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# COURSE INTRODUCTION

Dear students, welcome to this module. This module is prepared for the course “Farm management”. It is developed for students who are taking the course in the distance education division of the Wolaita Soddo University. Purpose of this course is to introduce students the concepts and principles of farm management. This module consists of seven chapters. It covers basics of farm management, decision making and basic economic principles in farm management, cost of production, production function, farm business planning and farm budgeting, farm resources management and farm record keeping and financial analysis, and risk and uncertainty management. Each chapter’s text is supported by examples and exercises and the module provides links and references for further information and guidance.

In the development of this module, all possible efforts have been made to develop standardized and the useful material with the help of adequate various information or materials. Attempts have been made to include pertinent examples, exercises and tables and figures in each seven chapters to make the subject understandable for learners. Further, the explanations have been supported by appropriate tables, figures and examples to make the subject mater more interesting and understandable. In addition, learning activities are included to engage you in better thinking and learning process. Extensive and exhaustive editing (i.e., content, language and pedagogy editing) have been made to produce quality and standardized module.

# COURSE OBJECTIVES

The main objectives of the course are to help enable students to recognize the farm business both as producing unit and as a consuming unit along with the harmonization of their behaviours and goals. It is particularly aim to:

* Provide insight into basic concepts, scope and characteristics of farm management, relationship of farm management with other science, problems of farm management;
* Have deeper insight into decision making and economic principles in farm management;
* Have good understanding of concept of production theory, production cost, production function;
* Provide an insight into the optimal utilization of resources in the farm business;
* Have deeper understanding of the meaning and procedure of moving from the existing combination of resources to their optimal use for profit maximization;
* Provide deeper knowledge on farm business plan and farm budgeting;
* Provide an insight into farm resource management;
* Impart deeper insight into record keeping and financial analysis;
* Provide deeper understanding of uncertainty and risk management

# CHAPTER ONE: BASICS OF FARM MANAGEMENT

**Introduction**

Dear learner, welcome to this chapter. This particular chapter deals with concepts and definition, characteristics nature of farm management and problems of farm management. It creates an opportunities for students to endowed themselves with knowledge about general concepts of farm management and enable them to understand the remaining parts of farm management course easily.

Farm management is the collective term for various management strategies and methods that are employed to keep a farm productive and profitable. The process of this type of management is often associated with large commercial farm, although many of the same methods can be utilized with equal success on a small family-owned farm. Depending on the size of the operation, the management process may require the services of a single farm manager or a group of managers who oversee various aspects of the overall project.

Farm management deals with the organization and operation of a farm with the objective of maximizing profits from the farm business on a continuing basis. The farmer needs to adjust his farm organization from year to year to keep abreast of changes in methods, price variability & resources available to him. Thus farm management is the science which deals with the analysis of the farming resources, alternatives, choices & opportunities within the framework of resource restrictions & social & personal constraints of farming business. This complex information is integrated and synthesized to increase profitability of the farming business, the ultimate aim being to raise the standard of living of the farming people. This does not mean that farm management deals exclusively with the maximization of income; in fact, it takes into account the goals and objectives of the individual farmer, other than income maximization.

**Objectives:**

Dear students, at the end of your study on this chapter, you will be able to:

* Define and describe concept of farm, management and farm management;
* Define the concepts and explain the scope of farm management;
* Explain the reasons for the study of farm management;
* Identify nature and characteristics of farm management;
* Identify functions of farm management;
* Explain relationship of farm management with other sciences;
* Explain specific objectives of farm management;
* Identify Problems of farm management.

## 1.1. Definitions and Concept of Farm Management

1. ***What is farm?***

* A farm is the area cultivated by a farmer or a group of farmers managed in common. Legally, a farm means an area of land devoted to agriculture either to raising crops or a few heads of livestock.
* A farm is a productive unit specialized in converting recourses or inputs into agricultural products.
* A farm is a socio-economic unit where a farmer drives his food and cash income for the whole family.

***What is management?***

* Management is a science applied to organize a firm for the purpose of securing the greatest continuous profit.
* It is also the art applied to increase agricultural production per unit of area or unit of cost to meet population demand in food.
* It is making use of available resource or allocating scarce resource in efficient manner.
* It is a process which directs action into some goals through planning, organizing, leading and controlling of resources (financial and human resources).

***What is farm management?***

### Different authors define/explain farm management in different ways:

Farm management is the science of organizing and combining people, natural and material resources for the purpose of crop and livestock production in order to maximize profit while optimizing input use.

Such resources include land, labour, management skill, specialist knowledge, capital (financial and equipment), sunlight, irrigation, plants and animals, livestock feed, fertilizer, agrochemical.

* Farm management is a branch of agricultural economics which deals with wealth-spending and wealth-earning activities with the idea to secure the maximum possible net income consistent with the conservation or maintenance of environmental capitals.
* Farm management is described as a science of decision-making applying economic principles and technology to production to maximize a set of goals based of relevant sociological, psychological and philosophical considerations.
* Farm management is concerned with how can the individual farmer organize the factors of production land, labour, and capital on his farm, so adapt practice to his particular environment and so dispose of his product, as to yield him the target net return while still maintaining the integrity of the land and equipment (Butter field, 1910).
* Farm management is concerned with the decision which affects the profitability of the farm business (Cattle, Becker and Nelson, 1987).
* Farm management is a decision-making science. It helps to decide about the basic course of action of the farming business.

These are clearly have both similarities and marginal differences among these definitions, it is interesting that the earliest definition of 1910 is little different from the most recent of 1994. The common thread through most of them is **decision making about the allocation of resources.**

**What are Productive resources?** Resources are inputs which are used for further production. These are also known as factors of production.

These are basically:

* Land
* Labor
* Capital
* Management
* Technology and marketing/ demand

**1). Land**: Refers to all natural resources that can be used as inputs for production such as minerals, water, air, forests, oil and even such intangibles as rainfall, temperature, and soil quality.

The key distinction between lands consists of natural resources or conditions improved by labour or capital expenditure. In short, land is the short hand extension for natural resources. The payment to land is called **rent**.

**2) Labour**: Is the physical and intellectual exertion of human beings in the production process. It embraces a wide variety of skills in specialized trades and occupations, and abilities of organization and management that are crucial in the productive process. It is clear that some labour is valued (paid) more than other labour. This is because labour, like land, can be much more valuable. This occurs when individuals devote money and time to increasing their labour skills. We refer to this development of labour skills as investment in human capital- the accumulation of labour enhancing abilities, including health that increases labour's productivity. **Wages** are the resource payments that entrepreneurs make for the use of labour.

**3) Capital**- Refers to all man-made aids (past human efforts) to production, the tools and production factors, warehouses, stocks of inventories, etc. The term is, how ever, used in a number of ways. Capital in its economic definition is the machinery; the tangible equipment that used to produce other capital can purchase or rented. The payment to capital is called **interest**. In farm management **money** does not mean capital/ productive resource, because money can be used for **the purchase of tools or physical items**, like, fertilizer, seed, and etc. Capital includes a wide diversity of elements of **durable items** ranging from **stock supplies**.

**Durable items:** are items which have more than one year uses in production line. Ex. buildings, dams, machinery, livestock. These are called ***ploy period resources***.

**Stock supplies:** are supplies which only use for one production year, such as fertilizer, seed and etc. These are called ***mono period resources*.**

**4) Management/Entrepreneur:**

* It is the major and last component of factor of production
* describes the task of making decision and implement these decisions
* It is mental /soft ware energy of human being usedin production to organize, lead, direct and take risk and bear responsibility. Its reward is **profit.**

## 1.2. Why Study Farm Management?

Dear learner, in the previous topic, we have dealt with definition of farm, management and farm management. In this topic, we will see the reasons for the study of farm management.

**Question**: Do you justify the reasons for the study of farm management?

We study farm management for the following reasons as under:

* It is the study of **farmer,** as a producer of food and other raw materials, **who occupies a strategic position in the economic life of the country**. Politically, farmers together exert a considerable influence on the type of government they like in the developing countries.
* Farm management investigation gives **thrust and direction** to farm business improvement by providing use full information to planners, farmers and extension workers.
* Better understanding of the sequential flow of new technology is provided by farm management research that contributes to more realistic projection of production potential.
* Basic information provided by farm management studies on specific farm projects such as, land reclamation, settlement, irrigation and drainage, which serves as **an aid to formulating national policies**.
* Farm management is important for making the **best use of scarce resources**.
* Farm management also helps to view **the threats** and **problems** that lie, and **opportunities** for showing its potential.

## 1.3. Scope of Farm Management

Farm management falls in the field of micro-economics. It deals with the allocation of resources at the level of individual farm.

Farm management covers all aspects of farm business which has a bearing on the economic efficiency of production resources.

The types of enterprises to be combined, the kind of crops and varieties to be grown, the dosage of fertilizer to be applied, the implement to be used, the way the farm functions fall within the subject of farm management. Thus, to carry out modern agriculture successfully, knowledge of farm management is useful in three areas:

The nature and scope of farm management is the theory of optimal decision making in the organization and operation of a farm for profit maximization. It includes /concerned with/ the following topics:

1. Selection, size & appraisal of enterprises
2. Appraisal of farm resources
3. Investment decision
4. Enterprise relationship( with the use of different enterprises)
5. Choice of input- output combination
6. Cost and return on individual enterprise and on the farm as a whole
7. Farm planning and budgeting
8. Farm prices ( for both inputs and outputs, profit and credit/ loan)
9. Risk and uncertainty
10. Planning and marketing of farm produce.

**In general terms, farm management is concerned with:**

* The resource allocation at the level of individual farm;
* The type of enterprises combined;
* The choice of input- output combinations;
* Formulation standard farm plan and optimum cropping patterns for different area and type of crops;
* Developing suitable model of mechanization and modernization;
* Evaluation of agricultural policies, bearing development growth of the farm.

***1. Farm management research***: Year after year new implements are manufactured, new input substitutes are coming in the markets and better doing practices are formulated to satisfy the increasing desire of cultivators for more income. As a result of all these changes, farm management research must be continuously strengthened.

Although the problems and solutions vary from time to time and place to place, the following aspects need to be continuously researched:

* Delineation of homogeneous type of farming areas;
* Generation of input-output coefficient;
* Formulation of standard farm plans and optimum cropping patterns;
* Developing suitable models of mechanization;
* Determination of farm size based on productivity;
* Determination of production costs; and
* Evaluation of agricultural policies having a bearing on farm development and growth.

***2. Farm management teaching***: Training in farm management science is essential for agricultural graduates for understanding farmers’ responses to new government policies and technological break through in agriculture. As a result of global competition, the decision-making processes have become more complex on farm organization. To help the farmers take the right decisions as to what to grow, how much to grow, how to grow, when and where to sell and buy, continuous training in farm management has become necessary.

***3. Farm management extension***: Once the results of a study are known, they must be made available to the farmers. They have to be educated and trained in the application and adoption of the research results.

Many farmers in the developing countries do not have the required education to effectively implement the research results. Thus, findings of farm management research have to be demonstrated to convince the farmers.

The managerial ability of the farmers can be improved through district, block and village level training camps, demonstration farms and farmers’ training centers (FTC).

Research, teaching and extension together seek improving the ability of farmers to introduce desirable changes in the utilization of scarce resources of the farm with a view to increase income, to improve living standards and satisfaction.

## 

## 1.4. Nature and Characteristics of Farm Management

Dear student, do you have knowledge about the nature and characteristics of farm management science before? If not, it is ok; in this topic we will discuss about it.

**Question:** Write down at least two nature and characteristics of farm management and explain it in detail.

Farm management science has many distinguishing characteristics from other field of agricultural sciences. A few of the important characteristics are:

***1. Practical science***: Farm management aims at testing the applicability of research findings by demonstrating on a given farm situation. It helps the farmers to select a method which is practicable and economical to their particular situation taking into consideration the volume of work and financial implications.

***2. Profit-oriented***: Farm management science alone is interested in the profitability of the farm along with practicality of an idea. For instance, physical scientists such as agronomists and plant breeders concern themselves with obtaining the maximum yield per hectare irrespective of the profitability and the cost of input incurred but the farm management specialist always considers the costs involved in producing each unit of the output in relation to the returns and decides the optimum level input combination.

The relevant factors to be considered in farm management are:

* Financial implication;
* Market outlets;
* Transportation facilities;
* Storage facilities, and
* Cost of production.

In brief, other sciences concern with the physical efficiency of production resources whereas farm management science concerns with physical, economic and allocation efficiencies as the major criteria of selection or adoption of improved practices. Nowadays, sustainable use of resources is also one of the tasks of farm management science.

***3. Integrating science***: Farm management is an integrating science in a sense that the facts and findings of other sciences are coordinated for the solution of various problems of individual farmers with the view to achieving certain desired goals. It considers the findings of other sciences in reaching its conclusions and deciding usefulness of new inputs under specific set of conditions.

* Optimum combination of practices;
* Constraints of individual farms;
* Evaluation of farm results (quality, cost, volume);
* Benefit-cost ratio.

***4. Broader field*:**Farm management decisions are made by getting reliable information from more than one discipline. Most of the physical and biological sciences concern themselves within limited or narrower compartments of information.

Farm management specialist and economist are expected to know the broad principles of all other concerned sciences in addition to business principles of farm management and economics. Better decision-making and best choice of alternatives of farming practices should be based on:

* Knowledge sources from other sciences;
* Wider compartments of information;
* Good managerial ability;
* Holistic in approach;
* An emphasis on integration;
* The local partnership approach;
* The bottom-up approach; and
* The area-based approach

***5. Micro-approach***: Farm management is a micro-approach where it treats every farm unit unique in terms of resources, potentials and problems.

It recognizes that no two farms are exactly identical with respect to soil, climate, farmers’ managerial abilities and other production resources. Each farm unit has to be, therefore, treated or studied individually. When we make SWOT analysis on the micro-approach, it is necessary to target at the following issues:

1. An adequate income;
2. Employment;
3. Affordable and adequate housing;
4. Education and training;
5. Information advice;
6. Easy access to services and facilities;
7. Social integration;
8. Develop the power to influence events (the community and others should be the subject of their lives not the object of their lives);
9. Community empowerment- placing more power in local hands, empowering individuals and communities to take control of their situations;
10. Increase mutual care at local levels;
11. Develop a share or sense of belongingness to the local place;
12. Enhancing the skill and capacity of the local community;
13. Encourage interaction of local communities;
14. Consider both vertical and horizontal relationship;
15. Develop complementary and supplementary enterprise.

**6.** ***Treating farm unit as a whole***: In farm management context, a farm as a whole is considered to be the unit for decision-making because the objective is to maximize the returns from the whole farm instead of only improving the returns from a particular enterprise or practice.

Farm management is much more concerned with the productivity of all crops instead of the productivity of one crop.

Highest return of a particular crop per hectare may lead to less income earning of other enterprises because the farmer may be allocated most of his resources to one crop or one plot land instead of using each unit of labour and other resources where it adds to the greatest returns. This is truer where many of the farm resources are limited and where there is free movement of commodity between rural and urban centers. Thus, applying the principles of farm management aims at reaching the optimum enterprise mix so that the farmer should obtain the highest income from his total farm organization.

## 1.5. Relationship of Farm Management with Other Sciences

Dear learner, this topic deals with the relationship of farm management with other disciplines.

**Question:** Explain relationship between farm management and economic theories**.**

Farm management is dependent on many other sciences such as:

***1. Economic theories***: The tools and techniques for farm management are supplied by the general economic theories. The law of equi-marginal returns, the law of variable proportions, the principles of input substitutions and the marginal analysis are all tools of economic theories used in the farm management analysis.

The economic theories that play an important part in farm management analysis are:

* Agricultural finance;
* Credit and co-operative marketing
* Land economics, etc.

***2. Other social sciences***: Farm management has close relationship with other social sciences like anthropology, psychology and sociology. Psychology provides information on human motivations and attitudes. In decision-making, many psychological aspects and mental reservations of decision-maker come in picture such as attitudes towards taking risks and work under conditions of uncertainty.

Rural sociology deals with the social problems, responses and reaction of rural people and has a great bearing on farm management decision-making of the farmers.

***3. Political science***: The acceptance of new production techniques and methods in farming involves political aspects of farm management. The legislation and political actions of government affect the production decision of farmers:

* Price of output and input;
* Scale of production;
* Land utilization policy (land size, floor and ceiling on land);
* Restrictions imposed on the growing of certain crops;
* Encouragements on the growing of certain crops;
* Inward (food self-sufficiency) and outward production (export-orientation) strategy.

***4. Supporting sciences***: Statistics and mathematics are other sciences that have been used effectively and extensively by the farm management specialists and agricultural economists. These sciences are helpful in providing method and procedures to analyze and evaluate data collected from different sources. Specific farm problems will be solved through the application of supporting sciences.

***5. Physical and biological sciences***: Farm management heavily depends on other physical and biological sciences for its source material. Farm management science defines the optimum use of resources within the framework of resource constraints whereas physical and biological sciences specify the production possibility without relating with the cost incurred.

Various sciences, thus, contribute to the solution of economic problems of farms.

It is, however, the main task of farm management specialist and agricultural economist to determine how and to what extent the findings of other science should be used.

Moreover, knowledge of farm management and agricultural economics is necessary to different types of agricultural specialist and to those who are working in the rural development. Hence, let us discuss briefly the relation of farm management and agricultural economics with different types of agricultural specialists.

***1. Farm management and plant breeder***

Plant breeder should have some knowledge of farm management or agricultural economics to find the desirable plant variety which possesses economic character such as:

* High yielding variety/unit area and unit cost;
* Suitable for profitable cultivation in a particular area;
* Compatible to the socio-economic set-ups;
* Variety of less risk and uncertainty.

***2. Farm management and animal breeder***

Animal breeder should try to find out a breed of milk cow and fattening livestock which can give

* Maximum returns/unit feed consumed;
* Maximum returns/human energy and cost incurred;
* Compatible to the socio-economic and environmental conditions;
* Breed of less risk and uncertainty.

***3. Farm management and agronomist***

Agronomist should be able to find out a better method of crop raising and cultivation that gives maximum profit to cultivator with minimum tillage.

***4. Farm management and entomologist/pathologist***

Entomologist or pathologist has to find out the desirable insecticide/pesticide/fungicide which can protect the plant with the minimum cost and risk.

***5. Farm management and agricultural engineer***

New tool or implement which the engineer invents should be such that rural people in the area can afford to purchase it and it should complete the operation with minimum cost.

## 1.6. Specific Objectives of Farm Management

## Farm management is a rational allocation of land, capital and labour that are relatively scarce to achieve a set of goals and objectives.

## The specific objective might be to maximize money profit or, recognizing the presence of uncertainty, to maximize the expected utility of risky profit or such money profit might be only incidental to other objectives or hardly relevant at all .

What are these set of goals or objectives that could be met by modern cultivators?

1. To produce enough agricultural products to:

* Feed the existing and increasing population;
* Substitute import;
* Promote export;
* Create some reserves or accumulations.

The actualization of these objectives is closely linked with agricultural policy, rural development plans, investment policy, evaluation of projects and appropriate technology recommendations for individual farms.

1. To provide reliable information that assists farmers in their farm management so that they are better to achieve their goals.

* Maximum profit/unit area or cost;
* Most profitable crop production and livestock raising methods;
* Reduction of cost/unit product;
* Evaluation of land and farm resources use.

1. To provide policy makers with reliable information on farmers and their management to formulate better government policies and development plans.

* Optimization of farm size;
* Determination of input-output coefficients;
* Use of profit-based technology and innovation;
* Evaluation of relative performance of different types of technologies;
* Producing goods or services efficiently.
  1. **Functions of Farm Management**

Dear learner, this topic will deal with function of farm management. It focuses main function of farm management and will deal with each function of management briefly. At the end of this topic, you should have deeper knowledge about the function of farm management.

**Question**: Define planning and write down steps in planning.

**Management has five main functions.** These areplanning, organizing, staffing, directing and controlling. They are separate but highly interrelated.

Farm manager is responsible for all management functions and all business functions, although the manager may not personally or physically do all these functions.

A). **Planning**: Mean the process of establishing a certain goal of action (a suitable course of action) activities, duties that a farm manager should do in order to attain the established and particular goals.

* + setting of goals and objectives
  + selection of activities to be implemented to achieve objectives
  + selection/ designing of strategies
  + making of SWOT( strengthen, weakness, opportunities and threats) analysis
  + Plan should be SMART( specific, measurable, achievable, relevant and time bounded)
  + Implementation of the plan:Once the planning process completed the best alternative must be selected and actions should be taken to change the plan in to practice through operation and implementation process. This requires the acquisition and organization of the necessary land, labour, machinery, livestock, and annual operating inputs. An important part of the implementation function is financing of the necessary resources. Since implementation can take time, it must begin early enough that all required resources are available at the proper time and place.

**b). Organizing:** Refers to forming the skeleton of a given business of the organization. It is not that much important in small scale farms as they don't have much complicated organization structure.

**C). Staffing:** Refers to arranging of staff members in areas where they are effective and important

**d). Directing:** Refers to coordinating, guiding or influencing task related activities as that the farm can achieve its objectives.

**e). Controlling**: Is the process of gathering feedback information. The objective is to see or investigate what has been done with what has been planned. Therefore, the decision makers can compare the actual result and the expected result.

## 1.8. Problems of Farm Management

Dear learner, this topic deals with farm management problems in developing countries. I think that you have good knowledge about existing farm management problems in your community.

**Question:** can you describe current farm management problems in your community? And identify similar farm management problems that exist in your community from the following discussion as under:

Farm management problems vary from place to place depending largely upon the degree of agricultural development and the availability of resources. Some of the most common problems in the field of farm management and planning are:

***1. The size of land holding***: fragmented landholding and unfavorable man-land ratio lead to poor financial position and limit the scope of farm business expansion. Farmers need to have reasonable landholding to produce enough for family at all times and sale for the market so that they could afford to buy modern inputs and processed manufactured goods for consumption and use.

***2. Farm as household***: The work habits of a farming population are closely associated with family food intake, living conditions, sanitation and purchasing power. This make difficult to draw line of demarcation between farm and household.

***3. Capital inadequacy***: Capital (fixed and working) is a serious deficiency in small farm development because of limited marketable surpluses. The new technologies (improved seeds, fertilizers, plant protection chemicals, machinery and irrigation) demand heavy investments. However, the small farmers, in developing countries, cannot meet these investments from their own financial sources.

The most pressing needs to keep farms on a growth path are:

* Low cost technology;
* Adequate and timely credit;
* Develop saving and investment habit of farming population;
* Develop community-run businesses;
* Add value to local products and resources; and
* Increase input productivity.

***4. Unemployment and underemployment labour***: this problem, in agriculture, results from the following:

* Farm landholding;
* Large family labour supply;
* Seasonal nature of production; and
* Lack of support to develop rural industries; and
* Lack of accessibilities.

Underemployment or unemployment in turns breeds laziness, social tension and frustration. It also reduces efficiency and productivity of rural labour.

***5. Slow adoption of innovation***: Small farmers usually conservative and sometimes skeptical of new doing practices because of the fact that established attitudes and values do not change overnight.

The rate of innovation adoption largely depends on the farmers’ willingness and ability to use the new information, and the capacity of research and extension programs to bring the finding across farmers so that they commercially exploited the research findings.

***6. Inadequacy of input supplies***: Farmers are willing to introduce new changes to their farms but they still face difficulty in obtaining the required quantity and quality on time to sustain the changes.

* Shortage of foreign exchange;
* Lack of raw materials;
* Lack of skill and capital for domestic industries;
* Lack of infrastructure; and
* Lack of communication and reliable markets

***7. Managerial ability***: The most important pressing problems for many years to come will be to improve the managerial skill of the large number of small farmers, extension agents and researchers in developing countries. This is necessary to make the attitudes of farmers, extension agents and researchers responsive to technological changes. Educating farmers about innovation on a mass scale is thus the most important need. Even illiterate people can be educated through demonstration or the application of new techniques and better ways of using the inputs available.

# 

# SUMMARY

Farm management is the collective term for various management strategies and methods that are employed to keep a farm productive and profitable. Farm management is the science which deals with the analysis of the farming resources, alternatives, choices & opportunities within the framework of resource restrictions & social & personal constraints of farming business. Farm management is the science of organizing and combining people, natural and material resources for the purpose of crop and livestock production in order to maximize profit while optimizing input use. Farm management is described as a science of decision-making applying economic principles and technology to production to maximize a set of goals based of relevant sociological, psychological and philosophical considerations.

