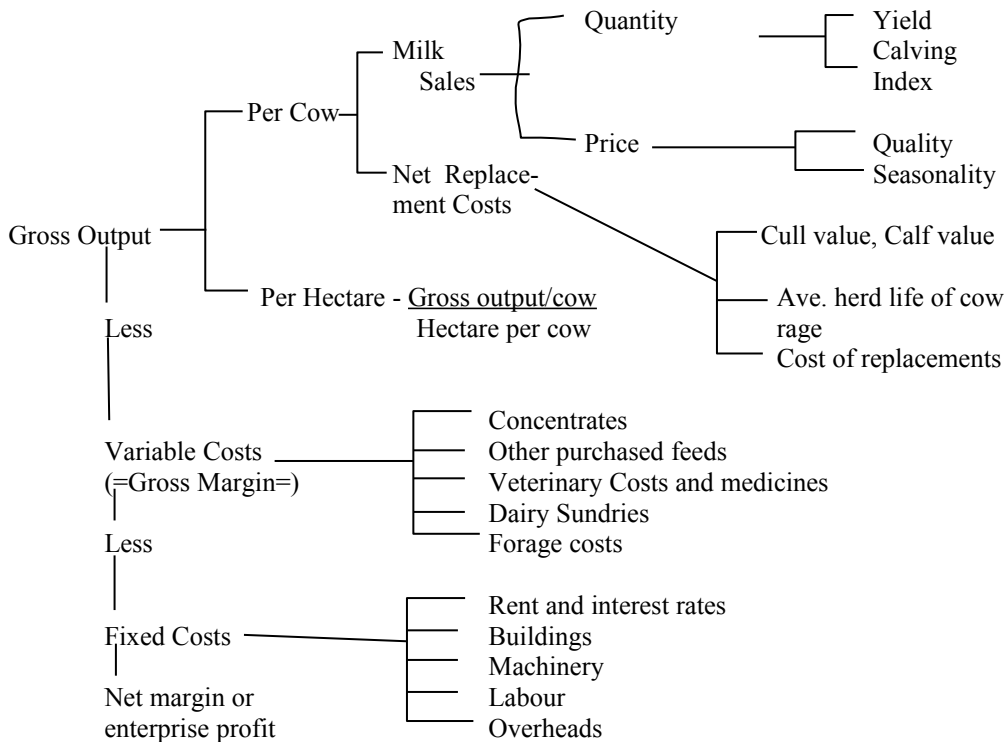
3. Production practices must be applied carefully. It is crucial not to lose one unit of livestock because of the sizable investment unlike crops.
4. Rapid adjustment to feed inputs. Formulate the least cost ration. Review prices often.

13.3.9 Factors Affecting Profitability of Milk Production

Units 3

Thus far in this unit you will notice we have treated livestock management in general terms. This section and subsequent ones will treat factors affecting profit ability of specific aspects like milk production, egg production and pig production. These will serve as examples and you are expected to be able to pick any other type of livestock and identify the factors by yourself.

Figure 1 below shows the factors affecting profitability of milk production.



Gross output of milk per cow depends on i) Yield

	Quantity sold	ii)	Calving Index
a)	Milk sales		Quality
	Price obtained		Seasonality

The value of the milk sold per cow per year is the result of a number of factors:

Quantity of milk sold

Quantity of milk sold per cow per year is a function of i) yield per cow per lactation and ii) calving index.

i) Yield per cow per lactation

Lactation yield is subject to the influence of many factors. The most important of these are health, management, level of feeding and environment. Breed of cows has an important influence upon yield as the following figures show:

Influence of breed of cow on milk yield

Breed	Lactation yield (gallons)	Annual yield (gallons)
Fresian	998	982
Ayrshire	905	862
Guernsey	763	732
Jersey	725	691
Shorthorn	868	832
Red Poll	793	767

Of equal importance is the strain of the breed and the level of genetic improvement within the herd.

ii) Calving Index

Calving Index is the interval in days between calving. This ideally should be 365 i.e. one lactation per cow per year which is made up as follows:

Cow calves

4 days - interval between calving and commencement of milk recording

305 days - recorded lactation

56 days - dry period
 365 days -

However, the ideal calving index is seldom achieved in practice the average calving index is about 395 days.

Therefore the milk sold per cow per year will be:

$$\text{Lactation yield} \times \frac{365}{395}$$

An approximate relationship exists between the percentage dry cows in a herd, the average lactation length and the average number of days in a year when a cow is dry. These can be expressed by these formulae:

1. Percentage dry cows in herd days dry in 'cycle' x 100 ÷ calving index
 e.g. at the ideal calving index of 365
 Percentage dry cows in herd

$$= \frac{56}{365} \times 100 = 16 \text{ approx.}$$

2. Lactation length = calving index – days dry
3. Lactation output = output per cow per year x $\frac{\text{Calving index}}{365}$

Therefore if sufficient information is available it is possible to calculate a number of factors relating to breeding efficiency and frequency. This can be an extremely useful exercise in pinpointing management weaknesses within than output per cow per year, then the calving index must be greater than 365.

If percentage dry cow is high, i.e. more than 16, then this will be due to either i) poor calving index ii) short lactation.

Price per gallon.

Price received per gallon (in developed nation depends upon)

- a) Quality of milk produced.
- b) Seasonality of production.
- c) Bonuses for which the producer is eligible.

The quality of the milk depends on the compositional quality and hygienic quality. The milk sold to the Milk Marketing Board is paid on a set of scale according to its analysis for total solids. The scale is set out and the basic price is paid for milk containing 12.0 – 12.1 percent total solids. Above this level the price per gallon increases and below this level, the price is reduced. A scheme is operated to ensure that hygienic quality of milk reaches very high standards.

Milk prices paid to the producer may vary from month to month as a direct result of supply and demand. Production of milk is at highest level during the rainy season and consequently prices are at their lowest. During the dry season when foodstuff is dear and water availability is low, the production goes down.

In order to encourage farmers to cooperate in bulk handling of milk, a bonus is given on a gallon depending on the quantity and frequency of collection.

Net herd replacement cost – is the difference between the cost of replacement of animals brought into the herd and any livestock sales in the form of calves and culls from the dairy herd. This depends on

- i) the rate of replacement
- ii) value of livestock sales from the herd
- iii) cost of replacement animals
- iv) difference in opening and closing valuation for the herd.

Variable Costs

Concentrates whether purchased or home grown, are usually the principal item of variable cost incurred in milk production. The most economic level of concentrate feeding will depend upon the quality of their bulk diet, upon their genetic potential and upon the level of yield already being obtained.

There is no universal answer as to the optimum level of feeding because it will not be the same for any two herds. The overall economy of concentrate feeding will in the final analysis depend upon the cowman's knowledge of his individual animals, upon knowing each cow's individual response and then feeding to it.

Bulk foods may also have to be purchased and if used wisely can be a means of improving the profitability of a dairy enterprise.

Miscellaneous variable costs include items like veterinary and medicine, service and recording fees, dairy stores, etc.

Forage costs – these include annual variable costs of grassland and forage crops such as seeds, fertilizers, sprays.

Principles of Culling

The basic purpose of culling is to remove animals which are uneconomic in order to maintain the productivity of the herd.

Certain basic principles must be borne in mind when culling stock:

1. A rigorous system of culling will increase the depreciation rate of the herd and must be justified by increased productivity.
2. Removal of animals will not result in a reduction of fixed costs if culling leaves a smaller number of animals, then each must carry a larger share of fixed costs.
3. When replacing an animal always replace with something better.

Factors Affecting Rate of Replacement Husbandry Factors:

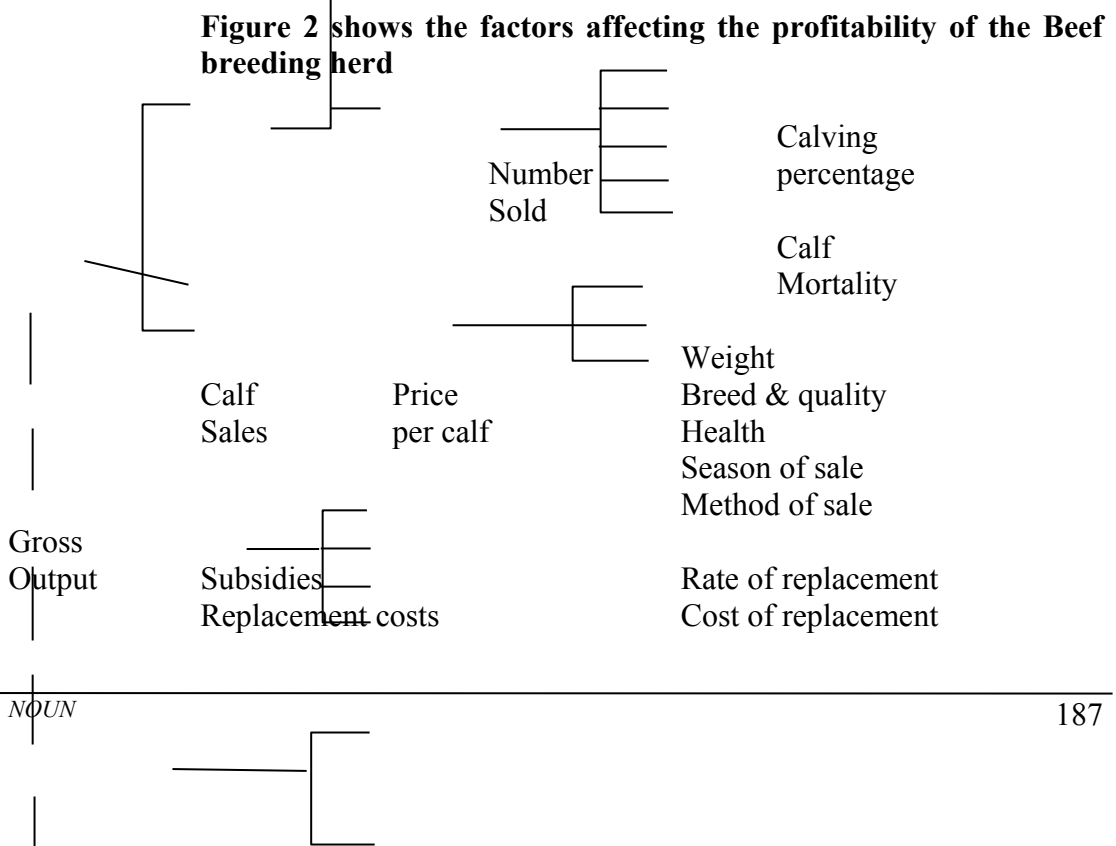
1. Diseases e.g. mastitis, brucellosis
2. Infertility.
3. Incapacity e.g. legs, feet.
4. Injury of cut teats etc.
5. Temperament e.g. slow milkers, kickers.
6. Genetic quality.

Economic Factors:

1. The level of fixed and overhead costs incurred by the farm where fixed costs are high, then high yields are essential to maintain a margin.
2. The amount of capital available. Replacement stock will require working capital. If this is limited, it may be better to cull lightly.
3. The cost of making the replacement which depends on:
 - a. Cull value of the animal replaced. This depends on the age, condition, breed of the animal, method of sale and time of the year.

- b. Sale value of calves. This depends on age, condition, breed, sex of animal and the time of the year.
- c. Cost of replacement heifer.

3.10 Factors Affecting Profitability of Beef Production



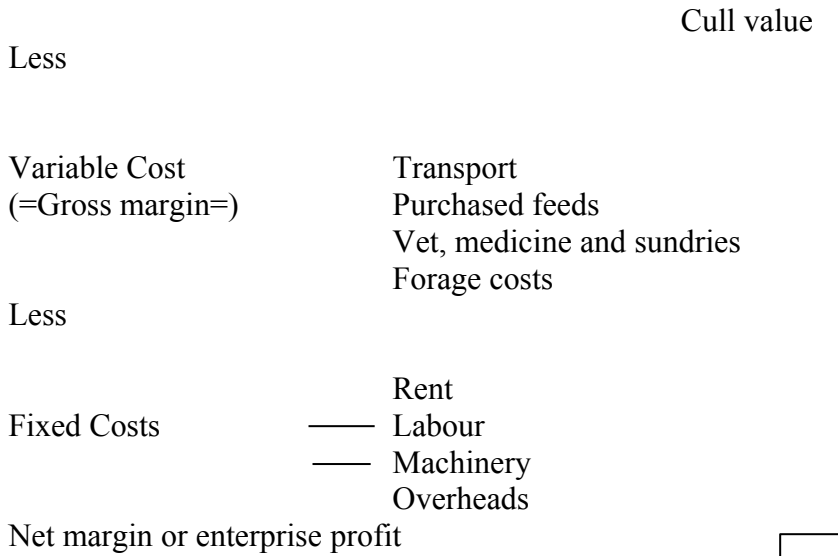
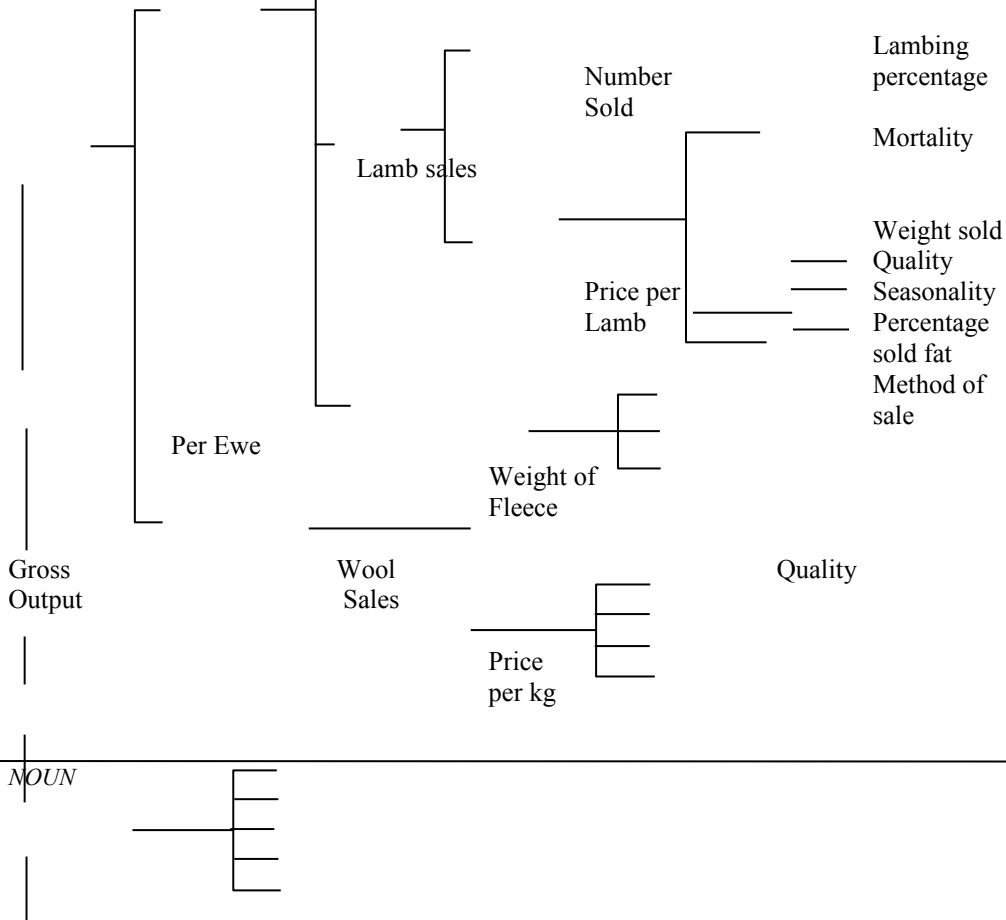


Figure 2: Factors affecting the profitability of beef breeding herd.

3.11 Factors Affecting the Profitability of Sheep Enterprise

Figure 3 shows the factors affecting the profitability of the sheep enterprise.



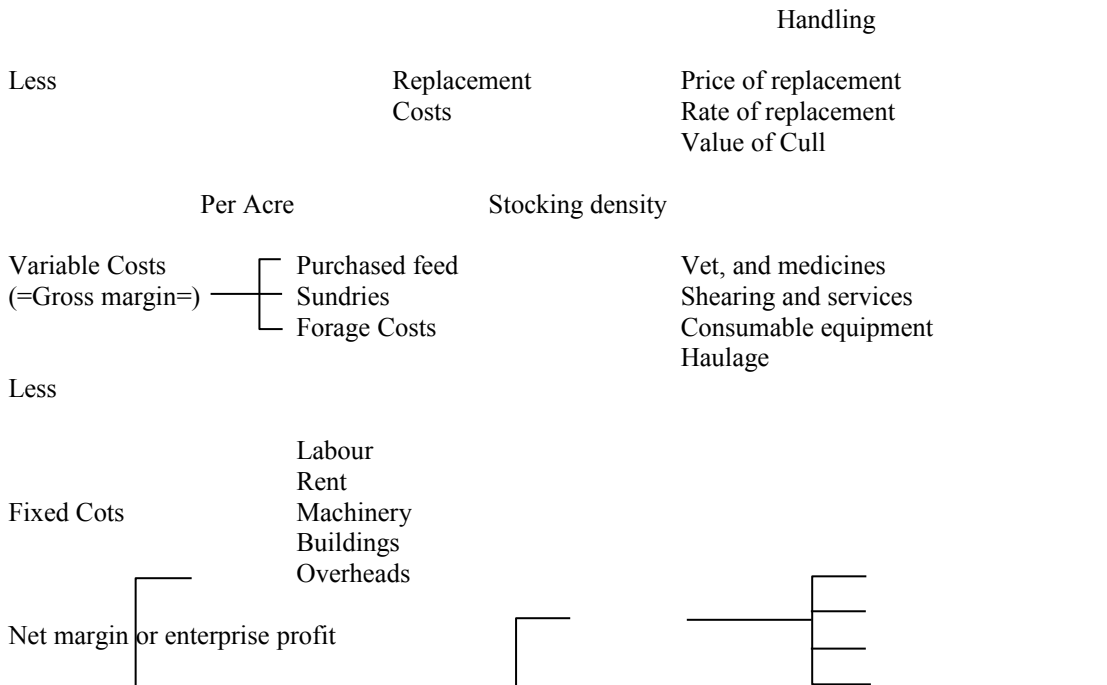
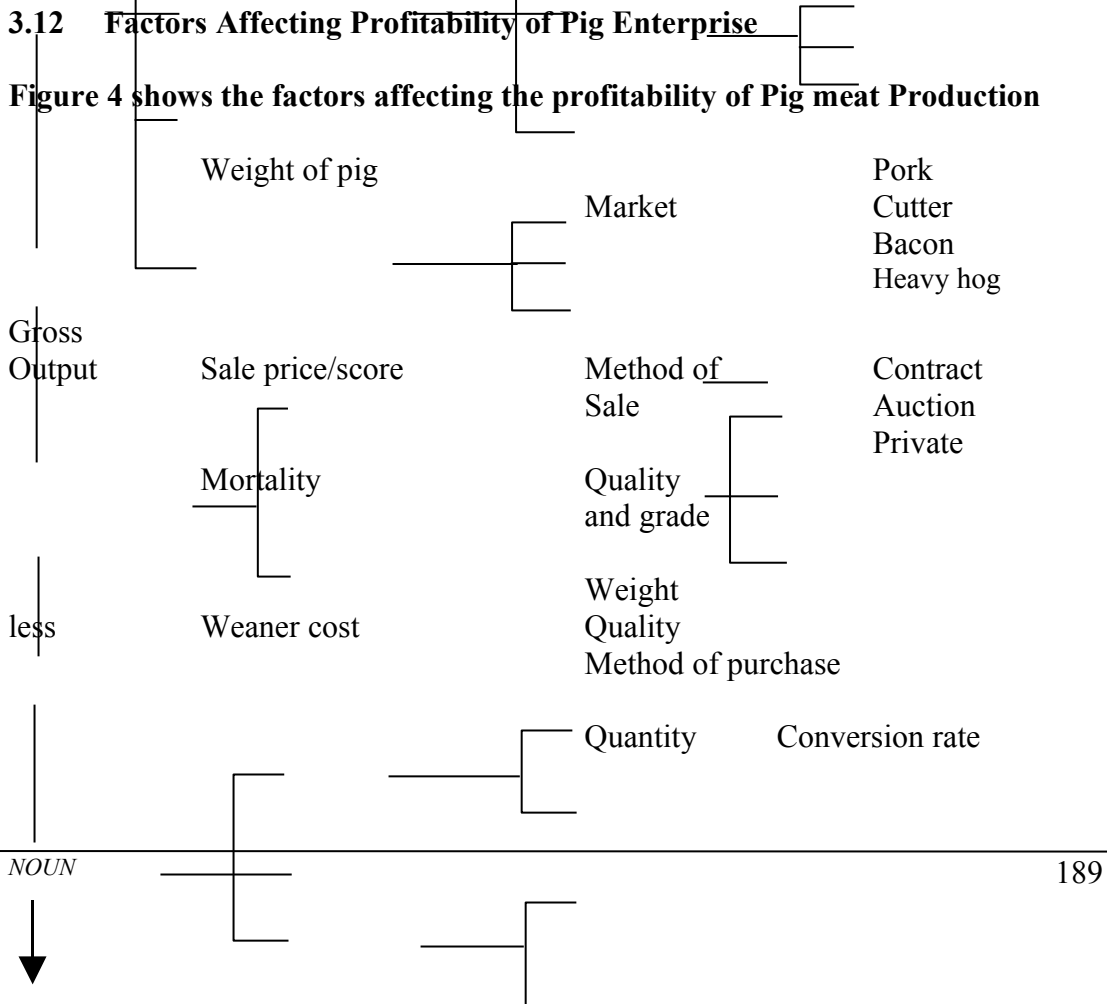