Farm management is also important for making the **best use of scarce resources**. The nature and scope of farm management is the theory of optimal decision making in the organization and operation of a farm for profit maximization. Farm management science has many distinguishing characteristics from other field of agricultural sciences.

Management has five main functionssuch as: planning, organizing, staffing, directing and controlling. They are separate but highly interrelated. Farm management have relationship with many other sciences such as economic theories, other social sciences and political science, supporting sciences, physical and biological sciences. Some of the most common problems in the field of farm management and planning in developing countries are the size of land holding, farm as household, capital inadequacy, unemployment and underemployment, slow adoption of innovation, inadequacy of input supplies and managerial ability.

**Learning Activity**

**i. Review your understanding of the following terms.**

Farm Management Farm management

Scope Input Output

Planning Organizing, Implementation,

Function Controlling Economic principle

**ii. Fill in the blank in a given space**

1.\_\_\_\_\_\_\_\_\_\_\_\_\_ is a science applied to organize a firm for the purpose of securing the greatest continuous profit.

2. Farm management is described as a science of decision-making applying economic principles and technology to production to maximize a set of goals based of relevant \_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ considerations.

3. Farm management has close relationship with other social sciences like \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

4.\_\_\_\_\_\_\_\_\_\_ comprises the ability of individual people to do productive work**.**

**iii. Give answers for the following questions accordingly**

## 5. Write down problems of farm management.

6. Write down economic theories that play an important part in farm management analysis.

7. Write down factors that affect the success of farm business i.e., success of farm management depends on five factors and then writes down them:

8. List down production goals in farm management

9. Write down and discuss scope of farm management

10. Discuss the relationship of farm management with other science

11. Write down Specific objectives of farm management

12. Write down problems of farm management

# CHAPTER TWO: FARM DECISION-MAKING AND THE BASIC ECONOMIC PRINCIPLES APPLIED IN FARM MANAGEMENT

# Introduction

Dear learner, in previous chapter, a considerable time was allotted in introducing the subject matter of farm management. In this chapter, we will deal with concepts and classification of decision making, economic problems and steps in decision making and the basic economic principles applied in farm management.

**Question:** Life is full of choice. Do you agree with this statement? If you say yes; give your reasons.

**Economics can be defined as:** a social science which studies society’s use of scarce resources in the production of goods and services that can satisfy the unlimited human wants or desires. Economics is a science of choice. It studies how people choose to use scarce or limited productive resources (land, labour & capital) to produce various commodities.

Economics or *economic analysis* is the science of making choices so as to best achieve desired objectives given that only limited (physical and other) resources and opportunities are available and that the future is uncertain. There are no choices to which the science of economics cannot be applied. Decision making utilizes criteria to determine which alternative is the best one. There are no right or wrong decisions, only best decisions for the current situation.

Farm management is concerned with the allocation of limited resources among a number of alternative uses which requires a manager to make decisions. A manager, first, must consider the resources available for attaining goals which have been set. The manager may be faced with a number of alternative uses of the limited resources and must make decisions on how to allocate them among the alternatives to maximize profit from the total business. One major task for a manager is to allocate available resources between competing uses to the goals of the business. All problems of resources involve fundamental economic principles.

**Chapter objectives:**

By the end of this chapter, students will be able to:

* Describe the concept of farm decision making;
* Identify the type of decision making strategy;
* Identify and discuss the basic questions;
* List down steps of decision making in farm management;
* Explain the importance of marginal analysis for managerial decision making;
* Identify how the principle of comparative advantage;
* Explain the use of the equi-marginal principle in the allocation of limited resources;
* Explain the use of opportunity cost principle in the allocation of limited resources.

## 2.1. Concept of Decision Making in Farm Management

The allocation of limited resources among a number of alternative uses requires a manager to make decisions. Without decision nothing would happen. Even, allowing things to continue, as they are implies a decision. **Decision- making** runs through the whole process of management.

## 2.2. Classification of Decisions

Decisions made by farm managers can be classified in a number of ways. One classification system would be to consider decisions as organizational and operational, administrative and marketing decisions.

**1. Organizational decisions /strategic/long run decision:** are those in the general areas of developing plan, acquiring the necessary resources, and implementing the overall plan. Examples of such decisions are determining size of the farm, how much land to purchase, or lease, planning of additional building, machinery, irrigation facility, and decision on soil conservation, how much capital to borrow, and planning of what types of crops and livestock to produce. Organizational decisions tend to be long run decisions, which are not modified or evaluated more than once a year.

**2. Operational decisions/ tactical/short run decision**: are made more frequently than organizational decisions, a day to day activity, and short term in nature, small in investment and relate to the many details necessary to implement the plan of the business.

They may need to be made on a daily, weekly, or monthly basis and are repeated more often than organizational decisions as they follow the routines and cycles of activities. Examples of operational decisions are:

* Choice of crop varieties;
* Right time of sowing & method of sowing;
* Selecting fertilizer and seeding rates for a given field and year;
* Making changes in a livestock feed ration;
* Selecting planting and harvesting dates, marketing decisions, and daily work schedules.

**3. Administrative decision:** are decisions to be taken administratively to achieve the goal of the organization. Examples of administrative decisions are:

* Financing- optimum utilization of funds(sources of funds);
* Supervision;
* Accounting- farm recording;
* Adjustment of farm plan / business with a change in government policies and strategies;
* Home consumption or market.

1. **Marketing problem decision**

These include decisions on:

* Buying (inputs)/decision: such as what, when, from whom and how to buy;
* Selling (outputs)/ decision: such as what, when, for whom and how to sell.

## 2.3. The Basic Economic Problem: Scarcity and Choice

Dear learner, this topic elaborates basic economic problem is about scarcity and choice. It also covers four basic economic problems.

**Question:** What is the difference between free good and scarce or economic good?

What is the relationship between scarcity and choice?

What types of problems require a decision on a farm?

What are the basic characteristics of a management or economic problem?

The basic economic problem is about scarcity and choice. Economic problems exist, whenever resources are scarce. Because of scarcity, **choices** have to be made by producers, consumers and governments. Making a **choice** made normally involves a **trade-off** – this means that choosing more of one thing can only be achieved by giving up something else in exchange.

Every production decision with which a farm manager is confronted relates to one or a combination of the four farm management problems or questions.

There are also economic problems, and an economic problem has three characteristics:

 a) Goals or objectives to be attained,

 b) Limited resources could be used to reach these goals and objectives

c) Alternative ways to use the limited resources to attain the goals and objectives.

Given a range of alternatives, a farm manager should be capable of deciding what to produce, how much to produce, how to produce, and when to produce, to maximize the farm profit using a given sets of resources.

Problem solving is a continual process because of the many changes that affect these problem characteristics over time. Goals may change as the business owner grows older and with changes in the financial condition of the business.

Resource limits change as more land and capital are acquired. The number of production alternatives may increase as additional capital is required and new technology becomes available. Many problem solutions must therefore be viewed as only short term solutions. And the problem along with its potential solutions will need to be reconsidered as changes occur in the future.

Farm management as economics is **a problem solving and decision-making activity**.

It faces four basic economic problems namely (What to produce? How much to produce? And How to produce? When to produce?) Management is a problem solving and decision making activity. Many of farm management problems fall into one of the four types, each of which can be put into the form of a question. These four basic economic problems are discussed as under:

## 1. What to produce?

This refers to the identification of what mix of goods and services to produce. In other words, a farm manager should decide in some way or another, what collection of goods and services will mostly satisfy the needs of the consumers. It is a matter of deciding to produce only crops, only livestock or somecombination. The manager mustselect from many alternatives that can maximize the profit or best meet some other goals.

Some of the issues determined what to produce are:

* Natural conditions;
* Large surplus of benefits over the cost incurred;
* Population demand and purchasing power;
* Marketing opportunities and transportation facilities;
* The right combination of crops and livestock;
* Manpower resources availability; and
* Material resource supplies and availability.

## 2. How to produce?

This problem refers to technical and organizational problem of production. An economic system chooses what techniques to use to produce the desired level of output. It is the choices of production techniques (traditional or modern techniques).

The question of choice among different alternatives must be based on the following issues:

* Choosing the least cost/efficient methods or practices;
* The cheapest technological units in terms of efficiency;
* The availability of spare parts or service for the technology/product selected;
* Farm size and crop grown in the area;
* The topography of the land; and
* The technical recommendations and advice of experts.

## 3. How much to produce?

This refers to the amount of goods and services to be produced based on the farm goal. The farm manager should consider the points such as, how much is the market demand for the products? What is the future price of the farm products? Are the necessary resources available? etc.

A management problem to decide on level of input use based on:

* The overall goals of the farmer to maximize the return or profit;
* Minimization of costs and losses.

At national level, the question of how much to produce can be determined by how much a crop should be produced to feed the existing and increasing population in the country. Thus, the total quantity needed to be produced is related to the total cultivated or cultivable land and the yield level obtained per unit area.

At farm level, the question of how much to produce is determined by increasing farm input until the extra benefit no longer exceeds extra cost. The right combination of inputs should be practiced in order to reach the climax point.

On the other hand, the highest combination of resources till the maximum output is being obtained tells how much to produce at farm levels. This is often difficult to determine at farm level without having the necessary knowledge and conducting research trails.

## 4. When to produce?

Farmers take care of the time while they decide what to produce, how much to produce and how to produce? Farmers often face with questions, whether to produce normal, early or late variety of crop or what combination to use to get the best price during different periods.

Moreover, the problem of what to produce, how much to produce, what method of production to use and when to produce are interrelated phenomena that should be decided by:

1. ***Traditional method***: Experience of forefathers, primitive cultures, expertise recommendations, suggestions, etc.
2. ***The technical method***: This method considers the soil types, vegetation types, local climate, crop to grow, livestock to rare, resource available, population density of forage crops, range management, etc.
3. ***Economic method***: It is a method where we usually obtain the possible yield per unit area under minimum inputs. The concepts is closely linked up with:

* The additional yield obtained per additional cost incurred;
* The relative selling prices of the output over the production cost;
* Size of benefit and cost incurred; and
* Total income earned per household.

The traditional, economic and technical solutions may not be the right track to draw a precise solution. It is necessary to conduct a mass of experiments and demonstration trials at farm level mainly to find out the minimum variant of expense as to obtain the maximum return and to study the percent structure of input-costs on both crop and livestock production. However, the best proportions of inputs at one period may not be the best at another due to:

* Change in economic conditions;
* Change in methods of production;
* Change in the relative price of input and output; and
* Change in the real situations.

Thus, the economic, technical and traditional solutions should be fully supported by research investigations (findings and evidences).

## 2.4. Steps of Decision-Making Process

The process of making a decision can formalize into a logical and orderly series of steps. Important steps inthe decision making process are:

**A. Identify and define the problem:** Many problems confront a farm manager. The basic problems faced by all managers are:

* What to produce?
* How much to produce?
* How to produce?

Identifications of problems need attention. Manager must be alert to identify problems as quickly as possible. Once the problems identified, they should be concisely defined. Good definitions of problems will minimize the time required to complete the remainder of the decision-making steps.

**B. Collect relevant data, facts, and information:** Once a problem has defined and identified the next step is gathering data, relevant facts, evidences and information. The concise definition of problem help to identify the types of data needed. Data may be obtained from various sources. Whatever the source, the relative accuracy and reliability of the information obtained should be considered.

**The distinction between data and information are:**

**Data**: can be defined as an un-organized collection of facts from various sources. **Information**: can be defined as the final product obtained from analyzing data in such a way that useful conclusions and results are obtained.

Gathering data and facts and transferring them into information is a never ending task. Gathering data has a cost in terms of both time and money.

**C. Identify and analyze alternative solutions:** Once the relevant information is available; the manager can begin listing alternatives, which are potential solutions to the problems. The technique of brainstorming can be used and list any idea which comes to mind. Each alternative should be analyzed in a logical and organized manner to ensure accuracy and to prevent something from being overlooked. Good judgment and practical experience may have to substitute for expensive information.

**D. Make the decision –select the best alternative:** Selecting or choosing the best solution / the best alternative to a problem is not always easy, nor is the best solution always obvious.

Till to get the best solution, it may need to go back, redefine the problem, and go through the decision making process again.

**E. Implement the decision:** Selecting the best alternative will not give the desired results unless the decision is correctly and promptly implemented.Resources may need to be acquired and organized, which requires some physical actions to be taken.

To do or not to do may be an alternative and potential solution to a problem, but should be done after enough analysis to be sure that this is the correct decision.

**F. Evaluate the results and bear responsibility for the outcome:** Responsibility for the outcome of the decision rests with decision maker. It is difficult for the managers to avoid decision-making; it follows that they must bear the responsibility. Not every decision will be a perfect one. Careful observation, gathering additional data and information as well as analysis can help to modify and improve the future decisions, and allow corrections to be made.

A simplified flow chart shows the sequence of events in the decision making process.

Acquire data **→** Process data into information **→** Make a choice or decision **→ t**o maximize profit.

## 2.5. The Basic Economic Principles applied in Farm Management

Dear learner, under this topic, you will be introduced to the basic economic principles which are applied in managing a given farm conditions.

**Question**: It is true that all problems of resources involve fundamental economic principles. Explain it.

This principles are applied when the supply of inputs are limited. Each principle in general, is applicable to all the sections of farm management, as there is no separate principle or law for each component part of farm business.

Farm management principles serve as a guideline for collecting and using requisite information for rational decision making.

They also provide a set of tools for the preparation of farm budgets and production programmes. These principles help to provide answers to various farm problems and save time and energy otherwise lost in trials and errors to arrive at appropriate decisions. The following are some of the basic principles or laws involved in making rational farm management decisions:

1. The law of diminishing return
2. The law of equi-mariginal return
3. The law of opportunity cost
4. The law of substitution
5. The law of comparative advantage
6. The principle of combining enterprises

1. **The law of diminishing returns**: Mean that a successive increase in the use of inputs, holding other factors constant, and the marginal product we get from each additional unit of input will eventually declined.

**Marshal**, stated that an increase in capital and labour employed in the cultivation of land causes in general a less than proportionate increase in the amount of **produce raised** unless it happens to coincide with an improvement in the art of agriculture.

**J. Robinson**, stated that the law of diminishing returns as in usually formulated with fixed amount of any factor of production, successive increase in the amount of other factors will after a point, **yield a diminishing increment of output**.

The law of diminishing marginal return is a phenomenon of a **short- run production function** and it is valid when the following conditions are satisfied:

1. The technology of production is fixed;
2. There is at least one fixed and one variable input in the process of production;
3. The fixed factor and the variable factor (input) are combined to produce output.

The last condition is essential and that is why the law is sometimes known as the **law of variable proportion**.

This is more general in scope because the law of diminishing return becomes universally valid even in the situation where the combined factors vary at different rates thus, giving us their variable proportions which in turn affects the total, average and marginal products of the variable inputs.

**Law of returns**: There are three laws of returns namely:

1. Law of increasing returns
2. Law of constant returns
3. Law of decreasing returns

Table2-1: Proportion of returns

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Units of inputs used (x) | Total product  (y) | Average product (Ap) | Marginal product(Mp) | Proportionate  Increase | Law of return |
| 1 | 8 | 8 | - | more | increasing |
| 2 | 20 | 10 | 12 |
| 3 | 36 | 12 | 16 | equal | constant |
| 4 | 52 | 13 | 16 |
| 5 | 60 | 12 | 8 | less | decreasing |
| 6 | 66 | 11 | 6 |

**TP (Total product)**: It is the amount of product produced by different quantities of the variable input used (other factors being constant).

**AP (average product)**: It is the total product divided by the numbers of units of the variable input used to produce that product.



**MP (marginal product)**: It is the quantity which an added unit of the variable input adds to the total product. 

**2. The law of equi-marginal returns:** This is concerned with the allocation of the same amount of a limited resource among different enterprises. The laws states that profits are maximized by using a resource in such a way that the marginal returns from that resource are equal in all enterprises.

Table2-2: Total product (TP) and marginal physical product (MPP)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| units of nitrogen(N) each unit =40kg | TP | | MPP | |
| Y1  Qt/ha | Y2  Qt/ha | Y1  Qt/ha | Y2  Qt/ha |
| 0 | 20 | 21 | - | - |
| 1 | 40 | 44 | 20 | 23 |
| 2 | **50** | 56 | **10** | 12 |
| 3 | 59 | **66** | 9 | **10** |
| 4 | 63 | 70 | 4 | 4 |
| 5 | 60 | 68 | -3 | -2 |

Let us assume that a farmer has 200kg of nitrogen with him to apply on Y1 andY2

**Q1. What amount of N is a farmer allotted for each variety to maximize his yield?**

From the Table2-2 you observed that, based on the law of equi marginal return, a farmer can maximize his yield in a point where the MP product he got from each variety is equal to 10. So by using 80kg of nitrogen for Y1 and 120kg of nitrogen for Y2; he finds that their marginal physical products are equal. Hence he gets the maximum yield of **116qt**.

But we are interested more in economic returns, as such the physical returns should be converted into birr, and then see that the return of the last birr in each use is equal in order to maximize profit the marginal returns are equal. But each enterprise is getting less input in comparison to added cost- added return principle.

Example**:** A farmer has Br. 3000.00 and wants to grow sugar cane, wheat and cotton that are suitable for his farm situation. What amount of money should be spent on each enterprise to obtain highest profit?

Table2-3: Additional income from the marginal amount of Br. 500.00

|  |  |  |  |
| --- | --- | --- | --- |
| Amount of money  spent(cost) in Br. | Marginal return from each additional unit of Br. 500.00 | | |
| Sugar cane (Br.) | Wheat(Br.) | Cotton(Br.) |
| 500 | 800 | 750 | **650** |
| 1000 | 700 | **650** | 560 |
| 1500 | **650** | 580 | 550 |
| 2000 | 640 | 540 | 510 |
| 2500 | 630 | 520 | 505 |
| 3000 | 605 | 510 | 500 |
| Total return | 4025 | 3550 | 3275 |
| Net profit | 1025 | 550 | 275 |
| Average return per Br.  at 3000 | 1.34 | 1.18 | 1.09 |

**Question:** What inference do you draw from the Table2-3?

Should the farmer follow the **law of average return** or **the law of equi- marginal return**? If he goes by the average return, he gets a net profit of Br.1025.00 on sugar-cane. On the other hand, if he is guided by the law of equi- marginal returns where the marginal returns in each direction of his investments on the three crops are equalized i.e. **Br. 650.00**, he gets a net profit of **Br. 1200.00**. Therefore, in his investment decision, he should spend Br.1500.00 for sugar-cane; Br.1000.00 for wheat and Br.500.00 for cotton a total of **Br.3000.00**.

Table2-4: The net return based on the law of equi- marginal return

|  |  |  |  |
| --- | --- | --- | --- |
| Enterprise | Total income | Cost of production | Net profit |
| Sugar cane | 2150.00 | 1500.00 | 650.00 |
| Wheat | 1400.00 | 1000.00 | 400.00 |
| Cotton | 650.00 | 500.00 | 150.00 |
| **Total** | **4200.00** | **3000.00** | **1200.00** |

**4. The Law of opportunity cost:** An opportunity cost is the earning from the next best alternative scarified. It is foregone benefit mean that the benefit that you might have gained from choosing the next alternative. All activities that have a next best alternative have an opportunity cost. Opportunity cost is a measure of everything you sacrifice to attain a given objective.

**Example:** If a pair of bullock labour earns Br.20 per day on plowing, but it can also earn Br. 25 per day in the alternative employment of carting. The opportunity cost of plowing is Br.25 per day i.e. the value of the bullock labour in its best alternative use.

Under subsistence type of farming, the concept of opportunity cost can be applied to the production of cash crops, but the alternative earnings (opportunity cost) can only be determined by projected cash out lay cost and net returns.

Table2-5: Gross income basis, when costs are equal

|  |  |  |  |
| --- | --- | --- | --- |
| Enterprise | Gross income(Br.) | Cost of production(Br.) | Net income (Br.) |
| Tobacco | 3600 | 1000 | 2600 |
| Potato | 5600 | 1000 | 4600 |

**\*\*** The opportunity cost of growing tobacco is the gross income of Br.5600 which was scarified by not producing potato.

Table2-6: Gross income basis, when costs are unequal

|  |  |  |  |
| --- | --- | --- | --- |
| Enterprise | Gross income(Br.) | Cost of production(Br.) | Net income (Br.) |
| Tobacco | 3600 | 1000 | 2600 |
| Potato | 5600 | 1000 | 4600 |
| Wheat | 7000 | 1800 | 5200 |

**\*\*** The opportunity cost of growing potato is the net income of Br. 5200, which was scarified by not producing wheat.

**Question**: Assume that the only alternative that a farmer produces on his land is wheat. What is the opportunity cost a farmer producing wheat?

**5. The Law of substitution:** The tendency that operates through the whole field of economics, in production, exchange and consumption is to replace the less efficient by the more efficient agent.

**Example; -** Substitute labour by machine

- Substitute oxen power by tractor, e.t.c.

The law of substitution states that "when more than one means of producing a given result is known and available, **the least costly will be selected**. **Substitution rates**: substitution of one input for another or one product for another is expressed by marginal rate of substitution (MRTS).

**MRTS= --------** it shows that the number of units of X2 scarified for each unit increase in X1. In the same way, we deal with two products.

**5. The law of comparative advantage:** It is evident from the fact that farmers try to produce those commodities that maximize their net income. They normally include in their cropping scheme as large areas as possible of the most profitable crops to the area and for their particular farms. Hence, the determination of the type of farming is based on the principle of **Comparative advantage.**

**Types of comparative advantages:**

1. **Relative advantage**
2. **Absolute advantage**

**1. Relative /comparative advantage**

The law of comparative advantage states that each region/country should specialize in the production of goods and services in which it has a **comparative advantage**. It means that the law of opportunity cost in terms of amounts of other goods and services that must be foregone in order to produce the good. No country has comparative advantage, no trade between them. A country should specialize in and export those goods for which it has a **comparative advantage**.

The concept of comparative advantage is associated with:

* Resource endowment
* Resource productivity
* Cost of production of enterprises

If there are "equal differences in costs" the comparative advantage is equal in such situation, the consideration of **specialization** and **diversification** does not arise.

**Comparative advantage is most easily illustrated as example with two countries and two goods.**

A. **On yield basis (on one hectare area)**

|  |  |  |
| --- | --- | --- |
| Region | Teff | Sorghum |
| A( Gojjam farmer) | 15qt/ha | 10qt/ha |
| B (Harergeha farmer) | 7qt/ha | 14qt/ha |

\*\* The amount of "***Teff"*** that must be scarified in order to produce one unit of "***sorghum"*** in Gojjam region is larger than in Harereghe region. So to benefit both region farmers:

* **By comparative advantage,** the Gojjam farmers produce Teff, whereas, the Harereghe farmers produces sorghum.
* The Gojjam farmers can obtain sorghum more cheaply by buying it from Harereghe farmers, and the Harereghe farmers can obtain Teff more cheaply by buying it from Gojjam farmers.

**B. Based on net return per hectare basis**

The net return per hectare basis leads to the same conclusion as the marginal cost basis. This method is most widely used in farming for determining comparative advantage.

Here two crops, namely wheat and ground nut are considered.

Table2-6:Comparative advantage based on net return per hectare

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Crop-account | Region - A | | Region – B | |
| Ground nut (Br) | Wheat  (Br) | Ground nut  (Br) | Wheat  (Br) |
| Total income per hectare | 13000.00 | 13000.00 | 11500.00 | 8000.00 |
| Total expenditure per hectare | 7000.00 | 8000.00 | 7000.00 | 6000.00 |
| Net income per hectare | 6000.00 | 5000.00 | 4500.00 | 2000.00 |
| Return per Birr spent | 1.86 | 1.63 | 1.64 | 1.33 |
| % of Return above cost of input | 186% | 163% | 164% | 133% |

\*\* From the Table2-6, you will see that Region-A has a relative advantage in ground nut over that of ground nut in Region-B. But farmers in Region-B can make more profit by having largest possible area for ground nut relative to that under wheat.

\*\* From the Table2-6, you will also see that Region A farmers has a greater relative advantage in growing both wheat and ground nut than Region-B farmers, because the net income per hectare is greater as compared to Region-B.

**2. Absolute advantage**

Some nations have a comparative advantage in producing goods, mean that, with a given complements of resources one nation can produce more of an item than the other nation with the same quantity of resources. But the presence of an absolute advantage in the production of an item does not indicate whether the nation should specialize in the export of that good or the good should be imported.