Figure 3: Factors affecting profitability of sheep enterprise



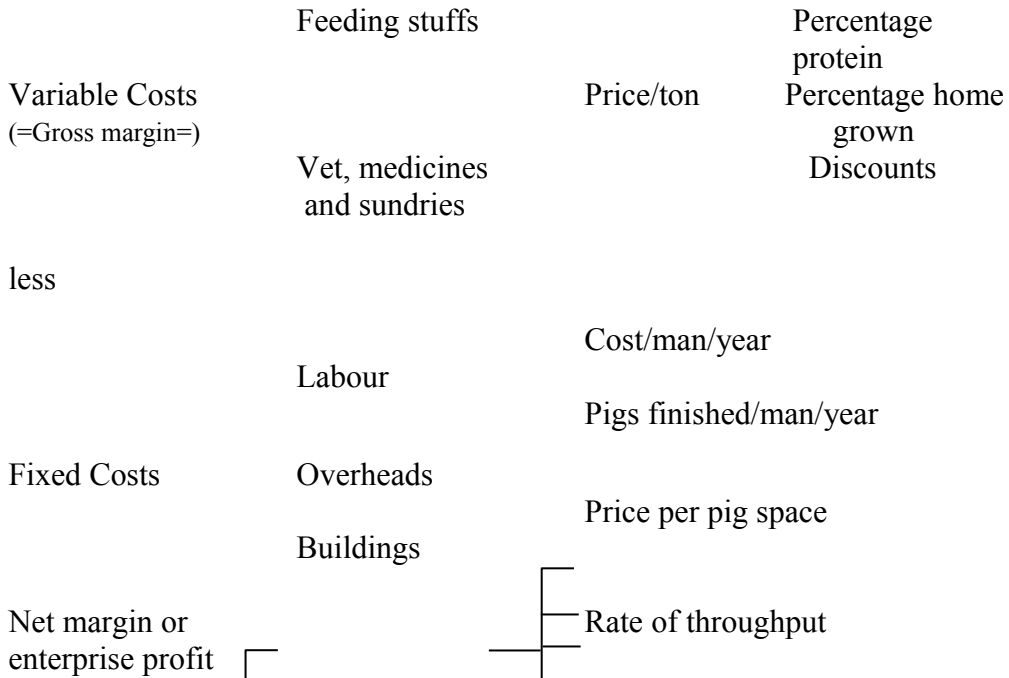
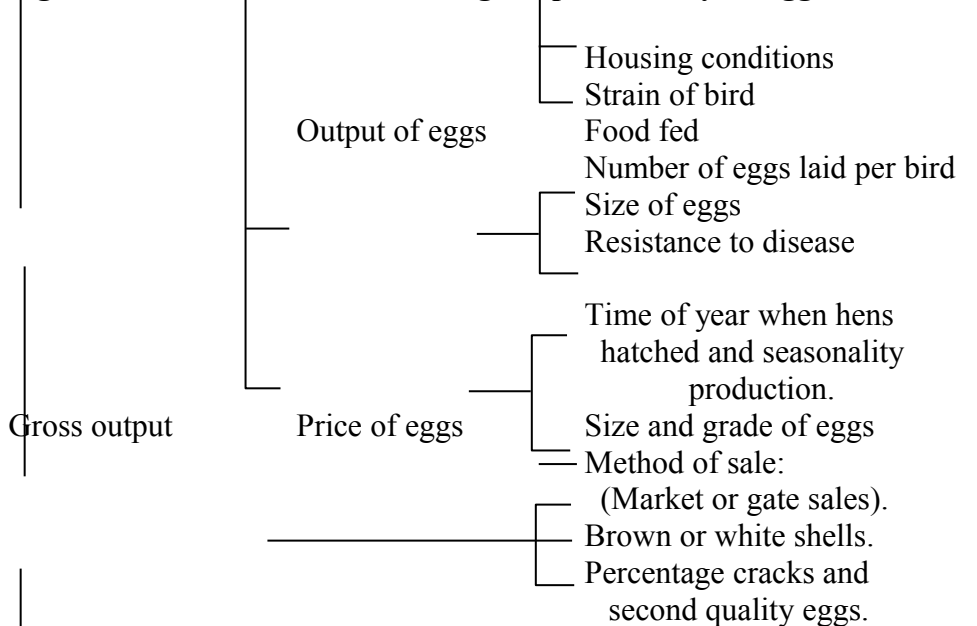


Figure 4: Factors affecting the profitability of Pig meat production

13.3.12 Factors Affecting Profitability of Egg Production

Figure 5 shows the factors affecting the profitability of Egg Production

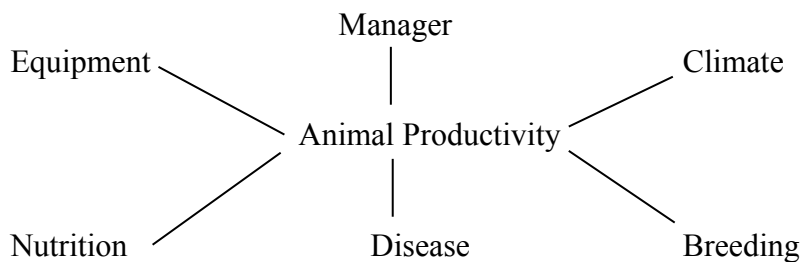


		Strain of bird (weight of carcass)
less	Price of culls	Age of bird (first or second year)
		Cost of replacement (day old, point of lay)
	Livestock replacements	Mortality
Variable Costs (=Gross margin =)		Feed Vet and medicines Miscellaneous
Less		
Fixed Costs		Labour Machinery Rent and rates Buildings and equipment costs General overheads
Enterprise profit or net margin		

Figure 5: Factors affecting the profitability of Egg Production

4.0 Conclusion

Managerial ability is the key to livestock profit. The ability to buy and sell – the right animals, at the right place and at the right time and at the best possible price is preferably the biggest part of management. Good feed, sanitation and disease control are areas in which the manager can have a lot of say.



Thus, the manager determines how much influence the equipment, nutrition, climate, disease and breeding inputs will have on animal productivity.

5.0 Summary

In this unit the livestock enterprise management is the focus because livestock is very important for the supply of animal protein for the teeming population. Factors that need to be considered for the selection of livestock enterprises such as use of land, labour, capital and management are considered. Risk and uncertainty which affect prices, production, cost structures, size and enterprise were also considered.

There is always a need to select livestock enterprises which would be supplementary or complementary to other farm operations. Such enterprise would use resources which would otherwise be wasted. Criteria for decision to raise livestock are elaborated in this unit.

Feeding is an important aspect of livestock enterprise are given before concentrating on the factors affecting profitability of milk production, pig production and egg production.

Answers to Self Assessment Exercises

SAQ 1:

If σ_c^2 = variance of income from crop enterprise
 σ_L^2 = variance of income from livestock enterprise
 $\sigma_T^2 = \sigma_C^2 + \sigma_L^2 + 2r\sigma_C\sigma_L$

Diversification condition is achieved when

- 1) $r = -1$ i.e. C and L move in opposite direction
- 2) $2r\sigma_C\sigma_L$ is advice
- 3) $2r\sigma_C\sigma_L$ is negative because r is negative
- 4) $2r\sigma_C\sigma_L$ must be greater than σ_T^2 .

SAQ 2:

The manager should be concerned about substitution possibilities because

- i) Costs of input vary from time to time and from place to place.
- ii) When one input is cheaper than the one previous in use, it makes economic sense to substitute one for the other.

- iii) When the value of added resources is equal to the resource of the damage.

6.0 Tutor Marked Assignment

1. Develop in form of a figure the factors that affect the profitability of (i) Broiler enterprise (ii) Goat enterprise
2. Write short notes on the following
 - i) Net herd replacement cost.
 - ii) Labour efficiency in livestock production
 - iii) Tips for making profit in livestock enterprise
 - iv) When the most economical combination of two inputs are made.
 - v) Risk and uncertainty in livestock enterprises.

7.0 Further Reading and References

Castle, E.N., M.H. Becker and F.J. Smith (1972) *Farm Business Management: The Decision-Making Process*. The Macmillan Company, New York. Chapter 12.

UNIT 14

Crop Enterprise Management

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1.0	Introduction
2.0	Objectives
3.1	Factors Affecting Crop Yields
3.2	Cropping Possibilities
3.3	Labour Profiles and Implications
4.0	Conclusion
5.0	Summary
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1.0 Introduction

The most important cash crops in Nigeria include cocoa, oil palm, rubber, groundnuts, cotton, benni seed (sesame). Tree crops are the most important in the South and annual crops in the north. Food crops of the South include yams, cassava and maize and in the North millet, sorghum and cowpeas.

2.0 Objectives

It is hoped that by the end of this unit, you will be able to:

- Describe factors that affect crop yields and implication for management.
- Describe the cropping possibilities in a particular location.
- Explain the implications of labour profiles on the management of labour on crop enterprises.
- Enumerate management of land in relation to crop enterprise management.
- Enumerate management of capital in the context of crop enterprise management.

3.1 Factors Affecting Crop Yields

A number of factors influence crop yields in Nigeria and these are:

1. Natural factors

Natural factors like rainfall, soil type, climate effect crop yields. These factors cause variations in crop yields from year to year and area to area in any one year, and the farmer has no control over them. The bad effect of rainfall has been felt in the northern parts of Nigeria in 1973 and ten years later in 1983. Implication for management is that precautions must be taken to enable income not to fall below expectation.

2. Level of technology

The level of technology available to Nigerian farmers is low because this includes the use of hand hoes and cutlasses. The drudgery involved in the use of these tools prevents a lot of acreage being farmed by each farmer. Yields are low because these are labour intensive while the land base and use of fertilizers is at low levels. Pesticides, improved varieties and level of technology also determines

size and ease of operation. The farm decision maker should avail himself of new proven technologies.

3. Time of Sowing Crops (Timing of activities)

Crops sown late or very early in the season tend to yield less than those sown at about the optimum time. The optimum date of sowing will vary from place to place and year to year. If cotton is grown, for example in late July or August instead of mid-June in the north, the yield will be low indeed because it will have poor establishment. Timely sowing and of other farm operations need close attention by management.

4. Variety

The variety of crop grown will influence yields obtained since varieties differ in their yield potential. Different varieties suit different areas. Improved varieties yield better than local varieties and may also be insect and disease resistant. Management should endeavour to obtain and use improved varieties.

5. Fertilizer Application

Application of super phosphate before planting encourages healthy growth of the crop and improves the general level of fertility of the soil. Nitrogen fertilizer encourages vegetative growth. Increased yield is obtained because a vigorous, healthy crop results by the use of these fertilizers. The law of diminishing returns has relevance and the optimum level of inputs of the fertilizer to maximize profit must be aimed at. Management should endeavour to put in as much fertilizer to achieve profit maximization.

6. Seed rate and row width

The traditional method of planting maize, for example, does not allow optimum plant density. The farmers tend to put two or three seeds per heap and plant width is 3-4 feet apart. The rows are also 3-5 feet apart whereas research has shown that better yield under improved technique can be obtained when the spacing is 2ft. by 3ft. Managing should ensure that correct spacing is followed for all crops.

7. Method of Planting

Due to the existence of some pests, such as birds, broadcasting of cereal seeds can be deleterious. The seeds may be picked up by birds and insects. A method of planting whereby the seeds are covered with top soil is essential. Where cereal seeds are being broadcast, the seed rate must be increased. In order to achieve optimum germination rate, management should follow appropriate planting method.

8. Weed Control

Weeding is a tedious operation in the traditional farming system. It demands a lot of the farmer's time and it must be done at the right time. If weeding is not done on time, it may result in very low yield. Total loss in yield may result if a sorghum field is invested by striga. It may be necessary to carry out two or three weeding operations during the growing period of a crop on such a field. Management should employ enough labour to ensure proper farm sanitation.

SAQ 1: Enumerate the different types of improvement a farm manager can make to reduce the effect of the following factors on crop yield and size of operation: Weed control; variety; low level of technology.