Absolute advantage is when the production of two products in a given locality is compared rather than with the product produced elsewhere.

Example:

1. **On net return per hectare basis**

Table2-7: Absolute advantage on the basis of net return per hectare

|  |  |  |  |
| --- | --- | --- | --- |
| Crop type | Crop account | Region-A | Region-B |
| Wheat | Total income | 13000.00\* | 9000.00 |
| Total Expenditure | 8000.00 | 6000.00 |
| Net return per hectare | 5000.00 | 3000.00 |
| Return per Br spent | 1.63 | 1.5 |
| % of return above cost of input | 163% | 150% |
| Sugar cane | Total income | 20000.00 | 25000.00 |
| Total expenditure | 12000.00 | 13000.00 |
| Net return per hectare | 8000.00 | 12000.00 |
| Return per Br spent | 1.67 | 1.9 |
| % of return above cost of input | 167% | 190% |

NB: \* In Birr

From the Table2-7, you will see that region-A has an absolute advantage in wheat, because the net return per hectare or per Birr spent is greater than that of Region-B. Region-B has an absolute advantage in sugar cane, because the income from sugar is 190% which is greater than the cost.

**How does the law of comparative advantage direct the farmers in farming?**

The law of comparative advantage directs a farmer in the selection of those enterprises on the production which available resources have the greatest relative/ comparative, but not absolute advantage.

This is why we can find fruits and vegetable farming near to the city, sugar cane farming around sugar cane factory, sheep farming in the hills are the outcomes of the operation of this principle.

Specialized and diversified farming depends largely on the principle of **comparative advantage**.

**6. The principle of combining enterprises**

The principle of combining enterprises requires a prior study of the nature of relationship between enterprises. First consider the nature of relationships between enterprises. If the relationship is found to be complementary, efforts should be made to arrange resources for increasing the area of complementary. But if the enterprises are competitive their combination will depend upon the following factors:

1. Price ratio of products;
2. Substitution ratio of the product;
3. Per unit cost of production.

* When cost of production is equal, selling price is considered.
* When cost of production is unequal, net price is considered.

# SUMMARY

Economics is a science of choice **because economic resources are scarce or limited in supply.** Thus, economic problems exist, whenever resources are scarce. Because of scarcity, **choices** have to be made by producers, consumers and governments. Problem solving is a continual process because of the many changes that affect these problem characteristics over time. An economic problem has three characteristics such as: goals or objectives to be attained, limited resources could be used to reach these goals and objectives, and alternative ways to use the limited resources to attain the goals and objectives.

Decisions made by farm managers can be classified into four groups such as: organizational and operational, administrative and marketing decisions. There are four basic economic problems namely (What to produce? How much to produce? and How to produce? When to produce?)

Five steps inthe decision making process to be followed are:identify and define the problem; collect relevant data, facts, and information; identify and analyze alternative solutions; make the decision to select the best alternative; implement the decision; and evaluate the results and bear responsibility for the outcome.

Farm management principles serve as a guideline for collecting and using requisite information for rational decision making. Law of diminishing return is usually formulated with fixed amount of any factor of production, successive increase in the amount of other factors will after a point; yield a diminishing increment of output.

Based on the law of equi-marginal return, the farmer can determine the most profitable level of input use by equating marginal product to the input-output price ratio or equating the marginal revenue to marginal cost. Opportunity cost is a measure of every thing you sacrifice to attain a given objective. The law of substitution states that "when more than one means of producing a given result is known and available, **the least costly will be selected.**  The law of comparative advantage states that each region/country should specialize in the production of the most efficient (advantageous) product, leaving the second region to produce the other product.

**Learning Activity**

**i. Review your understanding of the following terms.**

Scarcity Choice Comparative advantage

Opportunity cost Alternative Substitution

Organization decision Operational decision Market decision

**ii. Fill in the blank in a given space**

2. Farmer decides to produce wheat on his/her 10 hectare of land. This kind of decision in economic problem is said to be\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3. Farmer determines to use tractor or modern techniques to produce cotton in large scale for commercial purpose. This kind of decision in economic problem solving is said to be\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

4. It is the type of decision that is made more frequently than organizational decisions, a day to day activity. This kind of decision is said to be\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**iii. Give answers for the following questions accordingly**

5. Write and discuss about four type of management decision

6. Explain the basic question on “how much to produce”?

7. Write down important steps inthe decision making process.

8. Based on the law of diminishing return, how can producer determine the most profitable level of variable input use?

9. Is fixity of inputs necessary in diminishing returns? Explain it.

# 

# CHAPTER THREE: THEORY OF PRODUCTION

# Introduction

Dear student, in the previous chapter, we have studied concepts of decision making, basic economic problems and steps of decision making, the basic economic principles applied in farm management. It also attempted how to allocate limited resources among a number of alternative uses. In this chapter, on other hand, we will deal with how a firm/producer combines economic resources so as to maximize output from a given technology/input. This chapter, therefore, focuses on understanding of production costs and production relationships.

**Topic objectives:**

By the end of this topic, you will be able to:

* Define and explain concept of production;
* Explain and classify production period.

## Production, Inputs and Production Period

# Production: is the process of changing economic resources into output. It is transformation of input into output. Example, change in form (raw material changed into finished goods), change in time (storage) and change in place (transportation).

# So production is the process of change inputs into output and its distribution as well as storage of tangible goods, not only tangible goods it also considers intangibles.

All inputs can be divided into two categories such asfixed and variable inputs.

**Fixed inputs**: are inputs whose quantity can not be varied during the period under consideration. Example. plant, equipment, etc.

**Variable inputs**: are inputs whose quantity can be changed during the period under consideration. Example. raw material, labour, power, transportation etc.

Also inputs – the factors of production classified as:

* Land – all natural resources of the earth – not just ‘terra firma’!

Price paid to acquire land = rent

* Labour – all physical and mental human effort involved in production

Price paid to labour = wages

* Capital – buildings, machinery and equipment not used for its own sake but for the contribution it makes to production

Price paid for capital = interest

**In economics, production period is classified as:**

1. **Short Run**
2. **Long run**

**A). Short run**: is that period of time in which some of the firms inputs are fixed.

* In the short run at least one factor is fixed in supply but all other factors are capable of being changed;
* Reflects ways in which firms respond to changes in output (demand);
* Can increase or decrease output using more or less of some factors but some likely to be easier to change than others;
* Increase in total capacity only possible in the long run;
* In times of rising sales (demand) firms can increase labour and capital but only up to a certain level – they will be limited by the amount of space. In this example, land is the fixed factor which cannot be altered in the short run.

**B). Long run**: is that period of time in which all inputs can be changed. No fixed inputs in the long run.

* The long run is defined as the period of time taken to vary all factors of production;
  + By doing this, the firm is able to increase its total capacity – not just short term capacity;
  + Associated with a change in the scale of production;
  + The period of time varies according to the firm and the industry;
  + In electricity supply, the time taken to build new capacity could be many years; for a market stall holder, the ‘long run’ could be as little as a few weeks or months;
* In the long run, the firm can change all its factors of production thus increasing its total capacity. In this example it has doubled its capacity.

**Learning activity**

1. \_\_\_\_\_\_\_\_\_\_is the period of time taken to vary all factors of production.
2. Write down the types of input.
3. Explain the difference between long term and short term production period.

## 3.2. Production Cost

Dear students, as you all know, most of the economic resources producers/firms/farmers use to produce goods and services are not free resources. To acquire the required resources producers incur cost. In this topic, we will deal with the meaning and behavior of various types of costs.

By the end of this topic, students will be able to:

* Define various concept of cost like explicit cost and implicit cost;
* Explain the difference between variable and fixed cost of production;
* Define and explain opportunity cost;
* Explain the short run cost of production: total, average, and marginal costs and their behaviors.

### 3.2.1. Definition and concept of cost

**Costs are defined**:as expenses incurred in organizing and carrying out the production process in business. Cost is defined as the monetary value of inputs used in production of items. Managers should be familiar with all of the costs and their classifications and understand which costs are important in decision- making at a particular time.

The definition of costs emphasizes on a charge that should be made. Cost does not mean a cash transaction, nor is a cash transaction always a cost.

A cash outlay may be an investment expense, the cost of which should be prorated over time. Costs may or may not involve a cash transfer during the given time period. Money outlay is not a perquisite for a cost.

Economic cost is the cost of all inputs used to produce goods and services. Actual or out of pocket expenditures firms incur to purchase inputs from the market are called explicit costs.

On the other hand, the estimated costs of the non-purchased inputs are implicit costs. Therefore, economic cost includes both explicit and implicit costs.

**Explicit/ cash/ accounting costs**: Refers to the cost of purchased input only. These are the actual monetary payments or cash outlays that business firms make to outsides. Who are suppliers of inputs (resources) to them? For example, the rewards for labour, land, capital and the payments made for raw materials, fuel transport, services, power, and the like are explicit costs to a firm**.**

**Implicit/ non-cash costs**: Thevalues of non- purchased inputs owned and used by a firm in is own production activities are said to be implicit costs. There are costs of the firm’s owned and self- employed resources in carrying out production activities. For example, the salary of an owner- manager or the estimated rent of a building that belongs to the owner of a firm is typical examples of implicit costs. The values of these self- owned inputs should be inputted or estimated from what theycould earn in their best alternative use.

N.BThe distinction between cash and non- cash cost does not mean that non- cash cost is any less important than cash cost. Both cash and non- cash costs must be taken in to account.

**Opportunity cost**: The economist’s concept of costs is based on the fact that resources are scarce and have alternative uses. Thus, to use a combination of resources in the production of a particular good means that certain alternative products must be forgone. However, this doesn’t rule out using the same resource, such as a tractor or farm labour, in various lines of production. It simply says production of one product entails giving up so much of the opportunity to produce some thing else. Thus production involves what economists call an opportunity cost.

The opportunity cost of producing a certain amount of a good is the value of the same resources in an alternative use or it is the value forgone because an input was used for another purpose. The real cost of an input may not be its purchase price. Its real cost in any one use is the income it would have earned in its next best alternative use. There is always an opportunity cost for every thing, whether or not a specific payment is made. The concept applies to leisure and recreation as well as to the production of goods and services. Top of Form



### 3.2.2. Production Cost in the Short- Run and the Long-Run

**The short – run cost can be defined**: As a production and marketing period within which there are both fixed and variable costs. The short-run refers to a period too brief to change the capacity of a firm such as a farm or an agri-business, yet long enough to permit some changes in the level of variable inputs utilization at which the fixed resources are used.

The short –run might be a single crop season, or two or three seasons, in which the quantity and cost of land have been fixed or it might be several years, such as the life cycle of an orange growth, during which there is no attractive opportunity for buying or leasing more land or for disposing of some of the land being used but the existing fixed resources can be used more or less intensively in the short-run.

**The long – run cost can be defined:** As a production and market period within which all costs are variable. The long-run refers to a period of time which is extensive enough, from the view point of existing firms, to permit them to change all the resources employed, including the production capacity of the firm. Also, from the view point of an industry the long-run permits existing firms to go out of business and new firms to enter the market. For example the long-run permits all farmers who are not making the normal profit to continue farming. It allows farmers to change from one enterprise to another in whatever might be profitable, and it permits all new farmers who may be attracted to agriculture to enter farming.

### 3.2.3. Production Costs in the Short – Run

**Fixed costs**: Are the costs incurred even no output is produced. They are unaffected by any variation in the quantity of output. They exist only in the short-run and are equal to zero in the long-run. They are some times called overhead'' or '' sunk’’ or '' supplementary costs.

Fixed costs exist at the same level regardless of how much or how little the resource is used. The only way they can be avoided is to sell the item.

They include the explicit costs of property taxes, invest on farm mortgages, and other debt contracts, and contract payments for year- round labour.

They also include implicit charges, such as a return on the owner's equity an allowance for depreciation and perhaps an additional budget item for the living expenses of the farm operator's family.

**Total fixed cost (TFC**): Is the summation of several types of fixed costs. Depreciation, interest, repairs, taxes, and insurance are the usual components of TFC. They are easily remembered as the '' DIRTI 5'' costs.

Total fixed costs (TFC) remain constant as output increases. Average fixed cost (AFC) = Total Fixed Costs (TFC) / Output (Q). Average fixed costs will fall continuously with output because the total fixed costs are being spread over a higher level of production causing the average cost to fall.

|  |  |
| --- | --- |
| **Average fixed cost (AFC)** = | Total Fixed Costs (TFC) |
|  | Output (Q) |

An increase in fixed costs has no effect at all on the variable costs of production. This means that only the average total cost curve shifts. There is no change at all on the marginal cost curve leading to no change in the profit maximising price and output of a business.

**Average fixed costs** will **fall continuously** with output because the total fixed costs are being spread over a higher level of production causing the average cost to fall. Average fixed costs falls as output increases. A business can "spread their over head costs" by increasing output in the short run. Average fixed cost will never be zero if there are positive total fixed costs.

**Variable costs / operating costs**: Variable costs represent expenses that vary with the level of output. In other words, variable costs are costs which change with changes in output, starting at zero when output is zero; variable costs exist both in the short run and long-run period of production. All costs are considered to be variable costs in the long-run.

Marshall called variable cost the prime cost of production items as feed, fertilizer, seed, chemicals, livestock medicine and fuel for operating machines and other operating expenses are examples of variable costs. Total variable cost is the sum of all variable expenses incurred in the production process.

**Total cost (TC**) in the short-run (SRTC) is the sum of total variable and total fixed costs. Total cost in long –run (LRTC) is the variable cost at which each quantity of output can be produced when no resources are fixed in quantity or rate of use.

TC = TVC + TFC= in the short –run

TC = TVC = in the long –run

**Average variable cost (AVC)** = Total Variable Costs (TVC) /Output (Q); AVC depends on the cost of employing variable factors compared to the average productivity of these factors (usually labour productivity). If additional units of labour can be hired at a constant cost there will be an inverse relationship between average product and average variable cost. Therefore, when average product is maximised, AVC will be minimised.

**Marginal cost (MC):** is the additional cost incurred to get one more unit of the output. It is measured as

|  |  |
| --- | --- |
| **(MC)** = | ∆Total Costs (∆TC) |
|  | ∆Output (∆Q) |

****

**Cost MC ATC**

**AVC**

**Output**

Figure3-1: Illustration of average and marginal cost curve

Example: Table3-1: Represents cost of production

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Q | TFC | TVC | TC | AFC | AVC | ATC | MC |
| 0 | 100 | 0 | 100 | - | - | - |  |
| 1 | 100 | 50 | 150 | 100 | 50 | 150 | 50 |
| 2 | 100 | 90 | 190 | 50 | 45 | 95 | 40 |
| 3 | 100 | 120 | 220 | 33.33 | 40 | 73.33 | 30 |
| 4 | 100 | 140 | 240 | 25 | 35 | 60 | 20 |
| 5 | 100 | 150 | 250 | 16.67 | 28.33 | 45 | 20 |
| 6 | 100 | 170 | 270 |  |  |  |  |
| 7 | 100 | 200 | 300 |  |  |  |  |
| 8 | 100 | 240 | 340 |  |  |  |  |
| 9 | 100 | 290 | 390 |  |  |  |  |
| 10 | 100 | 360 | 460 |  |  |  |  |

**Learning activity**

**i. Fill in the blank in a given space.**

1. \_\_\_\_\_\_\_\_\_\_\_ is the value forgone because an input was used for another purpose.
2. **\_\_\_\_\_\_\_\_\_\_\_**are the costs incurred even no output is produced
3. \_\_\_\_\_\_\_\_\_\_\_ will fall continuously with output

**ii. Give answers for the following questions accordingly.**

1. What are the implicit and explicit costs that one farmer in your locality incurs to produce maize or other products?
2. What is opportunity cost?
3. Explain the difference between variable and fixed costs?
4. Calculate AFC, AVC, and ATC and fill the remaining blank space based on the information given in Table3-1.

## 3.3. Production Function

Dear student, are you familiar with concept of production function before? If you say no, don’t worry! Under this topic, we will see major production relationships such as: factor–product, factor-factor and product-product relationship in detail. Production function shows the technical relationship between inputs and output. It describes the amount of output expected from different combination of input usage.

**Question:** Dear student, do you understand what production function means?

**Objectives of this topic:**

Dear student, at the end of your study on this topic, you will be able to:

* Show the relation between a variable input and an output by use of a production function;
* Identify the major difference between the three different production relationship;
* Explain and exemplify factor –product relationship;
* Describe and exemplify factor –factor relationship;
* Discuss and exemplify product –product relationship;
* Describe the calculation of average and marginal physical products;
* Illustrate the law of diminishing returns;
* Find the profit-maximizing point using the concepts of marginal value of product and marginal input cost;
* Find the profit-maximizing point using the concepts of marginal revenue and marginal cost.

The production function is a systematic way of showing the relationship between different amounts of a resource or input that can be used to produce a product and the corresponding output. That is, it is the physical relationship between input and output. The relationship shows the rate of transformation of input to output.

* Mathematical representation of the relationship:
* Q = f (X1, X2, X3, -----------, Xn)
* Output (Q) is dependent upon the amount of capital (X1), land (X2) and labour (X3) used

Where, Q= output

f= function

Xi= inputs in the production process

The major production relationships fall under three categories, namely:

1. **Factor –product relationships** or input-output relationship-production function: this relationship is concerned with resource allocation to optimum production. The choice indicator to be used is price ratio.

2. **Factor-factor or input–input** relationship or input combination: this relationship is concerned with minimizing cost at a given level of output. The choice indicators are price ratio and substitution ratio.

3. **Product-product relationship** or output-output relationship or enterprise combinations: this relationship is concerned with optimum combination of outputs for a given input level. The choice indicators are price ratio and substitution ratio.

To be specific the production function can be expressed in terms of:

* Tabular form
* A graph
* An equation/ algebraic to specify maximum output rate from a given amount of inputs used.

### Factor -Product or Input -Output Relationship

A basic concept in economics is the production function. It is a systematic way of showing the relationship between different amounts of resource or input that can be used to produce a product and the corresponding output or yield of that product. In economics output or yield is generally called total physical product, which will abbreviated TPP.

In other agricultural disciplines, the same relationship may be called response curve, yield curve, or input-output relationship.

Whatever the name is, a production function shows the amount of output that would be produced by using different amounts of a variable input. It can be presented in the form of:

* A table/tabular presentation or tabulation
* Graph
* Mathematical equation.

**A). A table/tabular presentation or tabulation**

i. Short run production function may be represented as in Table3-2.

Table3-2: Short run production function

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Units of input  (labour in hour) | Capital | TPP | APP | MPP |
| 1 | 5 | 5 | 5 | - |
| 2 | 5 | 11 | 5.5 | 6 |
| 3 | 5 | 18 | 6 | 7 |
| 4 | 5 | 25 | 6.25 | 7 |
| 5 | 5 | 30 | 6 | 5 |
| 6 | 5 | 32 | 5.3 | 2 |
| 7 | 5 | 32 | 4.3 | 0 |
| 8 | 5 | 28 | 4.5 | -4 |

**TPP (Total physical product)**: It is the amount of product produced by different quantities of the variable input used.

# APP (Average physical products): It is possible to calculate the average amount of output or TPP-produced by each unit of input at each input level. This value is called average physical product (APP). APP is calculated by the formula:

APP = 

# MPP (Marginal physical products): The term marginal refers to incremental changes, either increases or decreases, which occur at the edge or at the “margin.”

# It may help to mentally substitute “extra” or “additional” whenever the word marginally is used. But keep in mind that the “extra” can be negative.

# Marginal means additional or extra. MPP is the additional or extra TPP-produced by using an extra unit of input. It requires measuring changes in both out-put and input.

Marginal physical product is calculated as:

MPP =

The numerator is the change in TPP caused by a change in the variable input. The denominator is the actual amount of change in the input. Marginal physical product can be positive or negative.

It can be also zero if change in input level causes no change in TPP. A negative MPP indicates too much variable input is being used relative to the fixed input(s) and this combination depresses TP

ii. Long run production function may be represented as in Table3-3.

Table3-3 long run production function for an output (Q) from various combination of two inputs

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Number of machines hours(k) | Number of labour hours | | | | | |
| 1 | 2 | 3 | 4 | 5 | 6 |
| 4 Output | **500** | **520** | **540** | **560** | **590** | **620** |
| 3 | **450** | **470** | **500** | **520** | **560** | **580** |
| 2 | **400** | **420** | **450** | **480** | **500** | **520** |
| 1 | **350** | **400** | **390** | **410** | **430** | **450** |

# B) Mathematical presentation of production function

y=f(x) where y=dependent variable (output resulting from the production process)

x = an aggregate independent variable (input that we change)

f= function

y = f (x1|x2----------- xn) for short run production

Where, x1 = the variable/ input, example, fertilizer

X2-xn=all fixed inputs for short period of time (e.g. land, labour, capital, etc.)

Therefore, the variation of y depends on the variable input x1.

Example by considering a linear production function

y = a+bx or y = 20+4x

Where, a. indicates the amount of y to be produced with non-use of x

b. indicates the slope of linear curve or marginal product we get from use of one additional unit of input x

# C) Graphical Illustration of a production function

Notice that TPP or output increases at an increasing rate as the input level is increased from zero. As the input level is increased further, TPP continues to increase, but now at a decreasing rate, and eventually begins to decline absolutely as too much variable input is used relative to the amount of fixed inputs available. As indicated in Table3-2 and figure 3-2, as TPP increases at increasing rate, both MPP and APP are increased (MPP is increasing along with APP).Where TPP changes from increasing at increasing rate to increasing at a decreasing rate, MPP reaches at maximum and declines continuously having a value of zero where TPP reaches its maximum.

APP increases over slightly longer ranges than MPP before beginning to decline. The relationships between TPP, APP and MPP used to divide the production function into three regions. Stage I begin at the zero inputs level and continue to the point where APP is maximum and equal to MPP. Stage II begins where APP is maximum and ends where MPP is zero (or TPP is zero). Stage III is the range of input levels where MPP is negative and TPP is declining absolutely.

**Economic theory gives us two types of factor-product relationship in production function.**

1. Proportionate relationship: In this relationship - some inputs are fixed, while quantities of other inputs vary showing short-run relationship.

2. Scale relationship: In this relationship, all inputs vary no fixed input. It is for a longer period, showing long run relationship.

**1. Proportionate relationship:** the physical input-output relationship with one variable input with fixed inputs. In this relationship, there are three stages of production.

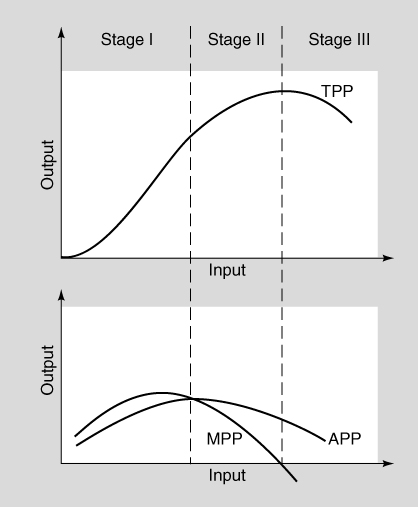


Figure 3-2 Graphical illustration of a production function

Stage I: APP increasing, MPP>APP, TPP increasing

Stage II: APP decreasing, MPP<APP, TPP increasing

Stage III: TPP decreasing, MPP<0

**Relationship between TPP, APP and MPP**

|  |  |
| --- | --- |
| TPP Vs MPP | MPP Vs APP |
| * When MPP increases, TPP also increases at increasing rate * When MPP decreases but greater than zero, TPP increases at decreasing rate * When MPP=zero, TPP is at its maximum * When MPP< zero, TPP declines | * When MPP greater than APP, APP is increasing * When MPP is equal to APP, APP is at maximum * When MPP is Less than APP, APP is decreasing |

# The Law of diminishing returns: The law stated that, if increasing amount of one input is added to a production process, while all other inputs are held constant; the amount of output added per unit of the variable input will eventually decrease. The law is a generalization based on experience that the use of increased inputs leads to less than proportionate increase in output.

The term diminishing return can be described in terms of either physical production or economic returns. TPP, APP or MPP values begin to diminish or decline after some point as more of the variable input is used.

Three stages of the law of diminishing returns:

1. Diminishing marginal returns(Stage I)
2. Diminishing average returns(Stage II)
3. Diminishing total returns(Stage III)

The law takes into consideration total, marginal and average product curves for a variable input (x) in combination with the fixed inputs, the relationship is expressed through this common "**law of diminishing marginal return**". For diminishing marginal returns **to exist**, **one or more fixed inputs** must be used in the production process in addition to the variable input.