3.2 Cropping Possibilities

Natural Resources

Biological processes regulate certain phases of production. Climatic conditions affect the yield and total value product. Plants require other conditions in order to grow properly e.g. right day length, soil fertility, temperature etc.

The cropping possibilities opened to farmers in a certain location are dictated by the climatic and soil conditions. This section will use Zaria as an example for you to understand the intricacies these climatic and edaphic conditions have imposed on management of crop production.

The climate in Zaria can be described as sub-humid with a severe deficit in rainfall from October to May and surplus from June to September. The average annual rainfall is 440 inches while the average annual evaporation from an open water surface is 1900mm. The seasonal distribution of rainfall and evaporation is shown in Figure 1 and 2 and Table 1. Optimum water requirement for a complete green cover of grass approximately is more than available soil moisture. There is severe water shortage for vegetation during that period. The moisture index is the amount of water required by the plant to grow adequately by month. This is affected by the amount of the wind, temperature and humidity.

The water regime is, however, well suited to the production of annual crops because the water requirement of an annual crop is small in the early phase when it covers only a small fraction of the ground, but rises with increasing cover to a maximum at full cover, falling off again towards harvest as the crop dries out. This pattern of water requirement is well matched by the pattern of water availability and a wide range of annual crops can be grown,

the major limitations being water shortage at the end of the growing season for long season crops like cotton and wet conditions at harvest for short season crops. Very long season or perennial crops like sugar-cane, can only be grown under irrigation or where water table never falls to excessive depths.

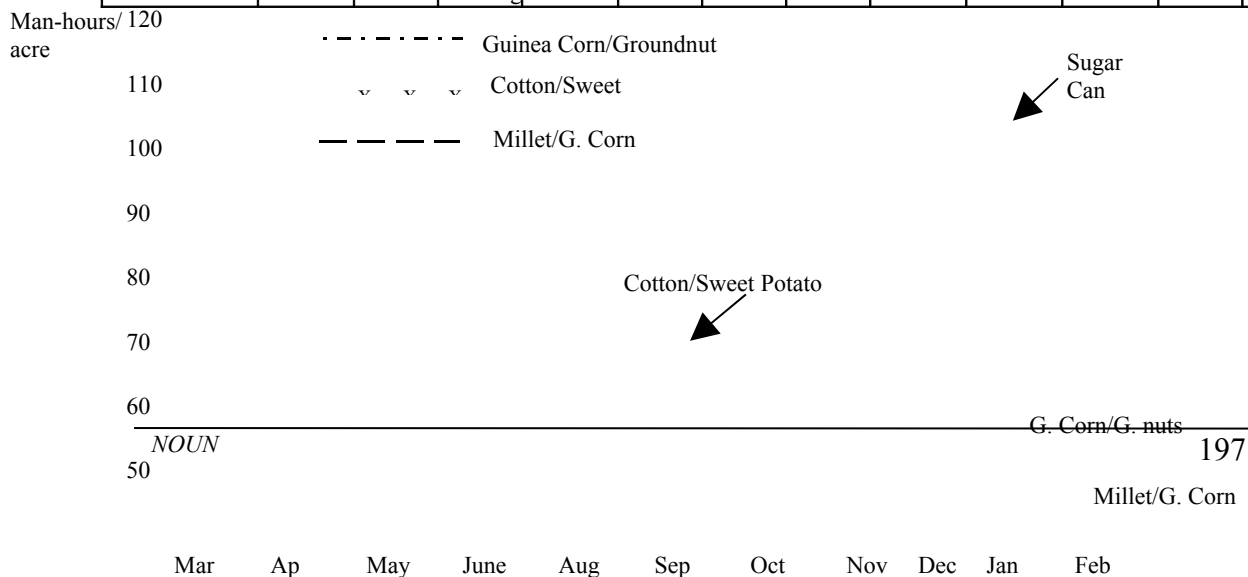
Crops like millet, cowpeas, sugar cane, guinea corn, cotton, groundnuts can be successfully grown. The single peak calls for a crowded three months period of use of labour. In order to make maximum use of the available moisture during June to September period, most of the planting has to be done before or at the beginning of this period.

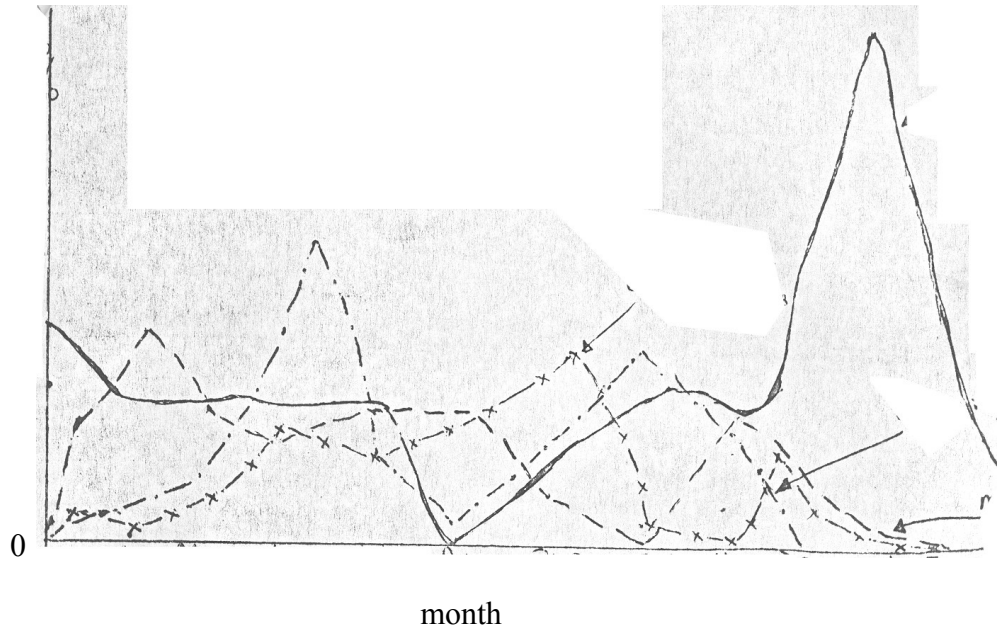
It appears logical for farmers to interplant their crops to enable quite a number of their food crops to take advantage of the available moisture. Thus it is not surprising that only 23% of the cropped land is sole cropped. Typical holdings have at least eight combinations and there are about 200 possible crop combinations.

3.3 Labour Profiles and Implications

Table 4.1: Labour Profiles for Millet/Guinea corn, G.Corn/Gnuts, Cotton/Sweet potato mixtures and sugar cane sole crop.

	Jan.	Feb.	Mar.	Apr.	May	June	Jul.	Aug.	Sept.	Oct.	Nov.	Dec
Millet/ G.Corn	5.92	1.43	2.59	28.59	50.78	33.27	25.60	30.97	13.81	2.89	34.11	17.38
G.Corn/ G.nuts	-	-	1.55	4.82	16.99	73.70	22.16	5.74	23.82	41.48	28.65	-
Cotton/ Sweet Potato	5.63	2.09	5.01	-	8.55	27.01	21.29	28.64	45.13	3.43	2.27	20.69
Sugar Cane	123.04	57.45	38.05	53.30	35.05	34.00	32.79	2.68	20.60	87.16	34.74	57.24





The labour profiles put together indicates that there is a labour peak during the June-July period. During this period, most of the food crops have their labour peaks. The other peak occurs around October and November.

What does this mean in terms of labor management?

The peak labour period in June-July is the limiting period while for the sugar cane (fadamah crop) the labour peak is around January. Thus harvesting period is important for the fadamah crop in January and the needed labour must be supplied. The June-July period is a time of weeding and October-November a time of harvesting. Those two periods require management ability since labour is limiting then. This is the reason why some farmers do not have time to plant cotton under the recommended practices which calls for planting around June when labour is a limiting factor. Because the farmer is operating near to subsistence level he prefers to concentrate on his food crops.

Economic principle teaches that the farmer would profit better if he devotes his labour to those crop enterprises which have the greatest opportunity cost. As a result we get economic versus technical feasibility.

It depends on what the objective is. The farmer may be interested in maximizing total returns from the whole farming enterprise and not on a single crop. He may therefore arrive at a point lower than the technical optimum.

Therefore there is a conflict between the technical and economic optima. But we must realize we are not fully in commercial agriculture.

Objectives of Peasant Farmers

During slack labour periods, farmers engage in off-farm employments but the location of the village to a large extent determines the type of off-farm employment.

When asked the reasons why they intercrop, farmers forward the idea of security. The need to maximize the return from the most limiting factor is apparent which is also consistent with the goal of profit maximization. Intercropping implies diversification in crop production. Such a strategy is an insurance policy since in one single year different crops are not likely to be equally affected by weather, diseases, insect attack and price fluctuations. Through intercropping farmers have an assurance of some return to their effort on a given piece of land.

Farmers can perhaps supply more than 5 hours a day depending on the type of operation. Some operations require more drudgery than others. Leisure after some hours of work and especially during the dry season may have greater social value than engaging in continuous drudgery throughout the year. The challenge this presents to farm management is that farm planners must take note of the preferences and objectives and adhere to what is socially acceptable.

SAQ 2: What advantages do farmers derive by growing crops in mixtures?

4.0 Conclusion

Crop farming is subject to vagaries of weather and biological factors. These impose certain conditions on the farmers producing at subsistence level to a point that their response to these conditions appear sometimes irrational. However, with careful examination, growing crops in mixtures is consistent with both goals of meeting food security without jeopardizing the profit maximization objective.

5.0 Summary

In this unit you have learnt about factors that affect the yield of crops and their implications for managerial action. The complexity imposed by weather and biological factors on crop production has been highlighted. The resultant

labour profile and implications are discussed. This unit shows the importance of proper management of land, labour and capital which will be the topic in later units whether the farm engages in crop or livestock enterprises or both.

Answers to Self Assessment Questions

SAQ 1:

Weed control:

Presently this is done mostly by hand.

- Improvement - use of Ox-drawn implement
 - use of motorized equipment
 - herbicides use
 - weed tolerant varieties e.g. against striga

Variety:

Presently farmers local varieties

- Improvement - use improved varieties such that you
 * get more yield per unit area
 * get higher total product on same piece of land.
 - use varieties that will more pest and disease tolerant
 - use varieties that have more protein content e.g. maize with lysine.

Low technology:

Farmers use hard hoes and cutlasses making it labour intensive

- Improvement - Improve labour efficiency
 - Increase use of capital to reduce to reduce drudgery.
 • Ox-drawn equipment
 • Motorized equipment
 • Herbicides use
 • Pesticides use
 • Improved varieties (seeds).

SAQ 2:

Advantages of growing crops in mixtures:

1. Labour combined spread over many crops.
2. If one crop fails another may not
3. Reduction in weeds.
4. Reduction in field pests e.g. cowpea grown in mixtures less pest attack than sole crop cowpea
5. Greater total return/hectare
6. Diversity of staples for the family.

6.0 Tutor Marked Assignment

1. Crops grown in the north of Nigeria are mostly annuals while perennial crops are grown in the south. From what you have learnt in this unit what do you think is responsible.
2. Farm sizes average about 7 hectares in the north but less than 2 hectares in the south. Discuss how this can be explained.

7.0 Further Reading and References

Castle, E.N., M.H. Becker and F.J. Smith (1972) Farm Business Management: The Decision-Making Process. The Macmillan Company, New York. Chapter 11.

UNIT 15

Management of Farm Capital

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3.2	Investment and Depreciation
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6.0	Tutor Marked Assignment

7.0	Further Reading and References
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1.0 Introduction

Farm incomes depend on the efficient combination of factors of production such as land, labour and capital by management. These factors involve costs. The cost of land is the rent paid for its use. Wage is paid for labour. The cost of capital is the interest on the initial sum borrowed. Capital includes supplies and materials such as seeds, feeds, fertilizers, farm animals, buildings, machinery and equipment.

2.0 Objectives

It is hoped that by the end of this unit you will be able to:

- ❖ Define and explain farm capital and assets
- ❖ Determine how much capital required on the farm.
- ❖ What a farmer should consider before taking a loan
- ❖ Enumerate important factors in purchasing supplies and materials and the use of farm capitals.

3.1 What is Capital?

From economic point of view, capital is not money. Money is only convenient means of evaluating physical assets. Money only becomes capital when it is put into productive use. For instance, a commercial farmer may decide to hold some of his capital in the form of money for the purchase of items like seeds, fertilizers, etc. at a future date. So until it is used to purchase those items it is simply referred to as money or savings.

Often misleading pictures are presented when stock of farm capital are valued in monetary terms. Though this may prove easier, it is often more realistic, especially when planning the use of those stock of capital, to first separate them and measure them in physical terms. Like labour resources (being expressed in man-hours) machinery resources could also be measured in machine-hours; building for storage in terms of their capacity or floor space, number of hectares of land available etc.

3.2 Investment and Depreciation

Investment refers to the production or acquisition of capital assets. Investment could be made in several different ways but among Nigerian farmers there are three recognized methods or ways by which investment for agricultural production are carried out.

The first one is by saving some of his produce for future use. Common examples are the storage of cereals, legumes (in rumbus) or tubers (in holes) either for seed or future consumption. All these represent an addition to the stock of capital and are therefore investments. When one invests, one is therefore saving for a future date and in effect forgoing current consumption. For instance goats and cattle which are kept for milk or breeding or even to be fattened represent savings and investment.

Another way farmers invest is through their own physical efforts. By clearing the land, planting trees, constructing dam or cattle ranches, he is investing because he is producing capital assets. Again he forgoes current consumption because the time spent on those activities could have been spent producing more food or in leisure which is a form of consumption.

The third method of investment is by purchase. The method operates in an exchange economy where articles are produced not only for family consumption but for sale or exchange by barter. Again current consumption is foregone if the money or bartered goods would otherwise have been used for consumption purposes. It is apparent that modern farm management requires the use of modern tools and equipment and improved inputs. Since these cannot often be produced on the farms they have to be purchased. Examples of these include modern tools and machinery, improved seeds and chemicals for spraying. It is important to mention that although investment is ultimately dependant upon savings, it does not follow that all savings are invested. Some of the savings may be consumed or use for festivities or even hoarded. But for which ever purpose a savings scheme is designed for it represents a cost to the user; that is the cost of waiting. People save because they believe that benefits are greater than the value of the consumption for forgone. Thus a farmer who spends time making a plough, training bullocks to draw it and destumping his farmland may find that his initial investment produced lesser amount of food than his neighbours who used hoe cultivation. In future years, however, the hopes are there that plough cultivation will add to his output more than enough to make up for his original efforts. This extra output, over an above the cost of the investment is known as the return on capital.

Capital asset in what ever form is eventually used up or destroyed: the stock of food is actually consumed or destroyed by natural hazards. The cow for breeding or milking or a kolanut tree dies and similarly a tractor is broken up for scrap as soon as the end of its productive life is attained. So apart from requiring a return on capital invested in a business and investor is also interested in recovering the value of his original investment by the end of its productive life. For a farmer to continue operating at least at the same level,

his worn out or used up capital must be replaced. In other words a recurrent replacement cost will be associated with any new introduced into the farm system.

Capital assets are often classified according to the length of their productive lives into long, medium, or short term capital. There are no steadfast rules as to which capital should be termed long, medium or short term capital assets. Classification depends on the life of the business and the duration of the asset in relation to all other assets. Long-term capital assets are those that are productive for many years and may virtually remain permanent. Items that fall into this category include buildings, dams, land improvements and tree crops. Capital with a medium-term life span of just a few years include work-stock such as bullocks, breeding or milking stock and some few tools and equipment. Those capital which are normally used up within a year are those referred to as short-term capital. This includes seeds, fertilizer, cash and stocks of food. After every annual or perennial harvest some stocks of seed are kept, not only for future planting but also to meet family consumption in between harvest. For these purpose capital in the farm of stored seed or food (or the cash to purchase them) is needed for at least part of the year. This short-term capital is known as circulating or working capital to distinguish it from other assets which are not consumed within a single year and are therefore known as fixed capital.

For long-term and medium term capital, replacement cost does not arise every year. For instance if a plough has a 5 year life span, then maintaining the system will involve a large item for replacement every five years, which is not present in the previous years. For convenience it is better to look at the replacement cost as an imaginary annual series of cost items which would be equivalent in total burden to the five-yearly replacement cost actually involved. This imaginary cost of replacement is known as "depreciation". Depreciation is also defined as the annual loss in the value of the asset. The latter definition gives a better meaning or approach especially if the asset can be sold at any stage of its productive life. In passing it is worth nothing that certain assets like livestock and tree crops actually gain in value or appreciate over at least part of their lives.

One of the simplest methods of calculating depreciation cost is to divide the original cost of the investment by the productive life of the asset. This method is unsatisfactory because of the assumption that depreciation is constant from year to year for most assets.

It is important to distinguish between the two type of investment – gross investment and net investment. Gross investment is the total investment made over a given period while net investment (i.e. actual increase in total

capital) is gross investment minus depreciation or replacement cost over the same period. If a farmer keeps a ranch with about 80 cattle but on the average slaughters and sells 10 each year, then he must breed or purchase 10 cattle each year as replacements to cover the depreciation of his cattle collection. Only if he breeds or purchases 11 or more cattle in a particular year will he increase the number of his cattle in the ranch and thereby make a net investment.

For fixed capital there is the problem of how frequently to replace them. For instance should an irrigation pump be replaced after 3 years or after 5 years. Should cocoa trees be replanted after 20 years or 25 years. This is a difficult decision to arrive at in practice but in theory the rule is that the asset should not be replaced until the extra return to be obtained from keeping it for one more year falls below the average return per year over its whole productive life.

For any capital asset the productive life may be prolonged by regular and thorough maintenance so that the annual depreciation is reduced. For example pest control on cocoa trees will reduce the rate of depreciation.

Maintenance and repairs on the other hand involve costs, thus a compromise or a balance has to be struck between maintenance costs and depreciation costs.

3.2 Capital Requirements

The amount of capital required on the farm is related to the type of enterprises being executed. Information required in assessing capital requirements may be categorized as follows:

a. Costing of Supplies and Materials for Enterprises:

The farmer should list all his enterprises in terms of size, eg. Acreage of land or heads of cattle. He should also determine his resource requirements, in terms of land, seed, fertilizer, sprays, feeds, hired labour, etc. He can then put a value on each resource requirement and estimate the total cost of supplies for each enterprise.

Example outline for costing supplies/materials for each enterprise

Enterprise.....

Items	(1) Requirement	(2) Size of	(1) x (2) = 3 Total amount	4 Unit	(3) x (4) = 5 Total cost of
-------	--------------------	----------------	-------------------------------	-----------	--------------------------------

	Per unit size	Enterprise	of supplies	Cost	supplies
Seed					
Seed dressing					
Fertilizer					
Herbicides					
Sprays					
Hired labour					
Feed					
Medicines					
Total Costs					

b. Costing Farm Machinery

Estimate cost of machinery and equipment as well as running costs. These will include tractors, cultivators, seeders, fertilizer applicators, sprayers, harvesters as well as spare parts.

Estimate depreciation (new cost divided by expected year of life) for each equipment and add interest on any loan used for its purchase.

(Also add insurance if equipment or machinery is insured).

Include estimated cost of fuel, oil, lubricants, repairs and maintenance. You should also cost the labour to operate the equipment.

Outline for costing farm equipment:

Items	Value (N)
Fixed Cost	
Original Cost.....
Depreciation (Annual)
Interest on loan
Insurance
Variable Costs	
Repairs and maintenance.....
Fuel, oil, lubricants
Labour
Total Annual Cost	

c. Land Improvements

You should cost all land improvements envisaged during the year. Such costs would include labour, machinery use and equipment. Land improvement includes soil conservation practices such as drainage systems and terraces.

d. Farm Buildings

You should also cost all new buildings to be built as well as any improvements and alterations planned on existing buildings.

Farm buildings are important investments. Although such buildings don't directly generate money but returns from certain enterprises can be lowered due to lack of adequate facilities such as grain stores. Annual building costs comprise depreciation, interest, maintenance, insurance. The costs for new buildings should be planned for. Usually original building costs are dictated by the size of farm and access to the site.

Various methods can be used to determine the cost of a planned building. Cost of building may be considered on the basis of its component parts such as floors, walls, roof and facilities. Capital costs of planned buildings may also be expressed in terms of usable floor space. Agricultural buildings can be estimated in terms of the use of which the building will be put. If for instance, the building is to be used for milk production, calculation could be made on such basis as cost per cow space; and if it is for storage, cost per ton of storage space and so on. It is always advisable to include planned building costs in the total capital requirement.

In all these calculations a farm manager can benefit from the experience of other people involved in similar enterprises. In summary, in assessing farm capital needs, a farmer should estimate the following:

- ❖ costs of supplies and materials for enterprises;
- ❖ costs of machinery and equipment;
- ❖ costs of planned land-use and improvement programmes;
- ❖ cost of planned buildings and maintenance of existing buildings;
- ❖ outstanding debts and family living expenses.

2. Borrowing to meet Capital requirements

- a. After knowing the estimated total expense, the next thing is to break it into monthly needs.

The farm manager can also refer to his farm plan and list his sources of income and the estimates on a monthly basis.'

It will then be easy for him to know when a deficit occurs and by how much.

- b. There are a few questions a farmer should ask himself before borrowing money:
- How much money do I expect to make from the amount I have decided to borrow? (To be able to answer this question he should budget the investment for which the loan will be used.

SAQ 2: In traditional farm setting give examples of what you would include under (i) materials and supplies (ii) farm equipment (iii) land improvements (iv) farm buildings.

Then he should compare the expected net return with the cost of the loan, i.e. the total interest charged).

- Will the proposed investment yield more than enough to repay the entire loan plus the interest charged?
- Is the loan utilized where it will be most profitable?
- Is it worth taking the risk involved? (Farm production involves risk).

A manager should be cautious in taking a loan. Excessive loan may not be used adequately. He must remember that the loan will have to be repaid. It is therefore important to budget the use of the loan wisely.

- c. Most lenders are interested in the capital position of a borrower, his ability to manage his chosen line of business, the security he has to offer, and the productivity of the capital requested for. A farm manager must therefore study and use proven production techniques and master the economics of the enterprises in which he is involved before starting the farm. It is advisable to invest money where it can create money.
- d. A good reputation for repaying loans, helps. If a borrower is unable to repay a first loan as promised, an honest explanation before the time expires can erase bad feelings and maintain good records for the future.