**How Much output to produce under the law of diminishing return**?

**(Rules of profit maximization)**

In this discussion, we will concentrate on finding the input level which maximized profit. There is also a related question. How much output should be produced to maximize profit?

To answer this question directly requires the introduction of two new marginal concepts namely marginal revenue (MR) and marginal cost (MC**).**

**Marginal revenue (MR):** Is defined as the change in income or the additional income received from selling one more unit of output. It is calculated from the equation

**Total Revenue (TR)** is the same as total income. Total revenue (TR) is used in place of total value product when discussing output levels**.**

***Marginal revenue (MR):*** Is constant and equal to the price of output. The additional income received from selling one more unit of output will equal the price received for that output.

**Marginal Cost (MC**)**:** Is defined as the change in cost or the additional cost incurred for producing another unit of output. It is calculated from the equation:

**The Decision Rule**- MR and MC are compared to find the profit maximizing output level. When MR is greater than MC, the additional unit of output increases profit as the additional income exceeds the additional cost. Conversely, if MR is less than MC, producing the additional unit of output will decrease profit. At the output level where MR=MC, profit will be at its maximum level. There is only one profit maximizing combination of input and output for a given production function and a given set of prices. If MVP > MIC, additional profit can be made by using more input. If MIC > MVP, less input should be used.

**Summary: Rule of profit maximization**

|  |  |  |
| --- | --- | --- |
| Stage-I | MR>MC | The quantities of the inputs used are so small relative to the fixed input that much of the fixed input wasted. Hence, produce more by using more units of input for profit maximization(expand output) |
| Stage-II | MR=MC | Optimum level of input use for profit maximization. Both the variable input and fixed input are being used in efficient amounts relative to each other |
| Stage –III | MR<MC | There is overuse of input relative to fixed input. Since, the MP of the input is negative; more of the input actually makes the output decline(reduce input used) |

**For one input and many enterprises:** Since the price of input (Px) is the same, the marginal physical returns must be equal. As such, the law holds well in such a situation also;

1. When capital is unlimited (profit is maximized):

Px

2. When capital is limited (profit is maximized):

Px

**Elasticity of production (Ep):** It is a measure of the responsiveness of production with a minor change in input. It is expressed as a percentage change in output as compared to a percentage change in input.

It is computed as:

 **----------------=--------------=**

**Example:** let the application of 4 units of input (land in hectares) give rise to 50 units of output of wheat. If the input is increased by 2 units, the output increases by 10 units. Find the elasticity of production?

Solution: the relative change in input=2/4=0.5=50%

The relative change in output=10/50=0.2=20%

Ep=20/50=0.4 or MPP=**** APP=Y/X=50/4=12.5

Ep==5/12.5=0.4----- it shows a decreasing return.

If the value of:

Ep>1---- increasing return----- Stage-I

Ep=1----- constant return------ Stage-I

Ep<1------decreasing return-----Stage-I &II

Ep<0----- negative return-------Stage-III

**Scale relationship**

* Under scale relationship we assume that all inputs are variable and none of fixed inputs
* All the inputs such as land, labour, capital and management which go into production are increased at the same proportion.
* Here we talk about return to scale

Y= f(x) where Y= yield

x= is the aggregate of all the input factors

There are three possibilities resulting from the expansion in scale (increase use of resources at the same rate).

Example:

* From 2 ha of land to 4 ha of land
* From 20 workers to 40 workers
* From 1000 capital to 2000 capital
* From one management to two management

**Q.** what is the difference between MPP and return to scale?

**Marginal product:** Describes the change in output levels as a single input level changes.

**Return to scale:** Refers to the direction of change in output when all inputs vary (change) in the same proportion. It describes how the output level changes as all inputs change in direct proportion.

**Constant return to scale:** When the proportionate increase in all inputs results in an equally proportionate increase in output (double- double).

**Increasing return to scale**: When the proportionate increase in output is greater than proportionate increase in input (Example, 2 times output, 1.5 times in input).

**Decreasing return to scale:** When the proportionate increase in output is less than proportionate increase in input (Example, 1.5 times output, 2 times in input)

Table3-4: Factor-product relationship for profit maximization

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Units of labour input used | Output (Y) | TC | TR | Profit | MR | MC | MPP | Px/Py |
| 0 | 0 | 0 | 0 | 0 | - | - |  | 3 |
| 1 | 8 | 30 | 80 | 50 | 10 | 3.75 | 8 | 3 |
| 2 | 10 | 60 | 100 | 40 | 10 | 15 | 2 | 3 |
| 3 | 15 | 90 | 150 | 60 | 10 | 6 | 5 | 3 |
| **4** | **18** | **120** | **180** | **60** | **10** | **10** | **3** | **3** |
| 5 | 18 | 150 | 180 | 30 | 0 | 30 | 0 | 3 |
| 6 | 15 | 180 | 150 | -30 | 10 | -10 | -3 | 3 |

Let Px= 30 Birr Py=10Birr

**We can see from the Table3-4 that profit is maximized where:**

* **MR=MC**
* **ΔY/ΔX= Px/Py**
* **MVPx= Px-----or-----MPPx\*Py=Px**

**Profit it maximized at Birr 60 by using 4 units of labour.**

### 3.3.2. *Factor-Factor Relationship (the question of input substitution)*

Dear learner, in factor-product relationship we dealt with all other factors of production except one factor is fixed. Under this topic, we will deal with the possibility of substituting one factor(X1) for another(X2) as product level(Y) is held constant. Also, in factor- factor relationship.

We shall study the combination of two or more inputs for a given level of output with the objective of minimizing cost.

Thus, objectives of this analysis of factor-factor relationships are two fold:

1. Minimization of cost at a given level of output; and

2. Optimization of output to the fixed factors through alternative combinations of resource use that produce unique amount of output.

One of the most important or the basic decisions a farm manager must make is how to produce a given product. Most products require two or more inputs in the production process, but the manager can often choose the input combination or ratio to be used. The problem is one of determining if more of one input can be economically substituted for the less of another and what is the least cost combination of inputs to produce a given amount of output. Substitution of one input for another occurs frequently in production process. The manager must select that combination of inputs, which will produce a given amount of output or do a certain task for the least cost. In other words, the problem is to find the least cost combination of inputs, as this will maximize the profit from producing a given amount of output. The manager is always asking the question: how inputs are be combined to produce the given amount of product at a minimum cost. The least cost combination of two inputs is determined by finding the point where the substitution ratio is equal to inverse price ratio.

**----------------------------------- For two inputs and one output**

**Input substitution ratio**: The first step in analyzing a substitution problem is to determine if it is physically possible to make a substitution and at what rate. The substitution ratio is defined as the rate at which one input will substitute for another, is determined from the equation:

As more of one input is substituted for another, it becomes increasingly difficult to make the substitution and still maintain the same level of output.

More and more of the added input is needed to substitute for a unit of the input being replaced which causes the substitution ratio to decrease.

***The question is how much each of be combined to produce the given amount of product at minimum cost.***

***The decision rule:*** Identifying the type of physical substitution which exists and calculating the substitution ratio are necessary steps, but they alone do not permit a determination of the least cost input combination. Input prices are needed and the ratio of the input prices is compared with the substitution ratio. The price ratio is calculated from the equation:

***A least –cost input combination is determined by finding the point where the substitution ratio is equal their inverse price ratio.***

**----------------------------------- For two inputs and one output**

Where x1 and x2 are inputs, Px1 andPx2 are price of respective inputs.

**** Slope of iso-quant ****Slope of iso- cost line

In any substitution problem, the least cost input combination depends on both the substitution ratio and the price ratio. The substitution ratio will remain the same over time provided the underlying physical and/or biological relationships do not change. However, the price ratio will change as the relative input prices change, which may result in a different input combination becoming the new least –cost combination**.**

As the price of one input increases relative to the other, the new least cost input combination will tend to have less of the higher priced input and more of the now relatively less expensive input.

***For more than two inputs and one output***

The principle of least cost combination of two variable inputs can be extended to three and more inputs for a given level of output. We use the following equations;

a). When MPP and the price of the inputs are considered



----------This equation states that the inputs are being used in their optimum proportion when the marginal product of the last unit of X has the same relationship to the price of X as existed for X1 and X3.

b). When MVP and the prices of inputs are considered

1

1--------------This equation tells us that inputs are combined in such quantities that their MVPs are equal to their prices. The expression leads to the decision that MC=MR=price of output (unit price). When the capital is limited, we will have >1 in place of +1 in the above equation.

Exercise: 3 inputs and 1 output level

We are given inputs X1, X2 and X3 and the output level with production possibilities as given below; show the inputs are to be combined at least cost.

Given:

i. Production level: 271 units of the product Y, price of 0.25 per unit

ii. Inputs: X1, X2 & X3 price at 1, 0.75, and 0.25 per unit respectively

iii. Production possibilities: the marginal products are given as follows:

Table3-5: Least cost combination of inputs

|  |  |
| --- | --- |
| Units of inputs | Corresponding marginal products |
| X1, 1 to10 | 30,25,24,22,20,12,8,6,4,2 |
| X2, 1 to 8 | 20,18,16,15,11,6,3,1 |
| X3, 1 to 5 | 12,10,5,3,1 |

Q. calculates the least cost combination of inputs for producing 271 units of Y?

Answer: find  for each unit of input

X1 at 9=4\*0.25/1=1 X2 at 7=3\*0.25/0.75=1 X3 at 5=1\*.25/0.25=1

Minimum cost= (9\*1) + (7\*0.75) + (5\*0.25) =15.5

*Maximum profit= (271\*0.25)-15.5=52.2*

Example.1. Assume that a firm combination of two inputs (X1&X2) for producing 20 liter of milk. Let that price X1=Br.11/kg; price of X2=Br.1/kg. Then find the least cost combination of two inputs that maximizes profit.

Table3-6: Decreasing rate of substitution

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| combination | Silage(X2)  in kg | Hay (X1)  in kg | ΔX2 | ΔX1 | ΔX2/ ΔX1  (MRS) | Cost of  production | Output  level |
| 1 | 40 | 0 | - | - | - | 40 | 20 |
| 2 | 24 | 1 | 16 | 1 | 16 | 35 | 20 |
| 3 | 13 | 2 | 11 | 1 | 11 | 35 | 20 |
| 4 | 6 | 3 | 7 | 1 | 7 | 39 | 20 |
| 5 | 2 | 4 | 4 | 1 | 4 | 46 | 20 |
| 6 | 0 | 5 | 2 | 1 | 2 | 55 | 20 |

We said that least cost combination of two inputs is determined by finding the point where substitution ratio is equal to inverse price ratio. Therefore, the price ratio is 11. Thus, the farmer can maximize his profit by using 13 kg of X2 and 2 kg of X1 with a minimum cost of 35.00.

To deal about the equilibrium combination of two inputs at least cost, we have to know the concept of iso-quant and iso-cost line.

Let us see the definition of the following terms for the understanding of the problem:

1. Production surface
2. Iso-quant
3. Iso-cost

1).***Production surface:*** The relationship between inputs and output can be depicted be a three dimensional diagram showing a production surface. In order to condense three dimensional figure into a two dimensional graph, an iso-quant is drawn which shows various combination of inputs to produce a given amount of output.

Table3-7: Input-output relationship with two variable inputs (production surface)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Quantity of out put(Y) | | | | | | | |
| Input X1( fertilizer) in kg | 5 | 42 | 50 | 60 | 67 | 55 | 66 |
| 4 | 37 | 47 | 53 | 68 | 69 | 70 |
| 3 | 30 | 37 | 47 | 54 | 67 | 74 |
| 2 | 21 | 30 | 37 | 46 | 47 | 67 |
| 1 | 10 | 21 | 27 | 35 | 37 | 49 |
| 0 | 0 | 8 | 15 | 21 | 30 | 37 |
|  | 0 | 1 | 2 | 3 | 4 | 5 |
| Input X2( Compost) in kg | | | | | | | |

Each contour line represents the various combinations of two inputs X1 and X2, while other inputs are fixed to the production of a given quantity of output Y.

2). ***Iso-quant:*** It is another expression of iso-product curve, which represents various combination of two inputs that yield a given (the same) level of output.

A

Iso-quant

B

Figure3-3: Linear iso-quant

If we go right to the origin the output level increases. Thus an iso-quant far from the origin the output level is increasing.

**Properties of iso-quant**

1. *They slope down ward:* because, if more of one input used, less of another input will be employed at the given level of output.

*2. They are convex to the origin*: because of the diminishing marginal rate of substitution of one input to another with a given output level the additional units of an input will replace less and less units of another input.

3. *Iso-quants do not intersect each other*: because it is impossible to have two different outputs from a single combination of inputs. If they across, they violates the law of diminishing rate of substitution.

4. Iso-quants far from the origin have highest level of output.

**Shapes of iso-quants:**

The shape of iso-quant for different quantities of output depends up on the substitutability of two inputs. They might be substitute:

* At decreasing rate
* At constant rate
* At increasing rate

a). convex iso-quant b). Straight line iso-quant

Figure3-4: convex iso-quant curve Figure3-5: linear iso-quant curve Substitute at decreasing rate Substitute at constant rate

c). Right angel iso-quants

Figure3-6: Right angel iso-quant curve

No substation of inputs (fixed ratio)

Table3-8: Iso-quant rate of substitution

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Decreasing rate of substitution | | | Constant rate of substitution | | | Increasing rate of substitution | | |
| X2 | X1 | Δ X2/ Δ X1 | X2 | X1 | Δ X2/ Δ X1 | X2 | X1 | Δ X2/ Δ X1 |
| 9 | 0 | - | 9 | 0 | - | 10 | 1 | - |
| 6 | 2 | 1.5 | 6 | 2 | 1.5 | 8 | 2 | 2 |
| 4 | 4 | 1 | 3 | 4 | 1.5 | 5 | 3 | 3 |
| 3 | 6 | 0.5 | 0 | 6 | 1.5 | 1 | 4 | 4 |

NB: why decreasing rate of substitution occur, because of operation of the law of diminishing return.

***Slope of iso-quant***

The slope of iso-quant is the marginal rate of substitution of one input for another. The -- it is the marginal rate of substitution of X1 for X2.

c). **I*so-cost line:*** we call it equal cost line, which indicating all possible combination of two inputs that can be purchased with a given amount of investment fund.

***Example:*** suppose a farmer has Br.100 to spend on two inputs X1 and X2. The price per unit of X1 is Br. 20.00 and that of X2 is Br.10.00. Thus, he can purchase either 5 units of X1 or 10 units of X2. On a diagram when these two points are joined by a straight line, it forms an iso-cost line for an outlay of Br.100.00. Any number of X1 and X2 costing the same amount can be traced on the line. Similarly, iso-cost lines can be drawn for outlays 50 and 150 and so on.

Let the iso-cost be (I), the total cost should not exceed I. Assume that, the price of X1 is Br. 20 per unit, while price of X2 is Br. 10 per unit and iso-cost is Br.100.

B

A

Figure3-7: Iso-cost lines

Any point in the line BA represents an expenditure of Br.100 for the corresponding number of units of X1 and X2. The Br.150 line is proportionally farther to the right indicating that more of either X1 or X2, or both can be purchased at the price.

***Slope of iso-cost line***

The slope of an iso-cost line is expressed as the ratio of the price of one input to the price of another input i.e. **-------** when X1 is on the X-axis and X2 is on the Y axis.

***Properties of iso-cost line***

1. Iso-cost lines are straight lines, because a farmer has a control over the prices purchased by him.

2. Iso-cost lines farther to the right show higher costs and near to the left show lower costs. The birr 150 line is proportionately farther to the right.

3. With change in the prices of inputs, the slope of iso-cost line changes.

***Summary of rule of decision***

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Rule | Marginal rate of substitution |  | Price ratio | Under principle of substitution |
| 1 | (ΔX2\*Px2) | > | (ΔX1\*Px1) | Increase the units of X1 or decrease units of X2 |
| 2 | (ΔX2\*Px2) | < | (ΔX1\*Px1) | Increase the units of X2 or decrease units of X1 |
| 3 | (ΔX2\*Px2) | = | (ΔX1\*Px1) | Least cost combination of inputs. Any combination for minimum cost. |

### 

### *3.3.3. Product- Product Relationship (Output-Output Relationship)*

Dear student, in the previous discussion we have seen two types of production relationships namely factor-product relationship and factor- factor relationship. In factor-product relationship; Y=f(X1) i.e. output is a function of input and in factor- factor relationship X2=f(X1), i.e. one input is a function of other inputs used in the production.

**Question**: Consider farmers in your localities and try to give examples those farmers who produce joint, competitive, complementary and supplementary enterprises.

But in product-product relationship, algebraically the relationship can be expressed as, Y2 = f (Y1) this means that one enterprise is a function of another enterprise.

Take a simple example that a farmer has a 2 hectare land. He wants to grow teff (Y1) along with maize (Y2).

It means that the area under teff (Y1) depends upon or is the function of the area under maize (Y2).

Now the question is that, what combination of these crops would give maximum profit, when the farm area is fixed? The answer is when ------------=**--**this is for two enterprises and one input.

---this is marginal rate of substitution

If the value of >0---------we call it two enterprises are complementary

<0-------- we call it two enterprises are competitive /substitute

=0-------- we call it two enterprises are supplementary

In product –product relationship the basic decision to be made by a farm manager is what to produce or what combination of enterprises will maximize profit.

A choice must be made from among all possible enterprises which may include vegetables, wheat, soybeans, cotton, beef cattle, hogs, poultry, and others. It is a question of allocation of the scarce resources among different enterprises. Natural factors like, climate, soil, range vegetation, and limits of other available inputs may restrict the choice of possible enterprises.

For profit maximization at a given level of input, the choice indicators are:

1. Substitution ratio ()
2. Price ratio (**)**

The general equilibrium conditions for a given level of inputs require knowledge of two relationships;

1. Iso- revenue line(curve) – choice function
2. production possibility curve

**A).** ***Iso- revenue line***: Represents the ratio of prices of two competing products. It indicates the different combinations of two products which give the same amount of revenue or income.

Y2

Iso- revenue line

Figure3-8: Iso- revenue line ***Y1***

Example: with a given quantity of input or fund of Br.100, a farmer can use it in the production of 50 units of product of Y1 and sell it at Br.2 per unit and he can also use it in the production of another product Y2 priced at Br. 4 per unit or he can produce a combination of both. The line joining at 50 and 25 is an iso- revenue line.

***Characteristics of iso-revenue line***

1. It is a straight line*,* because the prices of products do not change with the change in the quantity of products.

2. The position of the iso- revenue line shows the magnitude of the total revenue. If the total revenue increases, the line will move farther north-east.

3. A change in the prices of one product is accompanied by a shift in the iso- revenue line.

**B*). production possibility curve or product transformation curve:*** It is a locus of all the possible combination of two products which can be obtained from a given amount of input.

*Shapes of production possibility curve:*

1. Straight line curve 2. Convex to the origin curve

Y2  Y2

Production possibility curve

Y1  Y1

Figure3-9: Straight line production possibility curve, Figure3-10: Convex production possibility curve

Two outputs substitute at constant rate Two outputs substitute at decreasing rate (Ex. two varieties of local wheat)

3. Y2

Production possibility curve

Y1

Figure3-12: Concave production possibility curve

Two outputs substitute at increasing rate (this curve implies that the more or one product is increased the sacrifice of the other product becomes larger and larger.

***For more than two outputs & one input are considered***

When more than two enterprises with a given level resources are to be considered for profit maximization, profit is maximized at a point where:

**===1 ---**when capital unlimited----the equation tells us that out puts are combined in such quantities that their MVP's are equal to their prices. This expression leads to the direction that MC=MR= price of output. But when capital is limited, we will have >1 in place of =1 in the above equation.

**==>1 ---**when capital limited

***Enterprise or product relationships***

What is enterprise? It is a single line of production. It is the production of crop or livestock.The basic product relationships are:

1. Main enterprise

2. Antagonistic enterprise

3. Joint enterprise

4. Competitive enterprise

5. Supplementary enterprise

6. Complementary enterprise

These are the six types of relationships among different enterprises.

1. Main enterprise: It is the one which provides the most important source of income/revenue on a farm. It uses a very large portion of the farm resource (land, labour, capital & management).

2. Antagonistic relationship: the production of one product has an adverse effect on the production of another. One enterprise produces on the expense of the other. Example, eucalyptus tree & cereal production (Allophatic effect).

3. Joint enterprises: Joint product relationship exists when more than one product arises from a single production process. These have positive relationship, two or more out-puts from a single enterprise.

Joint products relationship exists when more than one product arises from a certain production process, sometimes in a fixed ratio. Joint product results from the same production process. As a rule, the two are combined products and production of one without the other is impossible.

Quantity of one product decides the quantity of the other product. For production decision, joint products can be treated as one product. Examples; cotton seed oil and cotton seed; beef/mutton and skin/hide; cattle and manure; sheep and wool, wheat and wheat bran.

Cattle (in number) (Y2)

Manure (Kg) (Y1)

Figure3-13: Joint products relationships

The figure shows that Y1 and Y2 are joint products, as the number of cattle increases, the manure we get from them also increases in the ratio of 1:1.

1. **Competitive enterprises:** Are those enterprises which compete for the same resources at the same season (labour, land, capital & management). Example, wheat, teff and barley are sown with the same season. These crops compete with each other for the resources in the same season. The marginal product of one increases, while that of the other decreases.

The marginal rate of substitution of one for the other is negative, (ΔY2/ΔY1<0). This means an increase in Y1 will be possible with a decrease in Y2. Example, land for wheat and teff. Competing enterprises have the following rate of substitutions.

* Increasing marginal rate of substitution;
* Decreasing marginal rate of substitution;
* Constant marginal rate of substitution;

The competitive enterprises compete for the use of the same limited input at the same time. Given a limited amount of land, capital, or some other input, the production from one enterprise can often be increased only by decreasing the production from another enterprise.

The following figure illustrates two types of competitive enterprises. In the first graph, corn and soybeans are competing for the use of the same 100 hectares of land.

Planting all corn would result in the production of 12, 000 kilogram, of corn and planting all soybeans would produce a total of 4,000 kilograms. Other combinations of corn and soybeans totaling 100 hectares would produce the combinations of corn and soybeans shown on the line connecting the above points. This line is called a production possibility curve (ppc), as it shows all produced from the given 100 hectares.

Beginning with producing all corn, replacing one hectare of corn with one hectare of soybeans results in a loss of 120 kg of corn and a gain of 40kg of soybeans. The trade-off or substitution ratio is 3, as 3kg of corn must be given up to gain 1kg of soybeans. With a straight- line production-possibility curve, this substitution ratio is the same between any two points on the ppc. This is an example of competitive enterprises with a constant substitution ratio.

**Production possibility curves for competitive enterprises**

12,000 12, 000

Corn 100ha corn 120

120 80

40 240

120 40 40

    Soybean 4,000 kg Soybean 4,000 kg

Figure3-14: Competitive products relationships, Figure3-15: Competitive products relationships

Over a period of time a combination of crop enterprises may benefit each other because of better weed, disease and insect control, erosion control, and timeliness in planting and harvesting large hectares. This situation is shown in the second graph the curved production possibility curve indicates that total corn production increases at slower rate as a higher proportion of the land is used for corn production. A similar situation holds true for soybeans. This causes the substitution ratio to be different for different combinations of the two enterprises.

The substitution ratio is 120÷80 = 1.5 near the top of the curve, and increases to 240÷40= 6.0 near the bottom of the curve. The enterprises are still competitive but have an increasing substitution ratio.

The most profitable combination of two competitive enterprises can be determined by comparing the substitution ratio and the price ratio. Each substitution ratio can be calculated using the formula:

Where the quantities gained and lost are the changes in production between two points on the ppc. The price ratio can be found from the equation:

Profit can be maximized by producing that enterprises combination where the substitution ratio is just equal to the price ratio.

In Table3-9 is an example of two competitive enterprises that have an increasing substitution ratio. The procedure for determining the profit- maximizing the least –cost input combination but with one exception. For enterprise combinations, when the price ratio is greater than the substitution ratio, substitution should continue by moving downward and to the right on the ppc and down to the next combination in the Table3-7. Conversely, a substitution ratio greater than the price ratio means too much substitution has taken place and the adjustment should be upward and to the left on the ppc and down to the next combination in the Table3-7. Following this procedure we find the profit- maximizing combination in the Table3-7 is combination number 6 (10,000kg of corn and 1,600 kg of wheat) because the substitution ratio equals the price ratio.

Table3-9: Selecting a profit- maximizing enterprise combination with land the fixed input (Price of corn= Br. 2.80 per kg, price of wheat = Br.4.00 per kg.)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Combination number | Corn (kg) | Wheat (kg) | Substitution ratio | Price ratio |
| 1 | 0 | 6,000 | - | 0.70 |
| 2 | 2,000 | 5,600 | 0.20 | 0.70 |
| 3 | 4,000 | 5,000 | 0.30 | 0.70 |
| 4 | 6,000 | 4,100 | 0.45 | 0.70 |
| 5 | 8,000 | 3,000 | 0.55 | 0.70 |
| 6 | **10,000** | **1,600** | **0.70** | **0.70** |
| 7 | 12,000 | 0 | 0.80 | 0.70 |

Our decision rule of substitution ratio equal to price ratio is a short- cut method for comparing the income gained from producing more of one enterprise versus the income lost from producing less of the other.

Whenever the price ratio is greater than the substitution ratio, the additional income is greater than the income lost and the substitution will increase total income. Profit will also increase, as total cost is assumed constant for any enterprise combination.

When the enterprises have a constant substitution ratio, the profit- maximizing solution will be to produce all of one or all of the other enterprise and not a combination. An increasing substitution ratio will generally result in the production of a combination of the enterprises; with the combination depending on the current price ratio any change in the price(s) of the output that changes the price ratio will affect the profit – maximizing enterprise combination when there is an increasing substitution ratio.

**5**. **Supplementary enterprises**

Two enterprises are supplementary if the production from one can be increased without affecting the production level of the other.

These are enterprises which do not compete in the use of resources, and rather make use of resources when they are not being utilized by one enterprise.

They are independent as the relationship of prices has nothing to do with the amount to be produced. Supplementary relationship increases profit by improving the resource use. Example, in crop production most of the work is seasonal and labour remains unutilized or under utilized during the slack period. Thus, farmers can take up poultry or beekeeping as a supplementary enterprise. A manger should take advantage of supplementary relationships by producing both enterprises at least up to the point where they become competitive. The most profitable combination of the two enterprises may be in the competitive range, with the exact combination found by applying the rules for competitive enterprises. See, the following figure,

Crop (Y2)

A B

C

Poultry (Y1)

Figure3-16: Supplementary enterprise relationship

**NOTE that**: From point A to B two enterprises are supplementary (ΔY2/ΔY1=0)

From point B to C two enterprises are competitive (ΔY2/ΔY1<0)

The income from poultry enterprise along the horizontal line can be extended up to the point B, without reducing the output of the crop enterprise. Beyond point B, the enterprises are competitive as poultry production can not be increased indefinitely without affecting crop production.

**6. Complementary enterprises:** Are enterprises which help each other and do not compete for the same resources (land, labour, equipment etc.

The contribution of mutual production, grain production and livestock production are complementary. Enterprises are not usually complementary for all combinations and eventually become competitive.

Complementary relationship means higher return from fixed cost. One or both of the two products that stand in complementary relationship give higher yields and gross return.

If the increase of the production level of one enterprise causes the production of the other to increase, they are complementary enterprises. Livestock and crop enterprises are complementary enterprises. Livestock enterprise can provide manure for crop enterprise, and crop enterprise can provide feed for livestock enterprise.

The following graph shows a possible complementary relationship between wheat production and land left fallow.

In many dry land wheat production areas with limited rainfall, some land is left fallow or idle each year as a way to store part of one year’s rainfall to be used by a wheat crop the following year. Leaving some hectares fallow reduces the hectares in wheat, but the per hectare yield may increase enough that total production is actually greater than from planting all hectares to wheat year after year. A complementary enterprise should be increased at least up to the point where production from the primary enterprise (wheat in the example) is at maximum. This is true even if the complementary enterprise has no value, as production from the other enterprise is increasing at the same time. Enterprises are usually not complementary for all combinations and eventually become competitive. As with supplementary enterprises, the profit maximizing combination may be in the competitive range as determined by the substitution and price ratios.

Wheat (Y2)

B

A C

Livestock (Y1)

Figure3-17: complementary enterprise relationship

NOTE that: from point A to B two enterprises are complementary (ΔY2/ΔY1>0)

From point B to C two enterprises are competitive (ΔY2/ΔY1<0)

# SUMMARY

# Production is the process of changing economic resources into output. All inputs can be divided into two categories such as fixed and variable inputs. Short run is that period of time in which some of the firm’s inputs are fixed. Long run is that period of time in which all inputs can be changed. No fixed inputs in the long run.

Economic cost is the cost of all inputs used to produce goods and services. It includes both explicit and implicit costs. Explicit/ cash/ accounting costs refers to the cost of purchased input only. Implicit/ non-cash costs are the values of non- purchased inputs owned and used by a firm in its own production activities. The opportunity cost is the value forgone because an input was used for another purpose. Short-run is a production and market period within which there are both fixed and variable costs. Long run is production and market period within which all costs are variable. Fixed costs don’t vary with the change in the level of output; where as variable costs are costs which change with changes in output. Production function states the technical relationship between inputs and outputs.

We have three types of production relationships: factor-product relationship, factor-factor relationship, product-product relationship. Term marginal refers to incremental changes, either increases or decreases, which occur at the edge or at the “margin.” As additional units of variable input are used in combination with one or more fixed inputs, marginal physical product will eventually begin to decline. Diminishing returns may start with the first unit of input used, or may start later after a period of increasing returns. Do not produce in stage III, because more inputs can produce less output. Do not normally produce in stage I because the average productivity of the inputs continues to rise in this stage. Stage II is the “rational stage” of production. In some situations an input may be limited so that the profit-maximizing point cannot be reached for all possible uses. A limited input should be allocated among competing uses in such a way that the marginal value products of the last unit used on each alternative are equal.

**Learning activities**

**i. Review your understanding of the following terms.**

Long term run Short run Variable cost

Fixed cost Iso-quant Joint product

Supplementary Competitive Complementary

**ii. Fill in the blank in a given space.**

1. \_\_\_\_\_\_\_\_\_\_refers to incremental changes, either increases or decreases, which occur at the edge or at the “margin.

2.\_\_\_\_\_\_\_\_\_\_ is a measure of the responsiveness of production with a minor change in input.

3.\_\_\_\_\_\_\_\_\_\_\_\_refers to the direction of change in output when all inputs vary (change) in the same proportion

4. The shape of \_\_\_\_\_\_\_\_ for different quantities of output depends up on the substitutability of two inputs.

5. \_\_\_\_\_\_\_\_\_\_\_\_ is a locus of all the possible combination of two products which can be obtained from a given amount of input

*6.* \_\_\_\_\_\_\_\_\_\_\_ is the one which provides the most important source of income on a farm.

7. The production of one product has an adverse effect on the production of another. This kind of enterprise relationship is said to be \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**iii. Give answers for the following questions accordingly**

8. What do you recommend those farmers in your locality who produce or operate in region one and region three of production function.

9. What are three zones of production function? How can one decide the optimum level of production?

10. Write down and draw shapes of production possibility curve

11. What does factor-factor relationship helps manager and what is its main purpose?

12. What does product –factor relationship tells?

13. Based on the information given in Table3-10, calculate MPP, TVP, MVP and MIC and fill the remaining blank space (cells).

Table3-10: Marginal revenue, marginal cost and the optimum output level

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  | | --- | | Input | | level | | |  | | --- | | Total | | physical | |  | | (TPP) | | |  | | --- | | Marginal | | physical | | product | | (MPP) | | |  | | --- | | Total | | Value | | product | | (TVP) $ | | |  | | --- | | Marginal | | value | | product | | (MVP) $ | | |  | | --- | | Marginal | | input | | cost | | (MIC) $ | |
| 0 | 0 | - | 0 | - |  |
| 1 | 12 | 12 | 24 | 24 |  |
| 2 | 30 |  |  |  |  |
| 3 | 44 |  |  |  |  |
| 4 | 54 |  |  |  |  |
| 5 | 62 |  |  |  |  |
| 6 | 68 |  |  |  |  |
| 7 | 72 |  |  |  |  |
| 8 | 74 |  |  |  |  |
| 9 | 72 |  |  |  |  |
| 10 | 68 | -4 |  | 0 |  |

***Input price = $12; output price = $2***

*14.* Calculate marginal physical product (MPP), total value product (TVP), Marginal value product (MVP) and Marginal Input cost (MIC) to fill some left blank space (cells) in Table 3-11

Table 3-11: Irrigation level for corn, determining the profit-maximizing production

****

***Water at $3.00/acre-inch, corn at $2.50/bu***

16. Describe concept of the complementary, supplementary and competitive relationships.

# CHAPTER FOUR: FARM BUSINESS PLANNING AND FARM BUDGETING

# Introduction

Dear student, are you familiar with the term’ planning and budgeting’? This chapter will cover the most important aspects of planning for a viable farm business such as definition and concepts of farm planning, why it’s important, its objectives or goals, SWOT analysis, production plan and provides basic knowledge and skills tools for farm business planning. In addition you will also be introduced about the different types of budgeting and their use.

**Objectives of this chapter:**

By the end of this chapter, students will be better able to:

* Understand the importance of effective planning for a farm business;
* Define the aim of a farm business plan;
* Organise their personal and business goals and determine a farm business mission statement;
* Make an overview of their farm business and identify any private farm business strengths, weaknesses, opportunities and threats (SWOT analysis);
* Prepare the basic components of a farm business plan covering all aspects of farm business;
* Manage themselves and the people working in their farm business;
* Explain concept of budgeting;
* Identify and explain source of budget information and reasons for importance of budgeting;
* Identify and discuss the types of budgeting;
* Identify the use and purpose of whole farm budgeting;
* Identify format of partial budgeting.

**4.1. An Introduction to Farm Business Planning**

### 4.1.1. Definition and Concept of Farm Business Planning

**Definition**: planning is the process of decision making in advance what is to be done, how it is to be done, when it is to be done, where it is to be done, and determining required resource to achieve established objectives/goals. Planning is taking decisions in advance. It stimulates thinking, broadens understanding and challenges the farmer to move forward. It is a forward-looking approach. Planning outlines where farm business wants to be at some determined time in the future and defines how you intend to get there. A plan is usually a concise summary of activities surrounding the creation and expansion of the business. It describes the product or service, customers, competition, production and marketing plans, management that the business will provide.

A business plan is like a road map, which shows where the business is now, where the business would like to be over the next year(s), and how it will get there. The business plan is directed towards the achievement of longer-term goals. A clear vision of where you want the farm to be in five to ten years can be a powerful driving force to keep the business plan on course. A well thought-out business plan will address the key management elements including the financial plan, the production and marketing plan, risk management, and human resource issues.

### 4.1.2. Why prepare a Business Plan?

Dear student, we will deal with the reasons for preparing farm business planning. Without planning, farm business decision would become random, ad hoc choices. The following reasons explain the important or advantages of farm planning as follows:

* It allows management to forecast credit requirements, timing and the need for capital purchases, production alternatives and structural changes over the planning period.
* Help farmers to become more effective managers of farming enterprises. Careful planning is often critical to the success of a business in every sector of the economy.
* Help a farmer to decide how to combine new ideas & old ones to his best advantage. By identifying his credit & supply needs, the farm plan helps him to arrange for the timely supplies of credit, seeds, fertilisers, etc
* It allows manager/farmers to test on paper the viability of a proposed plan, before committing it to action. As has been said, "if it doesn't work on paper, it won't work in the field!
* It allows the manager/farmers to make modifications and fine-tune a plan, in order to increase revenue and/or reduce costs.
* It necessitates giving careful thought to the key management responsibilities such as longer range goals and objectives, human resources, production, marketing, finance, profitability and risk issues.

Also many people might ask*: ‘Why should I prepare a business plan?’* but businesses often need plan more than money and dreams to keep them alive and profitable; they need careful planning so that:

* *Goals* can be defined and explained*:* i.e.
* Where is the business going?
* What needs to be done?
* What is the role of investors, family members and employees in achieving these goals?
* *Problems and pitfalls* can be considered before they happen, moves made to avoid them and advantage taken of opportunities as they come along.
* *Valuable information* can be collected and prepared ready to use for decision making

and managing change in operations.

* *Progress can be regularly compared* with expected goals and changes made to

plans where needed.

* *Communication* can be improved. For example goals can be better explained to team members and everyone can then contribute to their achievement.
* *Capital might be obtained* from private investors, venture capital funds, lenders, banks, trust companies etc.

Government financial assistance programmes normally expect a business plan to be submitted with applications for assistance. A well-prepared business plan serves as tangible evidence of your ability to manage, plan and communicate - all skills needed to operate a successful business.

Planning enables you to examine every aspect of your business. You must be realistic in assessing what opportunities exist and what you are capable of achieving. Some questions to ask yourself are:

* What is the *purpose - mission* of my business? (Be able to express it in a couple of

sentences)

* What are my personal and business *goals?* Are they *SMART?* (*S*pecific,

*M*easurable, *A*ttainable, *R*ealistic and *T*imely)

* What is the *specific market* I am targeting?
* Are *customers* willing and able to purchase my product and service?
* Do I have the necessary *skills, knowledge* and *resources*?
* What are my approximate *cash needs* for start up and beyond? Do I have the resources? If not, where could the *funds* come from?

The answers to the questions above will help you determine the feasibility of your business idea or your business in general. Some of these questions are answered by assessing your current situation. To answer other questions concerning your business environment, customers, competition and business opportunities you can collect information from newspapers, magazines, the internet, seminars, industry meetings and contacts, government agencies, libraries, tips you may have learned from your employees, salespeople, suppliers or competitors.

Various formats are available for business plans but most include the following:

* An introduction to the business history, ownership and activities;
* A summary of the plan;
* A statement of the business vision and goals;
* A statement of strategic and short term objectives;
* A description of your products and services;
* Details of your proposed production, market and sales, finance and human resource development strategy.

A business plan is actually a compilation of several sub-plans covering marketing, production, human resources and financial plans.

## 4.2. Setting goals and objectives

The first thing you will need to do when preparing a farm business plan is clearly to define your/farm business goals. It is important to consider the following issues:

* What are your *personal and family goals*?
* What is the *vision* for your business? (Stated as a mission statement)
* What are your *business objectives*? (Projections in terms of volume and value

during the time period that the plan covers) and how do you plan to achieve them?

* What is your *strategy* for getting there? Where are you now? Where do you want to go? How are you going to get there?
* How much finance do you need, where will you get it from and how will you get your

money back?

This information should be summarised in the introduction to our plan and more detail provided later. The introduction should also include information on:

* The size, organisation and ownership (e.g. sole proprietorship, partnership, and

corporation) of the business;

* Its history explaining how it got to this point;
* Its priority markets and customers;
* Main market trends and opportunities.

The *vision* for your business may be stated as a *mission statement* outlining what your business is and what the business is aiming to be in the future.

It should concisely summarise your most important business goals.

It is a useful tool to help you to understand and communicate to others the aim of your business and where you stand in the business environment. A mission statement is a first step in preparing a business plan. A mission statement should:

* Provide information but also be inspiring;
* Be quite specific but not too limiting;
* Be realistic, quantifiable, flexible and adaptable;
* Consider customers and other interested groups in the business such as employees, investors and other stakeholders;
* Aim for a specific time period;
* Be easily understood;
* Developed and discussed by all the key people related to your business.

**4.** After completing these tasks, how do you think that this mission statement will help you and your colleagues run your business?

Next you formulate your business goals and strategy. Business goals are more specific issues concerning your farm business. According to their time orientation they can be categorised into three groups:

* *Long-term goals:* These normally refer to a time period of more than 5 years. For example, expansion of your business activity to retailing in the next 5 years.
* *Medium term goals:* These normally refer to a period of between 1 to 5 years. For

example, investments in specific equipment and machinery in the next 2 years.

* *Tactical and operational goals:* They normally refer to a time period of less than 1 year and to the everyday operation of the business. A time schedule for you, your family and the people working on the farm can enable more effective use of time. Long-term goals are usually the first to be established. They are also considered as being “strategic” goals. The other shorter term goals are defined later as a means to realise them.

## 4.3. Analyzing Farm Business

A SWOT analysis is a particularly valuable tool for determining the ability of your/one business to compete and survive in a competitive environment. It is the first step in recognizing your options and potential problems and in preparing a strategy to act. *SWOT* is an acronym formed from: *S*trengths, *W*eaknesses, *O*pportunities and *T*hreats.

It helps business to identify their own strengths and weaknesses (such as the business resources, experience, structure, management, skills, products etc.) arising from the internal environment as well as the opportunities and threats arising from the external environment.

External environmental issues may include political, economic, social and technological issues as well as demographic and ecologic factors. The competitive environment will also need to be considered including competitors, customers, suppliers and new products on the market.

An example of a SWOT analysis for a cheese-making farm producing traditional products is presented as below:

|  |  |
| --- | --- |
| **Strengths** | **Weaknesses** |
| * Traditional know how for cheese production * Skilled and experienced workers * Strong links with local markets * Growing sales * Quality packaging | * Insufficient storage rooms * Low production capacity * Low capitalisation * Lack of promotion strategies * Insufficient know how of quality   control schemes applications |
| **Opportunities** | **Threats** |
| * Greater customers interest in   traditional food products   * New markets in foreign countries * Relatively low milk price | * Strong price competition * Strict legislation concerning   quality assurance procedures   * Price pressures from retailers |

## 4.4. Production Planning

This part of the plan should provide an outline of your products and business operation and include information related to:

1. ***Your business/any private business*** *-* farm locationand how it serves your business needs e.g. proximity to markets, pack-houses, suppliers, transportation and location of competitors

2. ***The product or service activity***. Presenting a timetable of production activities and cultivation periods will be useful. You can prepare planting schedules in order to assure harvesting in periods of high prices and enable production stability.

GANTT chartsare a particularly useful way of preparing schedules of production activity.

The production process can be separated into major activities that are listed on the left side of the chart. The time frame of the entire production process is indicated at the top or the bottom of the chart. The duration and scheduling for each activity is then shown by a horizontal bar. An example is given below:

Example Gantt chart

**

3. ***Land, buildings, facilities and equipment*** required including their costs and financing (lease or own), renovations, taxes payable and utility costs. You can also combine the necessary machinery with the products produced and summarise this information as shown in Table4-1:

*Table4-1: Necessary equipment*

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Type of  equipment | Time of  purchase  or lease | Supplier | Technical  properties | Unit of  measurement | Quantity | Cost per  unit | Total  cost |
| 1. |  |  |  |  |  |  |  |
| 2. |  |  |  |  |  |  |  |
| 3. |  |  |  |  |  |  |  |
| 4. |  |  |  |  |  |  |  |
| 5. |  |  |  |  |  |  |  |
| Total |  |  |  |  |  |  |  |

*Table4-2: Necessary equipment combined with products /services offered*

|  |  |  |  |
| --- | --- | --- | --- |
| Products /  Services offered | Necessary equipment  for production | Time of production  activity start | Time of equipment  purchase/lease |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

4. Your *labour* (family and employee) needs and especially skilled labour, for example for harvesting or specialist use of equipment.

5. *Input supplies and materials* (such as seeds, chemicals or fertilisers), including details of where they will be purchased and their cost.

6. How *value may be added* to your product, such as by packaging, processing, storage or transport.

7. What *after sales support* to customers may be required?

8. *Production levels and extra services* that can be realistically achieved with the proposed plan.

## 4.5. Human Resources Planning

Recognition of the contribution by yourself, your family and your employees to business success is essential. Your people plan should outline how you intend to identify, recruit, develop, promote and motivate key people and maintain a strong sense of collective achievement and an effective team. This component of the plan should also include an *organisational chart* (see figure below) and with the role and position of each person outlined. Supporting documents should include job descriptions of key positions in your business.

Within your plan you should consider:

* Who are the *key people* in your business? How experienced, skilled, educated and trained are they? Keep records of their curriculum vitae and training attended.
* What are your needs for *seasonal workers*? How many will you need? What skills are necessary and how much will you pay them?
* What are your needs for *advice and training* from professionals outside of your business*?*
* What are the main strengths and weaknesses in your people team? Present your strategy to build on their strengths and overcome their weaknesses within a clearly defined time frame e.g. through training recruitment of new employees, hire outside advisors etc.
* Who are the board of directors (if any)?
* How often should they meet and what should be their key tasks?
* Calculate the expected costs for labour and indicate whether the salary and other benefits you give your staff are competitive. You can use Table4-4 for calculating your labour costs.

*Table4-3: Calculation of labour costs*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Name | Specialty | Education / training  And experience | Month salary + social  security cost | Annual cost | Total Cost |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| TOTAL |  |  |  |  |  |

**4.6. Farm Budgeting**

Dear learner, in the previous topic we have dealt with farm planning and its uses. This particular topic focuses on the most important and widely used tools of planning in farm management budgeting. As budgeting is a tool for planning and making business decision, it is an important issue that rest at the core of the farm management course.

A *budget* is defined as an estimate of the revenue, costs, and net income of a farm unit or an enterprise. Development of a budget helps the farm manager to organize information into a logical order.

Income and expense items otherwise overlooked are often exposed through development of a budget. Budgeting is a basic farm business analysis procedure. Budget information is used in projections of cash flow, profit or loss, and the balance sheet.

The budget provides detailed listings of sources and amount of income and expenses. It indicates the amount of inputs required for the enterprise, such as quantities of grain, silage, hay, and other feed components.

Budgets (whole-farm, enterprise, and partial) are man­agement tools to help evaluate the farm business. Each type of budget has a different but related purpose and should be used by managers accordingly. The whole-farm budget becomes a starting point that can be used to analyze the farm business over time. Enterprise budgets can be used to analyze components of the farm business and also be a building block for the whole-farm. Once a whole-farm bud­get has been developed, a partial budget can be valuable in evaluating changes to the total-farm budget. Each type of budget offers useful information to support management decisions.

**Why budget?**

Using budgets can provide the farm manager a method to:

1) Experiment through simulation with possible outcomes of a given organizational change before resources are actually committed to the change.

2) Uncover cost items that might otherwise be overlooked.

3) Refine the present organization.

4) Seek credit from lending agencies.

5) Learn to better organize and reorganize.

**Sources of budget information**

All budgets should be based upon the best information available. The reliability of the budgets is only as good as the quality of the data used in the process. Data needed for use in budgets includes quantity, price, method, and timing of the inputs used.

Some sources of information available for use in prepar­ing budgets are:

1) Actual farm records

2) Area summary analysis

3) County production data

4) Typical budgets

5) Farm literature

6) Information from meetings

7) Neighbors

Any or all of these sources should be used in collecting and verifying data or information used in preparing budgets. Good managers verify the reliability of data collected from any source to see that it applies to their situation. Experience from one year is only an indicator and does not assure that same response will result in following years.

**4.6.1. Types of Budget**

There are three basic types of budgets that can be used in the farm business management process. Each type of budget provides different information to the manager for use in the decision-making process. The budget format permits the manager to use economic logic to answer ques­tions of what, how much, and when resources should be used to achieve the goals and objectives as established by the farm family.

The three types of budgets are:

1) Whole-farm budget

2) Enterprise budget

3) Partial budget

### 4.6.1.1. Whole Farm Budgeting

**The whole-farm budget** is a classified and detailed sum­mary of the major physical and financial features of the entire/total farm business.

Whole-farm budgets identify the component parts of the total farm business and determine the relationships among the different parts, both individually and as a whole.

**Whole-farm budgeting process**

To develop a whole-farm budget:

1) List the goals and objectives of the farm firm.

2) Inventory the resources available for use in production.

3) Determine physical production data that will be used in the input/output process.

4) Identify reliable input and output prices.

5) Calculate the expected variable and fixed costs and all returns.

Since it is a plan for the future use of farm resources and establishes the future direction of the farm organization, the whole-farm budget must conform to the farm family goals and objectives to be successful.

The **whole-farm budget** is the best tool to analyze the farm business and the impacts of the goals and objectives. It should start with the inputs the operator has available for use in the farm business. Often the amount of land and operating capital available are limiting factors. Other factors such as buildings, the farmer’s manage­rial skills, and available markets can also be relatively fixed. It is important to start with those fixed elements in planning a whole-farm budget. The results of the whole-farm budget should combine the resources, constraints, technical infor­mation, and price data into a realistic whole-farm budget for the farm being considered. The outcome should be a plan that can provide direction for the farmer and family to follow in maximizing the returns to owned resources.