Lenders get an idea of a borrowers ability to repay loans by going through his past records. They want to know how the business had been performing; the current situation and future plans. This is reasonable because by giving the farmer a loan the lender has a stake

in his business. If the farmer loses, the lender may also lose his money.

To present a genuine case, a borrower should put his farm records and accounts in order and be prepared to show them to the lender if he asks for them.

The farmer should also take along his budgeted plan for the loan, stating what he is investing in, what returns he expects and how long it will take him to repay the loan.

A farm manager should be aware of source of credit available. The Ministry of Agriculture used to sell most farm supplies at subsidized rates. Farm managers should take advantage of this whenever it still exists. The Ministry may also have some short-term loans through some externally funded projects. A farmer should ask the nearest agricultural officer for details.

Cooperative societies extend loans to their members. Farm managers should endeavour to belong to such organizations. The Nigerian Agricultural and Cooperative Bank (NACB) gives loans to ministries especially those that are responsible for agricultural cooperative development. Farm Managers who wish to benefit from these loans should organize cooperative societies or become members of existing ones. If a farm manager is well established he can apply directly to the NACB for a loan. The minimum amount an individual can apply for in this way was N10,000.

Commercial banks also give loans but require a borrower to pledge some security such as land, building and machinery. Individuals and merchants are other sources but their interest rates could be high. When shopping for credit a farm manager should consider interest rates charged and period of repayment as these may increase the total cost of loan.

3. Purchase of Supplies and Materials

After the manager has obtained the needed money, his next strategy is to use the money economically. High prices, poor quality of supplies and materials purchased, inadequate or excessive purchases, and the unavailability of materials can increase the cost of production.

The guard against this, thinking and planning in advance is necessary. It may be helpful to state these in form of questions such as: how much of supplies and materials should a farmer purchase? When and

where does he purchase them? He should also determine the quality of the materials he needs. Guidelines to answering these questions are provided below.

a. How much supplies?

This will depend on the requirements of the farm. The manager should refer to his plan. The problem facing managers is whether to purchase in bulk or in small amounts. Bulk purchasing lowers prices per unit of materials bought. When prices soar, buying in large quantities can reduce costs. Another advantage is that materials are readily available when needed.

But there are disadvantages. If storage facilities are inadequate, there is a possibility of suffering losses. Losses may also occur due to theft or falling prices of the materials. Although small purchases pay off especially when prices are likely to fall, a farm manager must be assured that he has enough to last through planned period.

b. Where to Buy:

The main considerations should be comparative prices. Sometimes a particular item may be sold at different prices by different suppliers. It is worth shopping around for the lowest price for same good quality. Poor quality materials must be avoided. If it is possible to get supplies on credit, points already discussed should be taken into account.

c. Cash or Credit:

Whether to buy with cash or on credit depends on how much funds are available to a farmer. With credit, interest has to be paid. With cash there is a possibility of being given a discount. Also when buying with cash, the manager should always consider the alternative use of the cash.

d. Good or low quality

Sometimes a farmer is faced with a decision on whether to buy a higher quality material at a higher price or to buy a lower quality material at a lower price. Two economic principles can be used. The first principle is to determine whether the marginal returns from the better quality material is greater than the additional cost involved. Inferior material should also be looked at in the same way.

The second principle is the alternative use of the extra cost. If the returns from the alternative use is likely to be higher than the return

from extra cost of higher quality material, it is good management decision to buy the inferior quality material, and invest the extra cost in the alternative use.

The Use of Capital on the Farm

Capital management does not stop after purchasing. A farmer must make sure that supplies, materials, machinery and equipment purchased are used with minimum losses. This entails supervision. The aim is to prevent waste in the use of seed, fertilizer, feed and other inputs. Wastes increase the amount and cost of input per unit output. Losses can be avoided in the following ways:

a. Storage and Care:

Fertilizers, livestock feeds and other inputs should be properly stored. If livestock is kept, a good shelter and adequate care must be provided. If animals are sick, a veterinarian should be contacted immediately. Farm equipment when not in use should be properly stored. Rough handling of farm equipment can reduce their useful life and increase repairs and maintenance costs. A farm manager should ensure that workers operating these equipments know exactly what to do. If an equipment needs repair, this should be done with minimum delay so that it can be put back to use on the farm.

b. Early Preparation for Work:

All supplies and equipment needed should be ready before the farming season begins. During slack period for all equipment must be thoroughly checked for adjustments and repairs. Regular services of farm equipment save money. Farm managers should include repairs and maintenance in their calendar of operations.

c. Supervision:

Each class of working capital should be properly supervised. This is related to labour and equipment supervision.

Both can be done simultaneously. A farm manager has to be alert and correct mistakes as soon as they are detected.

4.0 Conclusion

Capital is the product of human activity. It is made up of things which are not yet used up. Capital is produced to be used to produce other products. Capital must be carefully managed because either sooner or later it does get used up in the production process or become obsolete and will need to be replaced.

When the manager has made estimates of the total expenses he will be in the best position to know if he needs to borrow money. He should find out how much he will make from the borrowed money and whether the proposed investment will yield more than enough to repay entire loan plus interest. He should be cautious in taking loans. He should manage credit he takes very well and supervise its use properly.

5.0 Summary

In this unit you have learnt about capital management which is essential to running a successful farm business. Investment, as you have learnt, is the production or acquisition of capital assets. Investment can be made by saving some of the produce for future use, through physical efforts and by purchase. Capital assets are often classified into long-term, mid-term and short-term depending on the life of the business and the duration of the asset in relation to all other assets. Depreciation is the annual loss in the value of the assets.

The productive life of any capital the asset can prolonged by regular and thorough maintenance so that the animal depreciation is reduced. However, a balance must be struck between maintenance costs and depreciation costs.

You have also learnt that a manager must plan capital requirements, support his loan application with budgeted plan, watch interest rates and period of repayment, purchasing of requirements must be made with maximum economy and you should supervise working capital with utmost vigour and concern.

Answers to Self Assessment Questions

1. Three ways investments are carried out:
 - Saving some of his produce for future use
 - Through their own physical efforts.
 - Purchase goats and cattle kept for milk or breeding
 - Through farmers' own physical efforts
 - clearing land, planting trees
 - constructing dams or cattle ranches.
 - * Purchase
 - purchase of tools and machinery
 - purchase of improved and chemicals for spraying.
2.
 - i) Materials and supplies
 - o Land

- Seed
- Fertilizer
- Hired labour

- a. Farm equipment
 - Ox-drawn plough
 - Ox-drawn ridger
 - Ox-drawn weeder
 - Labour
 - Hoes
 - Cutlasses.

- b. Land improvements
 - Fencing
 - Drainage

- c. Farm buildings
 - Huts
 - Rhumba for storage

6.0 Tutor Marked Assignment

1. If you are a lender what will you look for in a borrower?
2. Describe how you will ensure you use borrowed money economically in supplies and material purchasing.

4. How will you minimize losses in the use of purchased inputs?

7.0 Further Reading and References

Castles, E.N., M.H. Becker and T.J. Smith (1972) Farm Business Management: The Decision-Making Process. The Macmillan Company, New York. Chapter 8.

UNIT 16**FARM LABOUR MANAGEMENT**

Table of Content	
1.0	Introduction
2.0	Objective
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3.2	Efficiency through Productivity and cost reduction

3.3	Increasing Labour Productivity through Better morale of Workers
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1.0 Introduction

Resource called labour is the work done by human beings. It is therefore to be measured as a flow over a given period of time. The amount of labour available depends upon the number of people and the hours they can devote to the farming enterprise. This depends upon the age that children are expected to work, whether women and old men are expected to work and the number of hours able members of each family are willing to work for. Thus the size of the labour force and hours worked depend upon customs, attitudes, towards knowledge, leisure and income.

2.0 Objectives

It is hoped that by the end of this unit, you will be able to:

- Explain the reasons why labour should be managed
- Explain how labour efficiency can be improved through enterprise Combination
- Explain how labour efficiency can be improved through operations calendar
- Explain how labour efficiency can be improved through work Simplification
- explain how labour efficiency can be improved through capital/labour substitution
- explain how labour productivity can be improved through morale of workers.

3.1 Why Manage Labour

On both small and large scale farms, labour constitute a major input. On small farms however, there is a tendency to pay little attention to labour management because the bulk of it comes from family sources, for which the farmer does not incur any direct cash expense. Nevertheless, labour has a

value even if no money is paid for it. For example, if all labour used on small farms using recommended input, is costed, it will be observed that it accounts for at least 80 percent of total costs of production for groundnut, maize, and guineacorn.

The objective when achieved can increase farm profit, and release labour for other activities.

On large scale farms, a high level of hired labour is also used. Labour costs on these farms are rising, especially with the Government decision to raise the minimum wage.

Large-scale farmers' objectives in labour management are similar to those of the small farmers. These are:-

- to obtain the best combination of labour and capital
- to increase output per unit of labour input
- to release labour for other farm activities.

The farm manager must always bear in mind that:

1. labour like other farm inputs, such as fertilizer, seeds, livestock feed etc., is a farm expense.
2. Labour efficiency is also related to the morale of farm workers.
3. Hired labour like other people have different attitudes to work, and different abilities at performing various jobs.

These points imply that labour efficiency can be increased not only through increased labour productivity and cost reduction, but also through ensuring a high morale of farm workers.

Self-Assessment Question 1

What is the basis for labour management?

3.2 Efficiency through Productivity and Cost Reduction

a. Enterprise Combination

Farm managers face fluctuating labour requirements during any farm Calendar year. this is due to the seasonality of farm production. The Following table gives monthly labour distribution for crops on small farms.

Table 16.1 Labour input in man-hours per acre

Months	Guinea corn	Guinea corn/ Millet	Maize	Cotton
January	0.9	5.9	-	8.5
February	-	1.4	-	11.6
March	20.	2.6	-	5.8
April	6.9	28.6	13.6	4.5
May	17.3	50.8	23.0	7.4
June	23.1	33.2	54.3	20.5
July	25.5	25.6	48.8	14.5
August	16.4	30.9	21.6	22.8
September	3.4	13.8	18.7	23.3
October	-	2.9	28.2	8.7
November	33.2	34.0	5.2	2.8
December	7.6	17.4	0.9	
Total	136.3	247.1	214.3	130.4

Source D.w. Norman: An economic survey of three villages in Zaria province Input-output study

Note that with maize no labour is used from January to March. While between April and October, the crop calls for a high labour use. Enterprise combination on the farm can be used in such a situation. In areas where irrigation facilities are available, doubled cropping is possible. Small farmers on fadama plots can also grow supplementary crops on these plots during slack periods. Another way in which small farmers use available family labour is by intercropping.

From table 16.1, while 9.8 man-hour per acre are spent on guineacorn between January and April, 38.5 man-hour, per acre are spent on a mixed crop of guineacorn and millet during the same period. Farm managers should ensure that in selecting enterprises, labour requirements and use are taken into consideration.

On large scale farms, livestock enterprises can supplement crop enterprises in the use of labour and other farm resources. However, in adding livestock as a supplementary enterprise, a manager must ensure that he has the knowledge and experience for the particular livestock enterprise chosen and that land best suited for crop production is not withheld for grazing or livestock buildings. Furthermore, the addition of supplementary enterprises to the farm

to make a more complete use of available farm labour must be decided upon on the basis of their relative costs and returns.

b. Work simplification

Work simplification involves a careful study of a job to be performed, identifying the important parts of such jobs, and allocating available resources for the job. Work simplification can be enhanced by adequate farm layout, close and central location of farm buildings, and the energy.