**Purpose and use of a whole farm budget**

1. Budgeting is a look ahead at what the farm business is expected to be at the end of a future period.

2. The whole farm budget combines all the enterprises and resources of the farm or ranch to provide an overall picture of the expected net returns for the planning period.

3. Uses of the whole farm budget are:

a. Provide a basis for preparation of net worth statements, income statements, and cash flow statements in the absence of farm records.

b. Provide a basis, in conjunction with actual records, for the projection of net worth statements, income statements, and cash flow budgets for a future production period(s).

c. Provide a basis for assessing the financial effects of changes in crop enterprises or production practices when actual records are not available

### 4.6.1.2. Enterprise Budget

**An enterprise budget** is a statement of what gener­ally is expected from a set of particular production practices when producing a specified amount of product. It consists of a statement of revenues from and the expenses incurred in the production of a particular product. An enterprise budget documents variable and fixed costs.

It is useful in calculating profitability and break-even values.Enterprise budgets provide useful information regarding the resources requirements and the relative profitability of different enterprises.

An enterprise budget should contain several components. A detailed description should include a production goal, the production techniques to be employed, the land resource required, and even something about the capital and labor requirements. An enterprise budget should include all costs and all returns associated with the defined enterprise. All variable and fixed costs, both cash and non-cash items should be included. The returns from products produced for sale (wheat grain crop) plus those that are produced for use in another enterprise (grazing) should be included in an enterprise budget.

Variable costs are the costs of such input items as seed, feed, fertilizer, normal repairs, custom operations, and machinery and equipment operating expenses. These costs also include labor whether associated with machinery or equipment or as hand labor operations. They are items that will be used during one year’s operation or during one pro­duction period and would not be purchased if the enterprise was not produced. **Variable costs are always included in an enterprise budget.**

Fixed costs are the costs associated with buildings, machinery, and equipment which are prorated over a period of years.

Included in this category are depreciation, interest, insurance, and taxes on individual buildings and pieces of machinery and equipment that can be allocated to an indi­vidual enterprise. **Fixed costs are always included in an enterprise budget.**

The costs are generally classified as overhead costs and include costs usually associated with buildings, utilities, and other miscellaneous items (such as record keeping and budgeting) that are used in more than one enterprise and are not easily allocated to an individual enterprise. Overhead costs can include both variable and fixed costs.

**Table4-4: Format of an enterprise budget**

|  |  |  |  |
| --- | --- | --- | --- |
| Items | Quantity(kg/litre) | Value per(kg/litre) | total value |
| **Gross returns** |  |  |  |
| Main product |  |  |  |
| By-product |  |  |  |
| Total |  |  |  |
| **Cash variable expenses** |  |  |  |
| **1. Seed & seed treatment** |  |  |  |
| (i)Seed |  |  |  |
| (ii)Sub-total |  |  |  |
| **2. Manures & fertilizers** |  |  |  |
| A. Farmyard manure |  |  |  |
| B. Chemical fertilizers |  |  |  |
| (i)CAN urea |  |  |  |
| (ii)Super phosphate |  |  |  |
| (iii)Muriate of Potash |  |  |  |
| **Sub-total** |  |  |  |
| 3. [Insecticides](http://www.krishiworld.com/html/insect_pest_crops1.html) & fungicides |  |  |  |
| 4. Tractor fuel cost |  |  |  |
| 5. Irrigation hours |  |  |  |
| 6. Human labour |  |  |  |
| 7. Threshing hours with diesel engine |  |  |  |
| 8. Cost of typing material |  |  |  |
| 9. Marketing charges |  |  |  |
| **Sub-total** |  |  |  |
| 10. **Interest on variable expenses for half the period of growth** |  |  |  |
| 11. Total variable expenses |  |  |  |
| 12. Returns over variable expenses |  |  |  |
| 13. Man-hours |  |  |  |
| 14. Bullock labour (pair hours) |  |  |  |
| 15. Machine(tractor hours) |  |  |  |
| **Grand/ Total** |  |  |  |

### 4.6.1.3. Partial Budgeting

Partial budget analysis is one of the tools in economics used to compare the relative profit of technologies. It aims at quantifying and comparing the effects of a proposed technology on livestock or crop production to those of other alternative technologies. Experience shows, however, that farmers rarely jump from one set of practices to a new technology that uses entirely different inputs and practices. Instead, they modify current practices to incorporate a particular innovation. For this particular reason, partial budgeting is most often used as a means of assessing the effects of new technologies on farm profitability.

It helps to identify weakness(es) (high cost and/or low profit) of the technology, level of profitability and then helps to decide whether to practice/adopt a new technology or not. Moreover, it is useful to assess the likely effect of future policies or prices changes in the part of the farm system on whole farm results.

According to Upton (1973), where only a relatively minor change in the pattern of farming is proposed. It is not necessary to prepare a complete farm budget to estimate the result. Instead of a partial budget can be used to arrive at the expected change in profits. This takes into account only those changes in costs and returns that result directly from the proposed modification.

He further notes that there are two main situations in which partial budgets help: change in the combination of enterprises or change in production method.

A partial budget is concerned only with those financial items which change as an outcome of a particular decision. The following four points are important in setting up a partial budget:

Additional returns from change;

Reduction in unit cost;

Reduction in return;

Addition in cost incurred.

Table4-5: Conventional structure of a partial budget model/format

|  |  |
| --- | --- |
| Debit(A) | Credit(B) |
|  |  |
| a. The change will increase some additional costs | *c.* The change will decrease some costs |
| b. The change will reduce returns | d. The change will increase returns |
| Total sum of a and b = debit(A) | Total sum of c and d= credit(B) |
| Net profit = [(element c) + (element d)] - [(element a) + (element b)] or B-A | |
|  | |

The net difference between total sum of positive and negative economic effects is an estimate of the net effect of making the proposed change in the total farm budget. A positive net change indicates a potential increase in income and a negative net change indicates a potential reduction in income due to the proposed change. These four increases or decreases in revenues or expenses make up the structure of a partial budget model is described briefly below:

**a. Increased expenses:** livestock/ crop technologies cost of production for the model includes feedexpenses, transport cost and veterinary services expenses; and includes expense of fertilizer, chemical, labor and etc. Because these new technologies require additional feeds, better veterinary service and transportation cost of feeds to produce more animal products, and require additional cost of fertilizer, seed, chemical and better management to produce more yield.

**b. Decreased revenues:** when local livestock/ crop or old practices are sold or partially or fully replaced, decreased revenues include incomes from sale of milk, beef, and calf, manure and crop products.

**c. Increased revenues:** increased revenues due to more milk, calf and manure sale and sale of higher yield that obtained from new crop technologies.

**d. Decreased expenses:** local livestock/ crop cost of production such as feed and veterinary service expenses/ fertilizer, chemical and management costs are considered as components of the reduced costs.

In practice, profitability is usually influenced by many factors that should be considered, but not all of them can be measured in cash terms (Johnson, 1985).

Income and expenses items that don’t involve movement of cash, like depreciation, valuation changes and other internal transfers are excluded.

Although they are important from an accounting stand point, for preparing the balance sheet and calculating profit, they produce no cash flows.

**Example of partial budgeting**

Table4-6: Estimation of the profit of substituting one crossbred cow for one local cow

|  |  |  |  |
| --- | --- | --- | --- |
| Debit | | Credit | |
| A). Increase in cost per head forcrossbredcow | | B) Decrease in cost per head forlocal cow | |
| Variable cost |  | Variable cost |  |
| - Cost of feed for crossbredcow | 4480.00 | - cost of feed local cow | 900.00 |
| - Cost of feed for crossbred calf | 750 | - cost of feed for local calf | 300.00 |
| - Cost of health service and transports, water | 202.00 | - cost of health and water | 30.00 |
| A). Decrease in income per head for local cow |  | **B).Increases in return per headfo*r* crossbred cow** |  |
| -Fresh milk 360 litter, 2.84 birr per litter | 1008.00 | Yield 3355 litters, 2.84 birr per litter | 9,528.00 |
| -Selling of calf | 446.00 | Selling of calf | 1,302.00 |
| -Selling of cow dung | 104.00 | Selling of cow dung | 324.00 |
| A Total loss | 6,900.40 | B Total gain | 12,033.00 |
| Net gain/Loss=B-A; 12,033.00-6,900.40= 5132.60, i.e., Net profit = 5,132.60 | | | |

Source of data (Zewdie.H, 2008)

It was found that the sum of total credit sides exceeded the sum of total debits. This implies that the proposed change increased the total farm income. The partial budget analysis shows that practice crossbred cow increased the net profit or return per head by birr 5,132.60 over the local breed cow (Table4-6). This implies that technological change, particularly crossbred cow, is powerful mean to increase income of households.

# SUMMARY

Planning is the process of decision making in advance what is to be done, how it is to be done, when it is to be done, where it is to be done, and determining required resource to achieve established objectives/goals. A plan is usually a concise summary of activities surrounding the creation and expansion of the business. It allows management to forecast credit requirements, timing and the need for capital purchases, production alternatives and structural changes over the planning period.

Careful planning is often critical to the success of a business in every sector of the economy. The *vision* for your business may be stated as a *mission statement* outlining what your business is and what the business is aiming to be in the future. It should concisely summarise your most important business goals. Based on time orientation goals can be categorised into three groups such as long-term goals, medium term goals and tactical and operational goals. A SWOT analysis is a particularly valuable tool for determining the ability of your/one business to compete and survive in a competitive environment. Production planning should provide an outline of your products and business operation. Farm budgeting is a tool for planning and making business decisions. A *budget* is defined as an estimate of the revenue, costs, and net income of a farm unit or an enterprise. Budgets are man­agement tools to evaluate the farm business. There are three types of budgets such as: whole-farm, enterprise, and partial budget. Each type of budget has a different but related purpose and should be used by managers accordingly.

**Learning activity**

**i. Fill in the blank in a given space.**

1.\_\_\_\_\_ refers to a time period of more than 5 years in which manager may intend to expand business activity.

1. Long –term goal
2. Medium term goal
3. Short term-goal
4. None
5. \_\_\_\_\_\_\_\_\_is the type of budget that is used to prepare budget for single crop or livestock enterprise.
6. \_\_\_\_\_\_\_\_\_ is a particularly valuable tool for determining the ability of your/one business to compete and survive in a competitive environment.
7. \_\_\_\_\_\_\_\_\_\_\_ may include political, economic, social and technological issues as well as demographic and ecologic factors.
8. \_\_\_\_\_\_\_\_\_is an estimate of the revenue, costs, and net income of a farm unit or an enterprise.
9. \_\_\_\_\_\_\_\_\_is the best tool to analyze the farm business and the impacts of the goals and objectives.

**ii. Give answers for the following questions accordingly**

1. Define and explain the concept of planning
2. List and describe the major types of budgeting
3. What is the difference between internal factors (strength and weakness) and external factors (threat and opportunity)?
4. What is the difference between partial budgeting and enterprise budgeting?

# 

# CHAPTER-FIVE: FARM RESOURCES MANAGEMENT

# Introduction

Dear student, we have dealt with farm planning and farm budgeting in the previous chapter. In this chapter, we will discuss the basic principles and techniques which will be used for efficient use of some farm resources.

Farm resources such as land, labour, capital, management are needed for agricultural production to take place. Some resources are contributed by the manager (operator) and family, others are obtained through borrowing, renting or hiring. Therefore, determining the proper mix of owned and non- owned resources to use is a key management decision. The net farm income is the return of all resources decision contributed by the operator (manager). One key issue to improve the net farm income is to increase the quality and quantity of resources owned by the operator.

**Chapter objectives:**

At the end of this chapter, students will be able to:

* Understand the concepts of land management;
* Identify the unique characteristics of land;
* Understand and practice planning land use;
* Explain the concept of labour management;
* Explain unique characteristics of agricultural labour;
* Identify steps in planning farm labour resource;
* Define capital and describe the concept of capital management;
* Identify the sources of capital;
* Identify types and sources of credit.

## 5.1. Land Management

Dear learner, in this topic, we will deal with the economics of land use and control and its characteristics which affects its uses and management.

Do you remember the characteristics of farm business that makes it differ from industrial business?

Land is the most valuable resource and most important resource in agriculture as compared to other industries. Owning and using the land for agricultural production requires attention to resource conservation and environmental sustainability as well as profits. Land has a unique characteristics not found in other agricultural or non- agricultural resources. These characteristics greatly influence the economies of land use and management.

### 5.1.1. Unique Characteristics of Land

Dear learner, can you imagine that land is unique in many respects? If you say yes, discuss it with your colleagues.

**a)** **Land is permanent resource that does not depreciate or wear out**, provided soil fertility is maintained and appropriate conservation measures are used. Proper management of land not only maintains the inherent productivity of land but also can even improve it.

**b)** **Land is immobile and can not move** **to combined with other resources**, but others resources like machinery, seed, and fertilizer must be transported to the land and combined with it to produce crops and livestock (pasture, grazing land-----).

**c)** **The supply of land suitable for agricultural production is essentially fixed**.

Even though, small amounts may be bought into production be clearing and draining or may be lost to non- farm uses. This makes the price of land very sensitive to changes in demand of it; because land can not be manufactured when the demand increases. Therefore, changes in the profitability of agricultural production are eventually factored into land prices, rent and the land owner receives the economic benefits of losses.

### 5.1.2. Planning Land Use

A land use plan which is developed based on a completed land inventory (soil fertility, slope, depth, soil types, and drainage) is the most profitable farm plan.

Land use plan is affected by:

* Regional differences in productivity( comparative advantage-----------) however, the most profitable use for land depends on :
* relative commodity prices and
* production technology

Both can change over time brings change in land use.

**Main sources of land:**

1. Owning land ( through land distribution)
2. Leasing
3. Renting( share cropping)
4. Buying( for some years)

Each has its own advantage and disadvantage from development point of view.

**Determinants of cropping system (land use system)**

1. Density of the population

* If we have more land ----- extensive farming
* If we have less land ----- intensive farming

2. Technology

* The production system is affected by the availability of technology and skill we have.

3. Soil fertility, topography (slope), soil type; these also determines the type of crop grown and enterprise that would be selected

4. Location: location of land to infrastructure also determines the type of crop to be produced. Like, to produce vegetable, the land must be near to market or roads etc, unless they loss their intensity.

5. Land tenure institution (lease, renting, individual users right, communal), therefore, depending on the type of ownership you decide what type of crop produced (annual, perennial)

Generally, land use decision need to consider long run environmental effects, interactions among enterprises and consequences that occur beyond the borders of the farm in order to conserve resources and sustain agricultural in to the future.

## 5.2. Labour Management

Dear learner, in the previous topic, we have dealt with unique characteristics of land or economies of land use and management, land planning and main source of land. In this topic, we will discuss about labour management.

Labour is one of the production resources which mobilize other resources. Labour requirement for the work determined by the amount of work to be done. Amount of work to be done also determined by:

* Number of persons;
* Amount hours worked;
* Amount of works.

**Amount of hours worked also determined by:**

1. The amount of work needed to obtain subsistence needs
2. Potential gain from extra unit of force( from leisure preference)
3. health and diet
4. Climate( hot places, rainy season)
5. Market day ( it make some other business to purchase some thing)
6. Job opportunity
7. Social customs( festivals, holydays…. etc)

Labour standardization mainly made in terms of adult man; this helps to calculate labour requirement of the farm.

**Standard conversion rate in adult man equivalent:**

|  |  |  |
| --- | --- | --- |
| age | Male | female |
| <10 | 0 | 0 |
| 10-13 | 0.2 | 0.2 |
| 14-16 | 0.5 | 0.4 |
| 17-50 | 1 | 0.8 |
| >50 | 0.7 | 0.5 |

\*\* Base on these we can determine the available labour for work.

Substitution of labour by other technologies like mechanization and other labour saving technologies has increased agricultural production as well as decrease in labour use.

But, these charges in the tasks performed by agricultural labour have required both employees and managers to increase their education, skills, and trainings.

**Why we adopt labour saving technologies?** Most labour saving technologies have been adopted for one or more of the following reasons:

1. If it is less expensive than labour, it replaced
2. If it allows farmers to increase volume of production
3. If it makes work easier and more pleasant
4. If it allowed to complete certain operations on time( planting, harvesting, if rain-------)
5. If it does a better job than could be accomplished manually

Therefore, input substitution occurs because of a change in the marginal physical rate of substitution.

**Main sources of labour are;**

1. Family labour
2. Hired labour( full time or part time)
3. Exchange labour

### 5.2.1. Unique Characteristics of Agricultural Labour

1. Labour is a continuous flow input:

* Mean that the service it provides is available hour by hour and day to day
* It can not be stored
* It must be used as it become available or it is lost

1. Full time labour is also a “ lumpy” input

* Mean that it is available only in whole , indivisible inputs
* It becomes difficult to avoid a shortage or excess of the resources for lumpy inputs, machinery, land

1. The human factor

* It is another characteristic that distinguishes labour from other resources
* Ex. if an individual is treated an” inanimate object, productivity & efficiency suffer
* The hopes, fears, ambitions, likes, dislikes, worries & the personal problems of both the operator and employees must be considered in any labour management plan.

### 5.2.2. Planning Farm Labour Resources

It helps to avoid costly and painful mistakes.

Major steps to be followed for labour resource planning are:

i. To asses the farm’s labour needs both in quantity and quality and the condition under which workers will function

* Quantity; in terms of man-day;
* Quality: in terms of experience, training, special skills(ability);
* Quantity of labour might be full time or part time( used at peak period, seasonal).

Most managers judge quantity of labour needed by observation and experience

But if new enterprise is being introduce, typical labour requirements from published enterprise budget can be used

Develop tentative job descriptions: for regular workers and occasional workers(hire as needed)

Match present employees and job description

* Good match;
* Change description to fit employee;
* Shift employee to new job;
* Shift employee and adjust description.

iv. Develop job descriptions for remaining tasks

V. Hire employees who fit job description

### 5.2.3. Measures of Labour Efficiency

Dear learner, do you know how the efficiency of labour can be measured?

Labour efficiency measures convert some physical, cost or income total into a total labour figure which is comparable across farm. The example below shows 21 months of labour provided from three sources. Dividing this total by converts it into 1.75 person-years, or the equivalent of 1.75 persons working full time during the year.

Operating labour 12 months

Family labour 4 months

Hired labour 5 months

Total 21 months

**=**1.75 person-years equivalent

Labour efficiency measures convert some physical, cost or income total into a value per person-year. The following measures are commonly used to measure labour efficiency as follow:

**a). Value of farm production per person:** This measures the total value of agricultural products produced in the farm per person year equivalent ( full time equivalent). This measure of labour efficiency is affected by:

* Business size;
* Type of enterprise;
* The amount of machinery used;
* Other labour saving equipments used.

**b). Labour cost per hectare (area crop):** It is found by dividing the total crop labour cost for the year by area of cropped. The opportunity cost of family labour and operator included in total labour cost. This value may be affected by:

* Machinery size;
* Type of crop grown etc.

**c). Crop area per person:** It is found by dividing total crop area by the number of person- years of labour used for crop related activities.

### 5.2.4. Improving Labour Efficiency

Dear learner, how we can improve labour efficiency?

1. Labour efficiency can be improved by more capital investment per labour. Like the use of large machinery and other forms of mechanization.
2. However, the objective is to maximize profit and not just to increase labour efficiency the proper combination is determined by MRTS & price ratio

* Increase the capital investment per worker will increase profit if and only if;
* Total cost is reduced while revenue increases remain constant or at least decreases less than cost.
* The labour that is saved can be used to increase output value elsewhere by more than the cost of the investment

1. labour efficiency can be improved by training and education.
2. Labour efficiency can be also improved by making sure workers have safe and comfortable working conditions whenever possible. Workers should provide with suitable clothing and other safety equipment when working with agricultural chemicals or performing other hazardous jobs.

## 5.3. Capital Management

In this topic, we will discuss about definition and concepts of capital,economies of capital use and sources ofcapital.

Dear learner, do you explain the difference between land and capital.

What is capital?

Normally capital represents past efforts of human being. Many people think of capital as cash balances in checking, and saving accounts and other types of liquid funds. But this a narrow definition of capital, thus, capital includes money invested in livestock, machinery, buildings, land and any other assets that are bought and sold; like fertilizer, seed( seasonal assets).

Economies of capital use broadly defined as:

* Capital is the money invested in the physical inputs used in agricultural production
* It is needed to purchase or rent productive assets pay for labour and other inputs and finance family living and other personal expenditure
* Capital use can be analyzed using the economic principles of equi- marginal return, to answer the basic question of:
* How much capital should be used?
* How should limited capital be allocated among its much potential?

The equi-marginal principle provides the guide lines and rules to ensure that the allocation is done in such away that “profit” is maximized from the use of limited input. A limited capital should be allocated among alternative uses, in such a way that the marginal values of the last units used on each alternative are equal.

**Total capital use:**

**a). when unlimited capital is available**

The problem is how much capital to use? The question of how much “input” to use is answered by finding the input level, where MVP is just equal to MC (marginal cost). The same principle can be applied to capital. Assuming that the unit price of capital is the *same*,

-------------------------1(MVP=MC)

MVP: Is the additional net return that resulting from an additional capital investment (before interest payment)

**b). when capital is limited (allocation of limited capital):** it means capital is limited to something less than the amount that will maximize total profit. The problem here is “allocating limited capital among alternative uses”.

Allocation of limited capital can be accomplished based on the principle of equi- marginal return. It means capital being allocated among alternative uses in such a way that the marginal value of product of the last dollar is equal in all uses.

-------------------------1

But applying the principle of equi- marginal return is often difficult in an actual farm situation due to:

1. Insufficient information available to calculate the MVPs accurately( Prices and costs are constantly changing)
2. Some alternative uses may require large lump-sum investments of an all or nothing nature, such as, livestock, building, green houses or large machinery.
3. Capital invested in assets such as land or building can not easily be shifted to other uses

These all makes it difficult to calculate MVPs for these alternatives with others, where capital can be invested dollar by dollar.

Nonetheless, difficulties encounter in applying the equal marginal principle should not discourage its use. Whenever, limited capital can be reallocated to make the MVPs more nearly equal profit will be increased.

### 5.3.1. Sources of Capital

1. Owners contribution (owners’ equity):

* It is called equity or net worth;
* It is calculated as the difference between total asset and total liabilities(C=A-L);
* Contribution of original capital acquired/gained through saving, gifts, or inheritance.

Assets that are already owned may increase in value through inflation or changes in demand. This does not increase the amount or productivity of the physical assets, but additional cash can be obtained by either selling the assets or using them as collateral for a loan.

2. Outside equity

* Some investors may be willing to contribute capital to a farm or ranch without being the operator(owner);
* Under some types of share lease agreements the land owner contributes operating capital to buy seed & fertilizer or even provides equipment and breeding livestock;
* Partners (contribute capital but not participate in management).

3. Leasing:

* It is often cheaper to gain the use of capital assets by leasing or renting rather than owning them;
* Short term lease is easier for the operator to change the amount & kinds of assets used from year to year;
* However, it also creates uncertainty about the availability of assets such as, land and discourages making long term improvements.

4. Contracting:

* Farmers who have very restricted access to capital or credit, or who wish to limit their financial risk may contract their service to agricultural investors. Ex. custom feeding of cattle, finishing pigs on contract, contract egg production.

5. Credit:

* After owner’s equity, capital is obtained through credit;
* It is the second largest sources of farm capital;
* Borrowed money can provide a means to more quickly increase business size, improve the efficiency of other resources spread out the purchase of capital assets over time and with stand temporary periods of negative cash flow.

**Types of loan:**

We can classify loans based on different criteria, like by their length of repayment, use of funds and type of security pledged.

**Based on length of repayment we can classify loans as:**

1. Short run:

* Productive finance
* Crop loans
* Mostly a year

1. Medium term

* Investment credit
* For 2-5 years
* Purchase dairy animals

1. Long term

* Investment credit
* For 5 to 30 years
* For machinery, irrigation canal, building

**Based on use we can classify loans as:**

1. Real estate loans

* Loans for the purchase of real estate such as, land and buildings, or where real estate serve as security for the loan
* Real estate loans are typically long term loans

1. Non real estate loans

All business loans other than real estate loans

* Loans usually short term or intermediate
* Loans for crop, livestock, machinery or other non-real estate assets may be pledged as security

1. Personal loans

* These are non-business loans used to purchase personal assets such as homes, vehicles and appliances

**Based on security we can classify loans as:**

1. Secured loan

* Some assets is mortgaged to provide collateral for the loan
* Intermediate and long term loans are usually secured by a specific asset such as tractor

1. Unsecured loans

* We call it “ signature loan”
* A borrower with good credit & a history of prompt loan repayment may be able to borrow some money with only” a promise to repay” with out pledging any specific collateral.

**Sources of credit:**

1. Institutional credit organization, such as banks, cooperatives, NGO,s
2. Non- institutional credit organization, like, money , leaders, traders

**Points that can be considered by a farmer (borrower) before deciding to borrow money:**

1. For what purpose he has to borrow?
2. How much he has to borrow?
3. When he should borrow?
4. What security is needed to borrow?
5. The repayment schedule?

**Economic principles applied to agricultural credit**

1. Equity or increasing risk principle:

* It helps to decide the farmer optimum limit of borrowing because the borrowing money always increasing risk. Hence, he is forced to pay the interest for borrowed money.

1. Added cost- added return principle:

* It guides the farmer in deciding how profitably he can use the credit.

1. No profit- no loss principle

* This shows the limit of borrowing for the expansion of the farm business with out losing” the net worth of the farm”

1. The opportunity cost principle

* It helps the farmer to determine the most use of credit or loan/ borrowed fund
* **Cost of credit**: is total amount of interest on loan
* **Cost of borrowing:** is total amount of interest on loan plus service charges like, stamps, paper charges, legal charges, documentation charges, inspection costs

**Characteristics of a good agricultural loan/ credit:**

1. It should be fit to farmers need & ability to repay;
2. It should not exceed the safe relationship security;
3. Budgeted base;
4. It should have a reasonable limit;
5. It should have reasonable cost of loan( interest, other charges);
6. It should provide timely & adequately.

**Characteristics of a good borrower (agricultural borrower)**

* The character of a good borrower is measured by
* His honesty, integrity and ability to repay the loan
* His financial position and security

# SUMMARY

Farm resources such as land, labour, capital, management are key inputs for agricultural production. The Increased quality and quantity of farm resources use have tremendous potential to improve the net farm income.

Land has a unique characteristics not found in other agricultural or non- agricultural resources.Land is permanent resource that does not depreciate or wear out, provided soil fertility is maintained and appropriate conservation measures are used. Land is immobile and can not move to combined with other resources Regional differences affects land use plan.

Labour is one of the production resources which mobilize other resources. Amount of work to be done depends on number of persons; amount hours worked and amount of works. Main sources of labour are family labour, hired labour( full time or part time) and exchange labour.Planning farm labour resources helps to avoid costly and painful mistakes. Value of farm production per person, labour cost per hectare (area crop) and crop area per person are commonly used to labour efficiency. Labour efficiency can be improved by more capital investment per labour, creating safe and comfortable working conditions, training and education.

Capital includes money invested in livestock, machinery, buildings, land and any other assets that are bought and sold; like fertilizer, seed (seasonal assets). The equi-marginal principle provides the guide lines and rules to ensure that the allocation is done in such away that “profit” is maximized from the use of limited input. Sources of capital can beowner’s contribution, outside equity, leasing, contracting and credit.

**Learning Activity**

**i. Choose the best answer from a given alternatives**

1. Which one of the following is not used as determinant for amount of work to be done?

A. Number of persons, B. Amount hours worked, C. Amount of works

D.A and B, E. Except A, F. None

2. Which one of the following are determinants of land use system except one.

A. Density of the population, B. Technology,

C. Soil fertility, topography D. Location, E. None

3. Which one the following can be used to measure labour efficiency

A. Crop area per person B. Labour cost per hectare

C. Labour cost per hectare, D. All of the above, E. None of the above

**ii. Fill in the blank in a given space**

4. \_\_\_\_\_\_\_is one of the production resources which mobilize other resources.

5. Allocation of limited capital can be accomplished based on the principle of \_\_\_\_\_\_\_\_\_\_\_\_.

**iii. Give answers for the following questions accordingly**

6. Write down reasons why land becomes unique as compare to other resource.

7. Write down reasons why manger/ government adopt labour saving technologies in project implementation?

8. Write down main sources of labour.

9. Write down major steps to be followed for labour resource planning.

10. List and explain sources of capital.

11. Write down and explain economic principles applied to agricultural credit.

# CHAPTER SIX: FARM RECORDS AND FINANCIAL ANALYSIS

# Introduction

Dear learner, in the previous chapter, we have dealt with farm resources management such land, labour and capital. In this chapter, we will see about farm record keeping and financial analysis.

Farm record is an account of the various activities carried out on the farm on a regular basis. Such activities include farm purchases, utilization of farm inputs, number of livestock kept and equipment procured. It also includes crop cultivated, seed planted, cultural activities carried out, quantity harvested, etc. Records provide information for proper farm planning, useful for sourcing credit, monitoring farm performance, provide basis for conducting research, useful for decision making, etc.

Balance sheet is a record of financial position at a given period of time whereas; income statement is the summary of income and expenditure over a given period of time. For any accounting year, balance sheet can be prepared at the end of each year.

**Chapter objectives:**

* Explain the importance of farm record keeping;
* Identify and discuss parts of farm records;
* Identify method of value of farm assets;
* Identify the methods of valuing farm production;
* Identify methods of depreciation and calculate the depreciation charge for long term assets;
* Identify measurement of farm performance;
* Understand difference between balance sheet and income statement;
* Identify purpose and use of balance sheet;
* Explain the types of asset and liability;
* Identify indicators of financial performance;
* Calculate current ratio, working capital, debt structure ratio, quick ratio, net worth and leverage ratio;
* Identify financial position of the business;
* Identify activity or turn over ratio;
* Explain the income statement and its analysis;
* Calculate net farm income.

## 6.1. Farm Record Keeping (FRK)

Dear learner, in this topic, we will deal with usefulness of farm record keeping and the characteristics of farm record keeping system.

**Question:** Do you know the reasons for keeping farm records?

Good farm records are the foundation of good farm management. When farm records can be used by farm managers to quickly analyze situations and reach decisions, they are powerful tools

to use in enhancement of farm profitability. Records that are developed, but not understood or not used, make no contribution to the decision making process that is essential to successful farm management.

There are a number of reasons for keeping farm records. Record keeping can:

* Serve as a good basis for calculating more precisely your production costs, yields and profit for a specific cultivation period and enable better forecasting of future levels.
* Help you in preparing your plan and when monitoring its implementation.
* Help you to organise your production and harvesting period in such a way that you can achieve higher prices in the market.
* Enable you to act proactively to protect your produce from potential diseases and your business from worsening conditions.
* Allow you to join buyer, national and internationally recognized quality assurance

Programmes.

* Allow you to measure the financial success.
* Help you to prepare soil map and farm map.
* Enable you to establish a realistic basis for comparisons with the past year.
* Enable you to establish the goal set plan for the future.
* Enable you to obtain credit- you will get credit if your business is on sound financial footing and its operations will produce satisfactory income.
* Compliance/Conformity in tax reporting requirement.

### 6.1.1. Characteristics of Good Record Keeping Systems

Farm records should provide essential information on a timely basis. They should contain an appropriate level of detail; complex farming operations with many and varied enterprises, such as multiple crops and livestock, require more detailed records. Other farms with few enterprises, perhaps a single crop, require less detail. A record keeping system should include:

* A business checking account to handle all business transactions.
* An income ledger to record all business income by calendar month.
* An expense ledger to record all business expenses by calendar month
* An inventory that involves both the physical counting and valuation assignment.
* A depreciation schedule pro-rating the original costs of assets over more than one accounting period.
* A net worth statement or balance sheet summarizing assets and liabilities of the farm. An income or profit and loss statement that lists receipts and expenses by type (and the result is net profit or net loss).
* Cash flow statement measures the flow of funds into the business and the flow out of the business over the accounting period.
* Enterprise records list receipts and expenses by enterprises.

## 6.2. Parts of Farm Records

Farm records system consists of three parts.

1. **Physical farm records: - non-monetary**
2. **Financial farm records- expressed in monetary terms**
3. **Supplementary records**
4. **Physical farm records: - non-monetary**

Physical farm records are related to the physical aspects of the operation of a farm business. They don’t indicate the financial position or the outcome of the business, but simply record physical efficiency or performance of the farm.

The main use of physical farm records is:

* To check the performance of enterprises;
* To control the business;
* To detect weaknesses and strengths to guide future decisions; and
* To provide planning and budgeting data.

Physical farm record should include the following:

a) Farm map

b) Land utilization records

c) Production and disposal record for crop, livestock, poultry and others.

d) Labour records

Paid labour- hired - full- time

- Part-time

\* Market wage rate is taken

Unpaid labour- operator (family) labour

\* Opportunity cost is calculated

**NB** labour days used on crop and livestock enterprises can be recorded separately on monthly basis.

e) Machinery use records

f) Feed records

g) Stock (goods ready to sale) and store register

**Field Records**

In addition to financial records, field or production records provide valuable information. These records might include crop operations and livestock records for poultry or beef enterprises. Field records for crop production might include such items as:

* Field identification or description;
* Parcel size;
* Cropping history;
* Crops grown, cultural practices used and yield information;
* Current field activities;
* Soil test data;
* Labor hours by activity.

Livestock or poultry records also provide useful information. Poultry records should include:

Chicken purchases and dates;

Mortality rates;

Feed records, quantities purchased, and quantities fed;

Production records, eggs per day;

Cull or damaged eggs;

Rodent control activities;

Sale of pullets or hens.

**Forms for maintain field records:**

**a) For crop production**

Year \_\_\_\_\_\_\_\_\_\_Crop\_\_\_\_\_\_\_\_\_\_\_\_Soil type\_\_\_\_\_\_\_\_\_\_\_\_\_,Slope\_\_\_\_\_\_\_\_\_\_

Field number\_\_\_\_\_\_\_\_\_\_\_ Area/ha\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Irrigated or not \_\_\_\_\_\_\_\_\_\_\_\_\_\_

Table6-1: Shows format of crop production record

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Date | Seed | | Fertilizer | | Chemical | | Machinery | |
| Variety | Amount | Type | Amount | Type | Amount | Type | Amount |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |

**b) For livestock**: Like inventory record, feed record, breeding record

i. In case of inventory record, we should know the type and number of animals

Year\_\_\_\_\_\_\_\_\_\_\_\_\_ Animal type\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Table6-2: Format of livestock production record

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Month/  Date | Beginning Inventory | | Transfer | | Purchase | | Produced | | Sale | | Death | |
| No | Value | In(+) | Out(-) | No (+) | Value | No(+) | Value | No(-) | Value | No(-) | Value |
|  | . |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |

\*\* Out- transfer refers to culling, which is negative to the livestock

In- positive

**ii). Feed record**

It is a daily activity and we should record on a separate sheet.

Year\_\_\_\_\_\_\_\_\_\_ Kind of animals\_\_\_\_\_\_\_\_\_\_\_\_\_

Table6-3: Format of number of animal, grain and feed record

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Month/  Date | No. of animals | Grain | | | Commercial | | | Forage | | | Pasture | |
| Corn | Wheat |  | Fagulo |  |  | Silage | Hay |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |

**iii. Breeding records** like calving interval, calving date, are some parts of important parameters from breeding records.

c). Machinery records

* Used for different purposes like:
* To schedule regular repairs and maintenance;
* To collect a day to day function of machinery;
* Helps to calculate depreciation per working hour.

Item\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Identity\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Year\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date of purchase\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Table6-4: Format of machinery record

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Month/Date | Hours used | Fuel | | Oil and lubricant | | Repairs | |
| Amount | Value | Amount | Value | Cost | Description |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |

**2. Financial Farm Records- expressed in monetary term**

It provides information on the profitability of the whole farm business over a given period.

It enables financial analysis to be carried out to reveal the economic strengths and weakness of the farming system.

- All the cash incomes from the operation and expenditures to the operation are recorded.

- Year, day and mouth should be included.

Financial farm record should include the following:

a. Farm inventory

- All kinds of goods purchased and consumed during the operation are recorded.

- The increased and decreased inventories are also recorded.

b. Farm cash or farm financial record

c. Classified farm cash accounts and annual business analysis (credit and debt accounts)

d. Capital asset and sale register

e. Cash sale register

f. Credit sale register

g. Wage register

h. Funds borrowed and repayment registers

i. Purchase register

j. Farm expenses paid in kind register

k. Non-farm income record.

**3. Supplementary records**

- Supplement the two records

- Include

a. Sanction register

b. Auction register

c. Hire register

d. Climate weather condition soil type agro - ecological condition etc

## 6.3. Farm Business Record Components

In the previous topic, we have dealt with parts of farm record. Under, this topic, we will deal with farm business records components.

**Question:** Do you know various methods of assets valuation before?

Farm business record components include value of farm production, asset valuation, and depreciation is explained in this topic.

1. **Value of farm production**

The value of farm production measures the volume of production in monetary terms.

It could be simply defined as the total farm income, both cash and inventory changes, less purchased feed & feeder stock. It is the monetary value of all agricultural production added on the farm during the year. The physical units of different products cannot be added to get a meaningful the value of farm production is one of the basic indices to measure the farm performance and if widely used in statistics and accounting.

The value of farm production equals=

* Total cash receipt
* Plus inventory increase
* plus value of farm products used in home
* Minus inventory decreases
* Minus livestock purchases
* Minus feed purchases

Cash receipts could easily be identified as payments received from selling commodities produced on the farm and other farm-related incomes, such as sale of grain, coffee, livestock, products (milk, wool, etc.). The selling expenses such as having or selling commissions should be included as expenses. The value of farm-raised products consumed by the farm household is non- cash income of the farm. These products, such as a sheep butchered for family use, are no longer available to be sold for cash. It might reduce the actual value of farm production. An accurate measure of total value of farm production should include the value of these products. Livestock and feed purchases are deducts as they represent agricultural products, which were provided by some other farmers. If the farm can purchase livestock and feed and increase their total value through livestock feeding, this increase will be added to the production value.

Inventory is a listing of all physical and financial items owned by the farm. Inventory must be in monetary values. The evaluation process can use one of the several methods to place a value on each type of property.

1. **Asset valuation**

There are many methods for valuing farm assets. Commonly used methods follow; each will be discussed in turn.

• Market costs;

• Net market price;

• Cost or market;

• Farm production costs;

• Capitalization;

• Replacement cost for equivalent function;

• Cost-minus-depreciation.

The **market cost** method values assets at their purchase price. Use this method for recently purchased assets that will be used in a relatively short time (i.e., feed, fuel, fertilizer, and seed). This method must be used to value inventories for tax purposes.

The **net market price** method uses the market cost less transportation and marketing charges. The net market price is the money the farm would have left after selling a product and can be used when liquidity estimates are needed. As examples, net market price could be used for livestock and farm produced crops.

The **cost or market**, whichever is lower, method is tied to the first two methods. Its major advantage is that it is related to the principle of conservatism in valuing assets.

With the **farm production costs method**, valuation is determined by the cost of producing a commodity on the farm. It is useful for farm produced commodities that in turn will be used in other farm enterprises. An example would be farm-raised hay fed to livestock. The production costs would not include a profit or interest on investment, or the operator labor and management charge.

The **capitalization** method uses the time value of money to estimate current asset value. Value is based on an annual income stream that an asset can produce in its present use. This method could be used on income producing assets such as rental property or investments.

The **replacement cost for equivalent function** method takes into consideration the changing function of some assets over time. For example, a building originally constructed for hay storage might now be used for machinery storage. The replacement cost considered should be related to its current use. Accuracy in valuing assets is only approximate. For items that are liquid, such as cash, government bonds.

The **cost-minus-depreciation** method applies to investments that have a useful life longer than a year. Examples include machinery, buildings, and breeding livestock. These assets decrease in value over time, and the change in value becomes a business expense allocated to individual accounting periods. Cost less depreciation can be used for property which provides service to a farm over a period of years but loses value because of age, use, or obsolescence, such as machinery, buildings, and fences and purchased breeding livestock.

1. **Depreciation**

**Definition:** Depreciation involves prorating or allocating the original cost of an asset over its useful life. It is a means of assigning loss in value to individual accounting periods. The major reasons for depreciating assets are to estimate their current value, to calculate annual expenses, and to adjust taxable income. You depreciate assets that have a life of more than one accounting period. (e.g., tractors, computers, implements, trucks, fences, wells, barns, grain storage, and purchased breeding livestock). There may be conflicts between these various purposes for calculating depreciation. Depreciation used to estimate current value affects the net worth statement.

In order to allocate the initial cost of an asset over the years of its life it is necessary:

- To calculate the net initial cost of the asset (purchase price).

- To estimate its likely useful life in the business (this is a matter of experience and judgment).

- To estimate its likely resale value at the end of that life (Possibly from current second-hand prices of similar assets).

- To calculate the depreciation charge for each year of the asset’s life.

There are various ways of calculating the depreciation of wasting assets. No method can provide an exactly accurate measurement of depreciation, since the calculation depends on forecasts of asset life and future resale value. The aim must therefore be to find a method which most nearly represents the likely pattern of depreciation. In what follows the most commonly used methods of depreciation are discussed as under:

**A) The straight -line method**.

In using this method, the difference between initial cost and eventual resale value is divided by the estimated life of the asset (in years).

Mathematically, the annual depreciation charge is given by:

Depreciation charge = 1/N (WDVo- WDVN)

Where, N = the estimated life of the asset

WDVo = written-down value (book value) of the asset at the beginning of its life.

WDVN = resale value of the asset at the end of its service life.

Example: If a farmer purchases water pump for 10500 Birr and the economic life span of this pump is estimated to be 10 years (with a resale value of 500 Birr at the end of the ten-year period), the annual depreciation charge would be

1/10 (10500 - 500) = 1000 Birr

Table6-5: Calculation of straight-line depreciation and book values

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Year | Book value at the beginning of the year | Annual depreciation | Cumulated  depreciation | Book value at the end of the year |
|  | 10500 | 1000 | 1000 | 9500 |
|  | 9500 | 1000 | 2000 | 8500 |
|  | 8500 | 1000 | 3000 | 7500 |
|  | 7500 | 1000 | 4000 | 6500 |
|  | 6500 | 1000 | 5000 | 5500 |
|  | 5500 | 1000 | 6000 | 4500 |
|  | 4500 | 1000 | 7000 | 3500 |
|  | 3500 | 1000 | 8000 | 2500 |
|  | 2500 | 1000 | 9000 | 1500 |
|  | 1500 | 1000 | 10000 | 500 |

The Table6-5 makes it clear that the depreciation charge is constant throughout the life of the asset and the book value declines at a constant or ‘straight -line’ rate. This method is easy to use , and is especially popular for budgets, where one calculation provides the depreciation charges for all the years of an asset’s life. It is appropriate particularly for buildings and improvements, where the services provided are likely to be relatively constant over the asset’s life.

Where machinery and equipment are concerned, however, it is reasonable to suppose that the business benefits more from the services of the asset in the early years of its life than later. This is partly a matter of wear and tear, partly a matter of the likelihood of the asset being superseded by newer, better machines.

**B) Sum - of - the digits method**

This method begins with the summing of the digits representing the years of the asset’s life (N).

In our example: 1+2+3+4+5+6+7+8+9+10 = 55 = 

Where n = 1... N

In year “n”, the depreciation charge would be

(WDVo - WDVN)

Table6-6: Calculation of sum of the digits depreciation

|  |  |  |  |
| --- | --- | --- | --- |
| Year | Annual depreciation | Cumulated depreciation | Book value at the end of the year |
|  | (10500 - 500x10/55 = 1818 | 1818 | 8182 |
|  | 10000 x 9/55 = 1637 | 3455 | 6545 |
|  | 10000 x 8/55 = 1455 | 4910 | 5090 |
|  | 10000 x 7/55 = 1273 | 6183 | 3817 |
|  | 10000 x 6/55 = 1091 | 7274 | 2726 |
|  | 10000 x 5/55 = 909 | 8183 | 1817 |
|  | 10000 x 4/55 = 727 | 8910 | 1090 |
|  | 10000 x 3/55 = 545 | 9455 | 545 |
|  | 10000 x 2/55 = 364 | 9819 | 181 |
|  | 10000 x 1/55 = 181 | 10000 | 0 |

In the sum of the digits method, the book value of the asset declines sharply in the first years, leveling off in later years.

**C) The Diminishing-balance or reducing -balance method.**

In this method, a percentage depreciation rate is applied to the book value of the asset as at the end of the previous year. Using the same example as above and depreciating at the rate of 20 percent per year, the annual depreciation charge would be as follows:

Table6-7: Calculation of depreciation charges using the diminishing-balance method

|  |  |  |  |
| --- | --- | --- | --- |
| Year | Book value at the beginning of the year | Depreciation at 20%  of book value | Book value at the  end of the year |
|  | 10500.0 | 2100.0 | 8400.0 |
|  | 8400.0 | 1680.0 | 6720.0 |
|  | 6720.0 | 1344.0 | 5376.0 |
|  | 5376.0 | 1075.2 | 4300.8 |
|  | 4300.8 | 860.2 | 3440.6 |
|  | 3440.6 | 688.1 | 2752.5 |
|  | 2752.5 | 550.5 | 2202.0 |
|  | 2202.0 | 440.4 | 1761.6 |
|  | 1761.6 | 352.3 | 1409.3 |
|  | 1409.3 | 281.9 | 1127.4 |

A major problem with this method is the selection of a depreciation rate which will result in a book value at the end of the asset’s life in the business which is identical to the anticipated resale value of the asset. In the example above, the rate used has resulted in a book value in year ten which is 1127.4 Birr, higher than the resale value assumed.

One way of dealing with this problem is to try a variety of rates until a suitable resale value is found. A quicker method is to use the formula:



Where, r = the Percentage rate of depreciation

R= the resale value

C= the initial cost

N= the years of life of the asset

Using the previous example, the appropriate rate is: r = [1- 10(500/10500)] x 100 = 26.2 %

Table6-8: Calculation of depreciation charges using the diminishing-balance method at 26.2 %

|  |  |  |  |
| --- | --- | --- | --- |
| Year | Book value at the beginning of the year (Birr) | Depreciation at 26.2% of book value (Birr) | Book value at the end of the year (Birr) |
|  | 10500.0 | 2756.0 | 7744.0 |
|  | 7744.0 | 2032.6 | 5711.4 |
|  | 5711.4 | 1499.1 | 4212.3 |
|  | 4212.3 | 1105.6 | 3106.7 |
|  | 3106.7 | 815.4 | 2291.3 |
|  | 2291.3 | 601.4 | 1689.9 |
|  | 1689.9 | 443.6 | 1246.3 |
|  | 1246.3 | 327.1 | 919.2 |
|  | 919.2 | 241.3 | 677.9 |
|  | 677.9 | 177.9 | 500.0 |

The diminishing - balance method gives rise to a greater decline in the book value in the earlier years than does the sum of the digits method.

**D) Mixed method**

This method enables to take account of the service charges (repair & maintenance costs). In fact, the annual cost of using a given fixed asset includes its depreciation charge and maintenance and repair costs incurred during that year in view of utilizing the asset effectively till the end of its life span.

The mixed method of depreciation is based on the principle that the costs of using an asset remain constant throughout the life of the asset (costs of using the asset = depreciation charges + annual service charges).

Example: Suppose that the purchase price of the pump, in the previous example, was 10000 Birr and its life is estimated to be 10 years with no scrap value. If we assume that the annual service charges are 200 Birr (from year 1 to year 5 ) and increase by 20 Birr every year after the 5th year and the annual cost of using the asset is fixed to be 1230 Birr, the mixed method of depreciation is presented in Table6-9.

Table6-9: Mixed method of depreciation

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Year | Service charge | Annual cost of using the asset (Birr) | Depreciation  charge (Birr) | Cumulated  depreciation (Birr) | Book value (Birr) |
|  | 200 | 1230 | 1030 | 1030 | 8970 |
|  | 200 | 1230 | 1030 | 2060 | 7940 |
|  | 200 | 1230 | 1030 | 3090 | 6910 |
|  | 200 | 1230 | 1030 | 4120 | 5880 |
|  | 200 | 1230 | 1030 | 5150 | 4850 |
|  | 220 | 1230 | 1010 | 6160 | 3840 |
|  | 240 | 1230 | 990 | 7150 | 2850 |
|  | 260 | 1230 | 970 | 8120 | 1880 |
|  | 280 | 1230 | 950 | 9070 | 930 |
|  | 300 | 1230 | 930 | 10000 | 0 |

6.4. Measures of Farm Performance

Common ways to measure farm performance are:

1. **Farm size/size of business**
2. **Efficiency measures**
3. **Farm size**/**size of business**

Farm income is directly related to the size of the business but in no way it indicated whether the farming business is operating efficiently or not. The following are some important measures of the size of a business/ farm size.