Poor farm layout in terms of irregular shapes of fields can result in less efficient use of labour and other resources especially machinery. For example, irregular and small fields make the operation of machinery difficult and fencing of fields more costly. To increase the efficient use of labour and machinery, fields should be arranged in regular shapes, and as much as possible field boundaries eliminated.

The arrangements and locations of farm buildings can also affect labour efficiency. Time and energy can be expended in traversing between buildings to get jobs done.

To reduce such travels, a farm manager should locate buildings and working areas close together. Centrally located farm buildings also provide access to all parts of the farm. The equipment sheds, tools' store and the repair workshop should be close together .

Work simplification also implies that energy should be saved whenever possible. Before allocating a job to a worker, a farm manager should divide the job into its component parts, identify which sub-units of the job can be eliminated without loss in efficiency, ascertain the parts which can be combined, identify all tools and supplies needed to accomplish each sub-unit of the job and plan to let the worker complete one job where another is started.

c. Efficiency through an Operations Calendar

The main idea here is that labour needs and use must be planned well in advance . From past records and experiences, a farm manager can draw up a calendar of operations to show each enterprise and the operations to be performed on it, the dates on which the operations are likely to be performed, the amount of labour required for each operation and the urgency of particular operations.

Consider the following example shown in Table 16.2.

Table 16.2: Operation and farm labour needs

Cotton	Dates	Needed Labour Man-hours	Urgency
Ridging	April 20-25	30	Averagely urgent (+ 1 day.)
Fertilizing	April 20-25	10	not urgent (+ 2 days)
Planting	April 26-28	10	Urgent.

An initial labour plan for each enterprise which the farmer would be involved in, enables him to estimate month by month labour requirement for the entire farm. Study Table 16.2 for a farmers operation

Table 16.2 labour plan for a farmer's operation

Month	Hours of required	No. of hours work available	Unavailable Hours	Extra No. of Workers needed
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January	30	60	-	-
February	20	60	-	-
March	50	60	-	-
April	40	60	-	-
May	60	60	-	-
June	80	60	20	3
July	90	60	30	4
August	95	60	35	5
September	20	60	-	-
October	5	60	-	-
November	2	60	-	-
December	2	60	-	-

Such a calendar of operations and estimation of labour needs should take into consideration other jobs which could be done when bad weather prevents field work to be carried out. Jobs which could either be done by workers when it rains or by tractor and equipment operators when the ground is too muddy should also be started in advance.

If a manager is able to estimate in advance the amount of labour that will be needed for each operation and how many workers to employ each month, he can arrange for their employment in good time and avoid last minute bottlenecks.

But farming is controlled by natural conditions which can upset a farmer's plans. Labour plans must be flexible enough to allow possible adjustments. One way of taking care of this is through job scheduling at regular intervals. Weekly and daily work plans should be made.. All jobs to be done should be listed for the day and by the week and worker posted and informed accordingly. It is also a good practice to post such work schedules with names of workers assigned to each job on notice boards in addition to informing the.

For enterprises where routine operations are unavoidable such as in a dairy or poultry enterprises instructions can be written in brief on thick cards and posted on the poultry house wall so that the worker assigned there knows what he is supposed to do.

d. **Labour efficiency through capital/labour substitution**

Substituting capital for some labour can increase labour use efficiency. Capital may be in form of farm machinery or other labour-saving technologies such as herbicides. For example in a 1981 study on groundnut it

was found that the use of herbicides resulted in a saving in labour of 106 man-hour per hectare while yields remain more or less the same with or without the use of herbicide. In monetary terms, while the total cost of applying the herbicides was 38 Naira per hectare, the value of the savings in labour was 64 Naira per hectare.

An important aspect of the capital/labour substitution situation is that displaced labour become available for other needs.

It is however important that the change from hand labour use to any form of capital use be budgeted for to ensure that it pays to effect the change.

In such a budgeting exercise added returns as a result of the substitution should not outweigh added costs.

Self-Assessment Exercise 1

Refer to Table Unit 14.1, 14.1

Which months do these enterprises NOT compete with each other?

- i) Millet/guineacorn mixture and Guineacorn/Groundnut mixture
- ii) Cotton/sweet potato mixture and sugar cane.
- iii) Which enterprise is most labour demanding?
- iv) Which enterprise is least labour demanding during the peak Period?
- v) which month is most labour used?

^a With hoe-weeding 170 man-hours were used and with use of a pre-emergent herbicide only 64 man-hours were employed in applying the chemical.

3.3 Increasing Labour Productivity through better morale of workers

Farm labour can work poorly or efficiently depending on their attitudes to a particular work and how capable management can influence their morale. Related factors are discussed under the following headings:

- Adequate supervision of workers
- Favourable working conditions.
- Cordial employer-worker relations.

☞ Supervision

The manager or farmer must see that assigned work is performed according to instructions given. A good manager must himself know the best way to get a job done. Supervision involves reaching and showing in-experienced workers new methods. Strict supervision may be mis-interpreted by experienced staff as distrust. To avoid this the manager should create opportunities for workers to develop confidence in management. Workers will not mis-interpret actions of management they know and believe has their interest and welfare in mind. Another way of developing initiative and reducing supervision is to assign workers jobs in which they are experienced.

☞ Favourable working conditions

Good working conditions are related to adequate wages. Incentive plans and working hours.

Wages paid on a farm should be comparable to what workers can get from other employers. A manager should be certain that he is paying a worker what he is worth.

Some managers use piece-work rate especially during harvest, for example, in cotton picking.

This increases the rate at which work is done on the farm. However, effective supervision is necessary for workers to increase weight of harvested product with foreign materials and immature products. Piecework rates should be comparable to what obtains on other farms in the areas.

Incentive payments are usually made in cash or goods to workers for performance above that covered by a regular wage. To increase workers' performance, incentive payments rates should be above the normal wage rate. The employee should know right from when he assumes duty, incentive payments available and what he should do to merit them. The duties that merit the payments should be within the

workers' control. The basis for calculating the payments should be made known to the worker (e.g. extra 20 kobo for 10 kg. of cotton seed harvested). Payments should be made soon after the work has been completed. Cost of production should be taken into consideration before setting incentives payments level. Incentive payments should dovetail with the farmers' goals, one of which is increased profits. At the same time such payments should compensate workers for extra efforts.

Good working conditions include enough break time for meals, reasonable hours of work, rate of pay for overtime, off-duty days, leave periods and medical facilities. These should be worked out by the farm manager/farmer and explained to the worker when he takes up employment.

Cordial employee Relations

In addition to adequate supervision and convenient working conditions, cordial working relations between a manager and his workers can increase efficiency and production. To achieve this, the manager should develop mutual respect and trust and be patient with employees when they make mistakes. A worker should be made to feel useful to the organisation and his responsibilities increased if he is prepared for it. A good employer praises a job well done.

Self-Assessment Question 2

What is the basis for labour management?

4.0 CONCLUSION

In this unit you have learnt that the objective of labour management is to increase labour productivity. Labour efficiency can be increased through increased labour productivity and cost reduction and also through ensuring a high morale among farm workers.

5.0 SUMMARY

Labour has been defined as work done by human beings. There is tendency to pay little attention to labour management because the bulk of it comes

from family sources, for which the farmer does not incur any direct cash expense. Labour is managed so that its productivity can be improved upon. Labour productivity the average value product per man hour, may be increased by producing more with the present labour supply or by saving labour. For the small family farmer it is easier to increase total product and more difficult to reduce the labour.

Where land is scarce under high population density, the total product can be expanded by intensifying per hectare but where land is surplus it may be better increased by extending the area under cultivation. Where land is sufficiently available, extension of cultivation is not total supply of labour but the amount available at the peak period.

Get the best from your farm employees:

- Check if enterprise combination adequately utilised available labour
- Be sure that time and energy are not wasted due to poor work methods.
- Plan and schedule farm work in advance.
- substitute capital for labour when it pays to do so.
- Maintain high morale of workers through adequate supervision, good working conditions, and cordial labour relations.

Answers to Self-Assessment Questions

Self-Assessment Exercise 1

Table 14.1

	J	F	M	A	M	J	J _U	A	S	O	N	D	Total
		JAN	FEB		MAR		APR.	MAY	JUN	JULY			
Millet/g.corn	5.9	1.4	2.6	28.6	50.8	33.3	25.6	30.9	13.8	2.9	34.1	17.4	247.3
g.corn/G.nuts	-	-	1.6	4.8	17.0	73.7	22.2	5.7	23.8	41.5	28.7	-	219.0
Cotton/sweet potato	5.6	2.1	5.0	-	8.6	27.0	21.3	28.6	45.1	3.4	2.3	20.7	169.7
Sugar cane	123.0	57.5	38.0	53.3	35.1	34.0	32.8	2.7	20.6	37.2	34.7	57.2	526.1
Total	134.5	61.0	47.2	86.7	111.5	168.0	101.9	67.9	103.3	85.0	99.8	95.3	1162.1

- i) Millet/guineacorn mixture and guineacor/groundnut mixture are not competing with each other in the months of January, February and December
- ii) Cotton/sweet potato mixture and sugar cane are not competing for August labour.
- iii) Sugar is most labour demanding.
- iv) Cotton/sweet potato mixture is least labour demanding.
- v) July is the month labour is used most followed by December.

Self-Assessment Question 2

The basis for labour management is to ensure that it is efficiently utilized. Labour is provided by human beings unlike the other factors of production that are passive. In order to maximize his objective function, the farmer must watch the use of labour carefully. In subsistence farming, labour could take as much as 80% of total cost of production. It therefore means the farmer must pay close attention to the welfare of the workers and keep their level of morale high to give their best.

6.0 Tutor Marked Assignment

Refer to Table 16.1 which gives the labour input per acre for different crop enterprises by month. Assume a farmer must grow all these crops as shown in the table in a particular year. Assume also that the labour recorded were supplied only by family members. Answer the following:

- i) Calculate the labour, requirement for the year
- ii) Calculate the total labour requirement by month
- iii) Which month has the highest labour input?
- iv) If the total labour the family can supply per month is 90 man-hours. In which of the months will hired labour be required and by how much?
- v) For guincorn and cotton enterprises which months do they NOT complete for labour?
- vi) Draw up a table similar to Table 16.2 to show the months with the unavailable hours.

7.0 Further Reading and References

Castle, E.N., M.H. Becker and F.J. Smith (1972) Farm Business Management:

The Decision-Making Process. The MacMillan Company, New York
Chapter 13.

Management of Land

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1.0 Introduction

Land acquisition is one of the most important decisions made by a beginning farmer. The importance of the decision does not end with the initial purchase on established farmer may add land to his farm business several times during his farming career. The characteristics of the land obtained and the way in which it is acquired will shape many subsequent farming decision .

2.0 Objectives

It is hoped that by the end of this unit, you will be able to:

- Describe how land is acquired for farming business.
- Describe the characteristics of various farm lands
- Explain the implications of the acquisition methods and farm land characteristics for management
- Determine maximum total products for both good and poor land holdings.

3.1 Land Acquisition

There are various ways of acquiring farm land in Nigeria. There are inheritance, allocation and gift, sale, pledge, loan and trust. These are discussed below.

i. Inheritance

Upon the death of the head of a family and sometime even before death, land is divided among the sons and sometimes daughters. A male who inherits a portion of land from his father can pass the same to his own children.

ii. Allocation and Gift

There are two variants of this type of transaction:

- a) The village head may allocate an abandoned farm or piece of bush to a newcomer or to a local inhabitant who requires some more farmland.
- b) The land holder may give a piece of land to relatives or close friends. Gift land can be inherited by the descendants of the original recipient of the land.

iii. Sale

This is an outright transfer of land for cash. However, it is only the usufructuary rights to the land that are being sold and not the land itself. Although there are variations in the procedure from area to area there must usually be two witnesses present and the village head has to be informed.

iv. Pledge

The right to use the land is passed to another individual in return for a money loan. In such cases the amount paid is usually less than the land's value. No term is stated and the creditor will farm it until the loan is repaid.

v) Loan or Lease

When a farmer has more land than he can farm or requires, he may temporarily entrust it to another person. This transaction may take the relatively informal shape of a loan (normally made to a friend or relative) which is either free or for a small rental fee which may be made in kind or cash at the time of harvest. It may also take the more formal shape of a lease which requires the presence of witnesses to the transfer of money usually made at the time of transfer.

vii) Trust

This is land held on trust pending the return of the owner who has emigrated from the community. This form of transfer is probably rooted in the practice of labour migration from rural areas. If labour migrants do not return before the following farming season, the land does not revert to the community, but is allocated by the village head to a trustee, normally a close relative, who will farm it until the migrant returns. The only restriction placed upon the trustee is that he may not sell it.

SAQ 1: In your own area, describe the types of land tenure system found starting with the most common to the least popular.

3.2 Characteristics of Farm Land

From farm management point of view, land is considered as a factor of production. However, it has certain characteristics that distinguishes it from other factors of production.

1. Land is durable

Land is a durable asset meaning that it will not be used up in a production process, although land may be depleted by use. Land can be used for more than one purpose and will react in different ways to various applications of labour and capital. In addition, existing institutional arrangements can influence the use of land.

2. Land is well suited as security for loan.

It is easier to borrow money with land as collateral than if other farm assets are used as security. Because a portion of a land can be bought at a time someone with limited capital can buy land.

3. Prestige goes with owing land

Many people experience a feeling of satisfaction when they make an improvement on something that belongs to them. Farm management analysis can determine if this satisfaction comes at a cost, and if so, can help to determine the amount of this cost.

4. Land offers opportunity to enjoy windfall gains

Owing land provides opportunity for one to enjoy windfall gains especially if the price of land suddenly skyrockets. When this happens the owner eventually benefits.

3.3 Buying a Farm

Farm property is different from other forms of real estate in that it has a dual aspect to its valuation. Like other property, it has appraisable market value, which is useful to real estate brokers, buyers and sellers, insurance companies, and those who settle estates. Appraisal of market value is a highly specialized process.

The other aspect of farm property valuation is as a capital asset to the farm business. This means that the land itself must be capable of producing a return. The farmer must determine regardless of its market value, whether the productivity potential of the land he considers buying justifies its purchase.

Since land, as an asset, is long lived, it will yield a return for years in the future. This future contribution must be taken into account. The process of bringing future returns back to the present is called discounting. A discount rate is used for the process which was discussed in Unit 4. The formula used is:

$$V = \frac{R_1}{1+r} + \frac{R_2}{(1+r)^2} + \frac{R_3}{(1+r)^3} + \dots + \frac{R_{10}}{(1+r)^{10}}$$

Where V = value of the annuity today

R_1 --- R_{10} = annual income

r = discount rate.

An asset that has an indefinite life, the formula above simplifies to $V = \frac{R}{r}$.

If soil maintenance practice are followed, land can be considered as having an indefinite life.

The capitalization of earnings formula depends upon certain assumptions:

1. That prices and yields can be estimated with reasonable accuracy.
2. That a realistic rate of discount can be determined.
3. That income will continue indefinitely.

One should not buy the land if the purchased price is greater than the present value of the series of income

SAQ 2: If you want to buy a piece of land in your area what rate of discount would you use and why?

3.3 Implications of Acquisition Methods and Land Characteristics on Management

Acquisition Methods

1. Inheritance, allocation or gifts and other acquisition methods except outright purchase do not encourage the owner to carry out some land improvement measures. The land purchased also has a greater potential for owners attention to improve its fertility. Since the removal of fertilizer subsidy and the attendant increase in prices, the use of fertilizer has actually decreased ie. Improving the fertility of the soil becomes a problem. The farmer in this case may abandon the field after a few years when the fertility is depleted and move to another field. This is a common practice when land is surplus.

The inheritance system result in more and more fragmentation of farm holdings. Fadama fields may be as low as 0.1 of hectare.

Characteristics of Land

The fact that land is a durable asset that can b used for many purposes affords the manager to be flexible. Flexibility is an important attribute of a good management. The land can be used for buildings for poultry, pig pens, machinery stores and it can be planted into the crops of the farmer's choice. Part could be turned into pasture for livestock or turned into an orchard.

For the farmer that has to borrow the land he owns can be used as collateral. The farmer can obtain the certificate of occupancy on the land so that it becomes tenable as a collateral.

The farmer can enjoy windfall gains on the land he owns. If he is hard-up, part of the land holdings can be sold or leased out. The higher the prevailing market price the better for the farmer.

3.4 Maximum Total Product on Good and Poor Land

Generally, land may not be homogeneous over a given piece of area. The total product which can be obtained per hectare and hence the population which can be supported is influenced by the natural environment, the inherent fertility of the soil, the topography and climate. In a sparsely populated region the fertile land with reliable rainfall will be cultivated first. Once the good land is in use; population growth will cause it to be more intensively cultivated. But it may be better to use labour more productively by extending the area under cultivation unto land of lower fertility.

Figure 17.1 shows that the total product per hectare is higher on a given area of good land than on the same area of poor land. If there is plenty of good

land available it will be irrational to cultivate the poor land. The total product at the maximum point is given by OR_2 under good land and OR_1 under poor land. The marginal physical product of the good land also lies above that for the poor land.

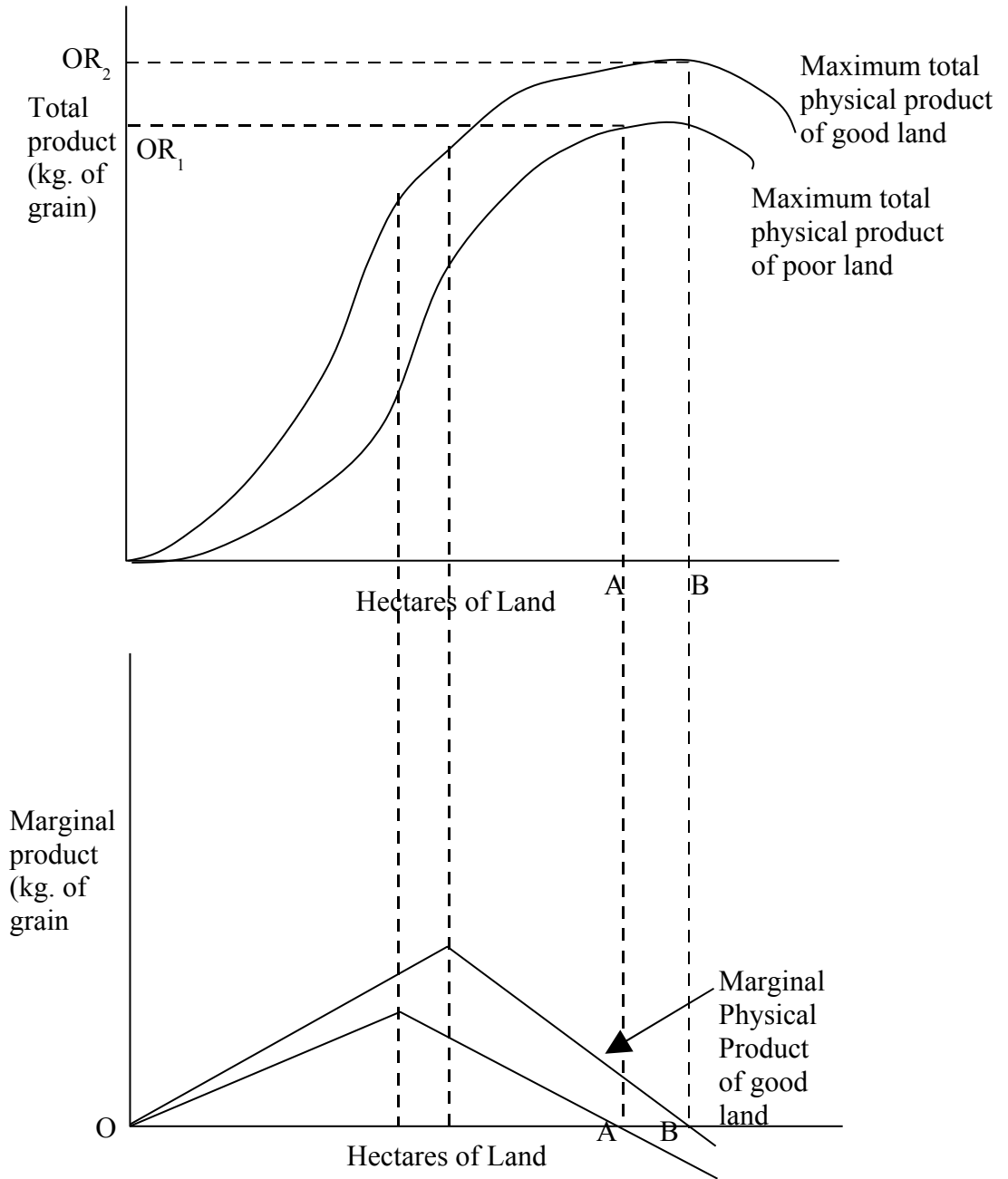


Figure 17.1: Total physical product for good land vs poor land.

4.0 Conclusion

SAQ 2: The way you acquire your farm will affect subsequent farming decisions. If the land is rented to you, for an example, you may not be able to plant tree crops on it. When you purchase the land, however, you have the freedoms to decide what you want to grow, how and when.

It is also important to know the characteristic features of land and their implications for decision making

5.0 Summary

In this unit you have learnt the different ways of acquiring farm land in a typical village setting. The characteristic features of land include durability, security for loan, prestige of owning land and opportunity of enjoying windfall gains. When you want to buy a piece of land you must ensure that the present value of the series of future incomes is greater than its acquisition cost.

The implications for management of all the above have been enumerated in this unit.

Answers to Self Assessment Question

SAQ 1: The description may not be too far from what is contained in this unit. There are supposed to be slight differences according to location. The order of popularity are usually:

1. Inheritance/gift
2. Allocation/gift
3. Pledge
4. Lease
5. Sale
6. Trust.

SAQ 2: You should use the discount rate that is close to the rate of borrowing funds in the economy. This is because if you will borrow funds to purchase it, you must be able to repay. But the current rate of interest may underestimate the productivity of the capital if the farmer wants to use it in a different way. If used in a different way you should estimate the return on capital.

6.0 Tutor Marked Assignment

In view of the land tenure systems in your area and the characteristics of the land types, discuss the implications for land management.

7.0 Further Reading and References

Castle, E.N., M.H. Becker and J.F. Smith (1972) *Farm Business Management: The Decision-Making Process*. Macmillan Press, New York. Chapter 9.