**(a) Total area of farm & the number of livestock:** The acreage as a measure of the size of the farm may be either the total [land](http://www.krishiworld.com/html/land_utilization1.html), or the area under [crops](http://www.krishiworld.com/html/comm_crops1.html). The acreage at its face-value carries no meaning. It is necessary, therefore that [land](http://www.krishiworld.com/html/land_utilization1.html) be homogenised & standardized for variations in fertilizer status, irrigation & lack of irrigation, etc. by such standard measures as rental value, land revenue, etc. As in a given type of farming area, there are important crops common to all farmers; therefore, the area (standardised) under principal crop enterprises will help to introduce further refinements in this measure. In the case of livestock farms, the number of animals can be used as a measure of the size of the business.

Again, the breed differences between the herds of two farms make a great difference in the returns received by them. On farms having both crop & livestock enterprises, any of the two will not give the relevant size of the business. Both may be used to represent the situation, but it is not comparable.

**(b) Total capital managed:** The total capital managed is obtained by adding all the capital values of inventories, including land. Either of the closing & beginning inventories can be used. This measure is useful when all the farms are producing the same product & this has no meaning for different specializations.

One is also not sure at the face value of the capital investment whether it is nearer to the optimum required, one farm can be compared with the other for the size of business by the capital investment only if the two farms have the near-optimum investments. The difficulty here is that many farms are understocked or overstocked & the comparison between them is meaningless.

**(c) Total inputs:** The level of inputs in a broad way determines the level of output (income).

The total inputs mean the operational expenses plus the fixed expenses- the rental value of [land](http://www.krishiworld.com/html/land_utilization1.html), the value of labour(of family & operator) & the interest on the capital.

This is the most reasonable method. It can be used in similar situations to compare with the assumption that rates of rent, interest & wages would be the same for each comparable situation.

**(d) Gross income:** This relates to the farm output during the year. This is obtained by adding the home-consumed farm products (in Rs) & the increase or decrease in inventory to the gross receipts of the year. This is a good measure but its use is limited to the same type of farming.

**(e) Productive manpower units:** They refer to the total manpower input required for normal efficiency. This method is more appropriate where labour is scarce & is being used optimally. In a labour-surplus situation, this method has only limited value. Also, the measure is limited to the comparing of the similar type of farming situations.

Again, the difference arises from the difficulty to see whether the farmers under comparison use the scarce labour where it adds to the maximum or not. These measures are rough indicators of the size of the business & can be used to compare only similar situations at a point of time & for the same type of farming.

**2. Farm-efficiency measures**

Dear student, in this section, we will deal with concept of efficiency and difference efficiency measures to evaluate a given farm business performance.

Question: Do you explain the difference between physical and economic efficiency? Can you explain what efficiency means? Good! It is as simple as the following. Efficiency is the ratio of the output to the input. When examined together they help to point out the weaknesses in the farm business & provide a guideline as to which part of the business deserves special attention for making improvements. Further, the efficiency of a farm can be judged from the costs or returns or both.

No single efficiency measure is so complete as to give a true picture of the entire farm business. These efficiency measures help to reorganize the same farm for which they are calculated but they must be used with great caution, while comparing different farms.

This is especially important in the developing countries where farming is of diversified nature & individual farm business has wide variations in respect of [soil](http://www.krishiworld.com/html/soils1.html) type, resource restraints, capacities & capabilities of the farmers to undertake risks, their attitude towards innovations, etc. Also, these measures suffer from limitations for making comparisons because of their changing prices, costs, & conditions of the farm business. Adjustments with the price & cost indices are necessary before such comparisons give any valuable information.

Efficiency measure is classified into two categories:

1. **Physical efficiency measure**
2. **Economic efficiency measure**
3. **Physical efficiency**

Following indicators are used to measure physical efficiency:

a) Total output

b) Grain yield per hectare

c) Milk yield per cow

d) Feed conversion ratio (FCR)



e) Commercial output: The actual sold amount of farm product in the period.

f) The average output per capita

1. **Economic efficiency**

Following indicators are used to measure economic efficiency:

**a) Capital investment**

i. Total capital investment

* The total value invested on land, buildings, machinery and livestock
* Allows an easy comparison of farm size across different farm types

ii. Rate of capital turnover (RCTO)

* An indication of how efficiently capital is being used in production

- Given as



**b) Income performance**

i. Net farm income (NFI) = NP (net profit)

* The profit for the year's operation represents the return to the owner for personal and family labour management and equity capital used in the business

-Given as:-

NFI= Net cash farm income

Plus inventory increase

Plus value of farm products used in home

Minus inventory decrease

Minus depreciation

Minus total cash expends

Minus different from net farm profit (NFP)

Net profit = total production value

Minus material costs

Minus labour costs

Minus taxes



ii) Crop value per tillable hectare (Cv/Tha)

- Measure the intensity of crop production and whether or not the higher value crops are included in the crop plan.

- Given as:-



iii) Net crop income per tillable hectares (NCI/Tha)



iv) Value of farm production per labour (VFP/L):

Following formula is used to measure labour efficiency



v) Net farm income per labour (NFI/L): Another measure of labour efficiency is:



N.B if VFP/L>NFI/L 🡲labour efficiency is good but some cost problem exists.

c) Cost performance

i) Material costs for seed, seedling, chemicals, feed, fuel, fertilizer, veterinary supplies, electricity, water, small tools, depreciation, etc...

ii) Labour cost = working days x labour price/day

iii) Total inputs' cost (fixed and variable inputs)

= Cash operating expenditures

+ Depreciation on capital investment

+ Costs of all labour

+ Interest charge on capital used on the farm.

iv) 

v) Cost per hectare = 

## 6.5. Financial Analysis

Dear learner, in the previous topic, we have dealt with farm record keeping, parts of farm record, components of farm record keeping and the different methods of asset valuation. In this topic, we will study financial analysis which involves maintaining and using records and other information needed to measure the financial performance.

Balance sheet is a summary of financial position at a given period of time. A balance sheet describes the assets, the liabilities, and the equity of farm business at a particular point in time. It is one of the most basic tools used in financial management and should be developed on an annual basis by every farm manager. It is often called a *financial statement* and sometimes a *net worth statement*. The balance relates to the relationship between assets on one side of the document and liabilities on the other side.

Balance sheets may reflect both business and personal assets and liabilities or only business or only personal assets and liabilities. If both business and personal assets and liabilities are included, the result is a *consolidated* balance sheet. If only business assets and liabilities are included, the document is a *business* balance sheet. If the document includes only personal assets and liabilities, it is a *personal* balance sheet

Income statement is the summary of income and expenditure over a given period of time. The income statement is the only tool of farm business analysis that measures profitability.

### 6.5.1. Balance Sheet and Its Analysis

Dear learner, do you know that balance sheet uses as source of information for liquidity and solvency analysis to measure financial performance?

**Question**: What is balance sheet? What is the primary purpose of balance sheet?

**Purpose and use of balance sheet**

**Purpose:** A balance sheet summarizes the financial condition of the business at a point in time. Therefore, the purpose of balance sheet concentrates on estimating the net worth or owner equity by valuing and organizing assets and liabilities and important for loan operation.

**Balance sheet:** Is a systematic organization of every thing “owned” and “owed” by a business or individual at a given point in time. Any thing of value owned by a business or individual is an asset. Any debt or other financial obligation owed to some one else is referred to as “liability”.

Therefore, a balance sheet is a listing of assets and liabilities that concludes with an estimate of net worth or owner’s equity.

**Owner’s equity**: Is the amount that the owner invested in the business.

Asset= Liabilities + Capital; Owners’ equity= Asset- Liabilities

A common layout of a balance sheet is presented in Table6-10

*Table6-10: Balance sheet structure*

|  |  |  |  |
| --- | --- | --- | --- |
| ASSETS |  | LIABILITIES |  |
| Current asset |  | current liabilities |  |
| Intermediate Assets |  | Intermediate Liabilities |  |
| Long Term Assets |  | Long Term liabilities |  |
|  |  | **Total liabilities** |  |
|  |  | **Owner's equity** |  |
| Total asset |  | **Total liabilities& owner's equity** |  |

**Assets can be further categorized into three classes:**

**Current assets:** Are more liquid assets, which will be either be used up or sold within the next year as part of normal business activities. Example, cash on hand and checking, saving account balance are current assets, others like, readily marketable bonds, and stocks, accounts and note receivables , inventories of feed, grain supplies and feed livestock.Current assetsare owned primarily to produce agricultural commodities that can then be sold to produce cash income.

***Intermediate-term assets:***Are those items which are expected to impact the business after one year but within ten years. This category includes assets used in production of income. Machinery and equipment, breeding livestock, retirement accounts, and longer term securities are classified as intermediate assets.

***Long term or fixed assets****:* These can be tangible, such as land and buildings, or intangible, such as goodwill, licenses, patents etc. Their value is calculated by deducting accumulated depreciation from the original cost of purchase.

**Liabilities**

Liabilities are the financial obligations incurred by an individual or firm. They are composed of current, intermediate, and long-term obligations.

**Current liability:** Current liabilities are financial obligations that will become Due and payable within “1” year from the date of the balance sheet.

This is short term loan. Example, principal payment for short & long term loans, account payables at farm supply stores for goods and services received interest for short term, like loans for purchase of fertilizer, seed, feed for livestock etc.

***Intermediate liabilities****:* Sometimes these are included as long term liabilities usually represent loans with a repayment period of 3 – 5 years. Loans are used to purchase machinery or equipment and breeding livestock are usually classified as intermediate.

***Long-term liabilities*** are related to real estate and typically involve debts due after more

than ten years from the initial date of the loan. Real estate mortgages are the typical obligation that appears on the balance sheet as a long-run liability.

**Equity** represents the funds contributed by the owner and can include:

Capital reserves: Surpluses from sources other than the normal business activity.

* Revenue reserves: Surpluses generated by the normal business activity.
* Common stocks: Owner paid capital into the business.

**Owner Equity:** is the difference between total asset and total liabilities.

The three basic sources of owner’s equity are:

1. Capital contributed to the business by its owner(s);
2. Earnings or business profit that has been left in the business rather than withdrawn;
3. Any change caused by fluctuating market values when market values” rather than” cost is used.

*Table6-11: Example balance for a livestock breeding company*

|  |  |  |  |
| --- | --- | --- | --- |
| ASSETS |  | LIABILITIES |  |
| Current asset |  | current liabilities |  |
| Cash | 4.000€ | Operating loans Deposit | 10.000€ |
| Deposits | 10.000€ | Accounts payable | 3.000€ |
| Accounts receivable | 4.000€ | Cash advance payments | 2.000€ |
| Grain and forage | 2.000€ | ……… |  |
| Market livestock | 10.000€ |  |  |
| **Total Current Assets** | **30.000€** | **Total Current Liabilities** | **15.000€** |
| Intermediate Assets |  | Intermediate Liabilities |  |
| Machinery | 8.000€ | Intermediate loans | 15.000€ |
| Equipment | 6.000€ |  |  |
| Animal capital | 16.000€ |  |  |
| **Total Intermediate**  **Assets** | **30.000€** | **Total Intermediate**  **Liabilities** | **15.000€** |
| Long Term Assets |  | Long Term liabilities |  |
| Land | 30.000€ | Long term loans | 30.000€ |
| Buildings | 10.000€ |  |  |
| **Total Long Term Assets** | **40.000€** | **Total Long Term**  **Liabilities** | **30.000€** |
|  |  | **Total liabilities** | **60.000€** |
|  |  | **Owner's equity** | **40.000€** |
| **Total asset** | **100.000€** | **Total liabilities + owner's equity** | **100.000€** |

**Exercise:** Use the balance sheet structure to prepare a balance sheet for any/your own business. Things to consider when preparing your balance sheet are:

* Has the date of the statement been recorded?
* Are all assets listed, and in the right category?
* Are reasonable values placed on the value of assets?
* Have you included leased assets (by mistake)?
* Are all the liabilities listed in the right category?
* Are the liabilities and loan balances correct at the date of the statement?

### 6.5.2. Financial Performance Indicators

Dear learner, in the previous topic, we have discussed the balance sheet which is used as source of information to measure financial performance. In this topic, we will deal with liquidity and solvency analysis that are used to measure financial performance. It also introduce you how to calculate these ratios from balance sheet statement and determine the financial strength or weakness of the business.

**Question:** What are liquidity and solvency mean? What is the difference between liquidity and solvency?

Farm managers use performance indicators all the time. Yield per hectare is one example. Almost every production performance activity can be expressed by comparing two or more elements. The same is true for the financial side of the business. Ratiosare simple relationships between two sets of financial values and comparing trends of these ratios over time is often more important that simply looking at the numerical values. Comparing actual results to historical trends is one of the best ways to keep on top of your finances.

A balance sheet is used to measure financial condition of a business and more specifically, its liquidity and solvency. The financial position of the business can be measured based on:

**a. Analyzing liquidity:** Liquidity is the ability to pay interest and principal to its supplies of short term credit. It is the ability of the firm to meet financial obligations as they come due with out disrupting the normal operations of the business. Like, sale of grain & feeder livestock but selling of machinery affects future firm operation. Its analysis concentrates on current liabilities and assets. The need for “cash” over the next “12” months. There are four main indicators of liquidity: the current ratio, working capital, the debt structure ratio, and the quick ratio.

**1.Current ratio**

Liquidity indicators are found in the balance sheet. One of the most useful is the current ratio, which is current assets over current liabilities, i.e., Equation 1.

This measures the ability of a firm to pay its short term obligation without affecting the business operation. The larger the value, the more liquid the business, if the value >1; If, for example, a business has a current ratio of 2:1, it means that there is $2 of current assets covering every $1 of current liabilities.

Agricultural lenders generally like a current ratio of at least 2:1. If the ratio is 1:1, then the firm is barely liquid, and if the ratio is less than this, the firm has liquidity problems. It is always hard to generalize in farming because of the variation between different enterprises and different areas and practices. Generally, any current ratio trends below 1.3:1 indicate danger. Conversely, a ratio above 5:1 strongly suggests that the firm is overly liquid and should be investing some of its current assets.

**2. Working capital**

A second liquidity guide is working capital, that is, current assets minus current liabilities. Working capital shows what is available after meeting debts due. Obviously, we need a positive figure; otherwise the firm is illiquid. But the amount of working capital considered reasonable depends on the size and type of the individual firm. We would expect it to grow for an expanding business. However, as a rough guide working capital should be close to expected net farm income. Otherwise, we may not be making sufficient investment in the farm.

If there is insufficient working capital, a fall in total current asset values could wipe it all out. For

example, if total current assets were $60,000 and working capital $40,000, it would take a 67 percent drop in asset values to eliminate the working capital.

**3. Debt structure ratio**

A third liquidity guide, debt structure ratio, illustrates the debt structure of the firm. This ratio is calculated by dividing current liabilities by total liabilities, i.e., Equation 2.

A ratio of 0.6:1 (often written as 0.6) means that 60 percent of the total farm debt is due the following year. If total debt is small, there is nothing to worry about. But most farms have considerable debt loads, and a debt structure ratio of 0.6 shows that too much of the farm debt is current. In general, a ratio of 0.2 or less is safe and 0.5 or more is dangerous.

Trends going in either direction may require some decisions. For example, we could increase borrowing in the former case and perhaps, by transferring some of the current debt into long-term liabilities, arrange for debt restructuring in the latter situation.

**4. Quick acid ratio**

Our fourth, and final, liquidity ratio is the quick or acid test ratio. It is the best measure of ability to cover current obligation.

This essentially revamps the current ratio by taking out noncash current asset items, including inventory in crops, livestock and supplies, plus cash invested in growing crops, and dividing this numerator by current liabilities, i.e., Equation 3.

Quick acid ratio=

The remaining assets are cash, marketable securities, and accounts receivable. If these assets are sufficient to cover all current liabilities, the farm is decidedly liquid. However, on most farms which already have a healthy current ratio, a quick ratio around 0.5:1 is probably reasonable. A ratio of less than 0.3:1 usually means that the farmer has a lot of inventory and will have to take current market prices in any forced sale.

Unlike most nonfarm businesses, all this current inventory is expected to be sold in the following year. So the quick ratio should mainly be used on these farms for trend purposes.

These liquidity ratios give some idea of the firm's current position and short-term progress. They indicate potential trouble and should be calculated regularly. But in order to examine long-term effects we need to look at solvency.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Table6-12: Balance Sheet (1) Dec. 31, 19\_\_ ($,000) | | | | | |
| Assets | | | Liability and Net Worth | | |
|  | Cost | Market value |  | Cost | Market value |
| Current | 100 | 110 | Current | 100 | 105 |
| Intermediate | 200 | 210 | Intermediate | 120 | 130 |
| Long-term | 700 | 1000 | Long-term | 400 | 440 |
|  |  |  | Total liability | 620 | 675 |
|  |  |  | Net worth | 380 | 645 |
| Total | 1000 | 1320 | Total | 1000 | 1320 |
|  |  |  |  |  |  |

**Example of liquidity analysis**

Based on the information in Table6-12 some key ratios related to the balance sheet are calculated in Table6-13:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Table6-13: Liquidity analysis | | | | | | | | |
|  | | | Cost | | | Market value | | |
| Current Ratio | = | current assets / current liabilities | 100/100 | = | 1 | 110/105 | = | 1.05 |
| Working Capital | = | current assets - current liabilities | 100 - 100 | = | 0 | 110-105 | = | 5 |
| Debt structure ratio | = | current liabilities / total liabilities | 100 / 620 | = | 0.16 | 105 / 675 | = | 0.15 |

**b. Analyzing solvency:** The ability of a firm to pay its short term & long term obligations if all assets are sold. It explains the ability of a firm to pay all financial obligations or liabilities, if all assets were sold. Solvency is a long-range concept which shows the firm's ability to meet all debts when assets are sold. Solvency indicators are found in the balance sheet. The main indicators are net worth, the leverage ratio, and the solvency ratio.

**1. Net worth:** As assets minus debt equals net worth; we are obviously looking for a positive figure. A negative net worth shows insolvency. So the basic solvency indicator is net worth. Trends in net worth show trends in solvency. The two-column balance sheet provides a cost net worth and the market value net worth.

The cost net worth shows what we paid for our assets, minus any depreciation. The market value net worth shows what we could get for our assets if we sold them at current market prices, minus any contingent taxes.

(Contingent taxes are the income and capital gains taxes which we would have to pay if we sold these assets.) Understandably, market value net worth is generally greater than cost net worth. As most of the difference between the two can be attributed to inflation, we need to look at both net worth when examining the solvency of a business.

2. **Leverage ratio or debt /equity ratio**: Is another solvency indicator. This ratio is calculated by dividing total debt by net worth.

Most lenders do not want to see leverage ratios over 1.5:1. This means there is $1.50 of debt for every $1 of net worth. The higher the ratio, the more risk the firm faces, and, conversely, the lower the ratio, the lower the risk. However, many young farmers need ratios over 4:1 if they are to obtain sufficient capital to farm. Trends are again important. Ratios above 2:1 must be watched carefully. Those below 1:1 may suggest acquiring additional debt to exploit current opportunities.

The leverage ratio is 300,000 /100,000 or 3:1, which is fairly high for a farm. Now suppose our farmer gets a 20 percent return on his assets during the following year.

His 20 percent increase in assets has resulted in an 80 percent growth in his net worth. This is why borrowing can be so attractive. Successfully using other people's money provides impressive gains in net worth. If the farmer had no debt, he would only be controlling $100,000 of assets, and his assets would equal his net worth.

So a 20 percent asset return means his net worth would also grow by 20 percent. However, by borrowing he was able to increase his return on net worth fourfold (and reduce his leverage to 1.67:1). This is the advantage of leverage. At the same time, his leverage ratio has increased from 3:1 to 15:1, which is an extremely dangerous level.

**3. Solvency ratio:** It is the third guide to business solvency is the solvency ratio, found by dividing total debt by total assets, i.e., Equation 4.

This shows the share of liabilities from total business asset.

The higher the ratio, the more debt there is for each dollar of assets. In the three balance sheets used to illustrate the leverage ratio, the solvency ratios were 0.75, 0.63, and 0.94, respectively. The 0.75 ratio means that there are 75 of debt for every $1 of assets.

Any ratio approaching 1 shows imminent insolvency. In the conditions of the mid 1980s, any ratio above 0.5 looks dangerous, particularly for those businesses that expanded considerably in the mid 1970s. Solvency, therefore, covers the long-range aspects of the business. We now need to see how the business is performing throughout the year. This performance is indicated by profitability indicators taken from the income statement.

Debt ratio=

This shows the share of owner’s equity from the total asset.

|  |  |
| --- | --- |
| debt/equity ratio = | Total liabilities |
| Total equity |

This shows the capacity of a firm to cover its liabilities.

Long term debt to equity ratio=

This measures at which the degree that total asset greater than liabilities. If assets are not greater than liabilities the business is insolvent and a possible candidate for bankruptcy proceedings.

Based on the information in Table6-12 some key ratios related to the balance sheet are calculated in Table6-14:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Table6-14: Solvency Analysis | | | | | | | | |
|  | | | Cost | | | Market value | | |
| Net Worth | = | Assets - debt | 1000 - 620 | = | 380 | 1320 - 675 | = | 64 |
| Leverage Ratio | = | Total liabilities / net worth | 620 ÷ 380 | = | 1.63 | 675 / 645 | = | 1.04 |
| Solvency Ratio | = | Total liabilities / total assets | 620 ÷1000 | = | 0.62 | 675 / 1320 | = | 0.6 |

c. **Activity or turn over ratio:** It indicates efficiency of the utilization of the firm assets. Major activity ratios are:

|  |  |  |  |
| --- | --- | --- | --- |
| i. Account receivable turn over= | | | Net sales |
| Account receivable |
| ii. Inventory turn over= | Net sales | | | |
| Ending inventory or average inventory | | | |
| iii. Net current asset turn over= | | Net sales | | | |
| Net current asset( current asset- current liabilities) | | | |

|  |  |
| --- | --- |
| iv. Fixed asset turn over= | Net sales |
| Net fixed asset( fixed asset- depreciation) |

|  |  |
| --- | --- |
| v. Total asset turn over= | Net sales |
| Total asset |

### 6.5.3. The Income Statement and Its Analysis

Dear student, in the previous topic, we have seen about balance sheet and its analysis. In this topic, we will deal with income statement which is important tool to measure profitability.

**Question:** What is income statement? What are the advantages of income statement?

Income statement: Is the summary of income and expenditure over a given period of time. It is needed for the control function. It is also called profit or loss statement or operative statement.

Its primary function or purpose is:

* To compute/ calculate profit with a given period of time
* To measure the difference between revenue and expense. Therefore, positive difference shows profit and negative difference shows loss.

The period of income statement is called accounting period. The purpose of a profit and loss account is to show the incomes and expenses from normal operations of your business over a period of time, called the accounting period. The accounting period is usually the calendar year. The profit and loss account measures the profitability of the business over this period. The difference between profit and loss is called net income (profit or loss) for the period.

The income statement can be computed monthly, quarterly, semi-annually, annually, or on some other schedule depending on what is needed for management purposes. Most farm businesses use an annual income statement. The annual statement is consistent with the production cycle for

livestock and crop enterprises and with calendar year record-keeping and tax filling activities. This approach permits comparison of farm profitability from one calendar year with profits from prior and subsequent years.

**Income statement format**: In a very condensed form, the basic structure;

* Total revenue
* Less total expense
* Equals net-farm income from operations
* Plus or minus, gain/loss on sale of capital asset( like machinery, equipment)
* Equals net farm income.

**Analysis of net farm income:** The income statement may show positive balance, that shows profit, but it is a” profitable” business. Profitability is relative; it depends on the size of the business or value of resources used to produce a “profit”.

The revenue per unit cost (how much return we get from investing one birr). Therefore, there are about “four” measures of profitability.

1. Net farm income
2. Rate of return on assets
3. Rate of return on equity
4. Operating profit margin ratio we can also made a return to operator labour & management.
5. **Net farm income**

Net farm income, (farm profit or loss based on operating earnings), is net cash operating income (farm receipts minus farm expenses) plus the adjustment for value of products consumed by the family, plus inventory adjustment, plus adjustments for accounts payable and receivable, and minus depreciation. The consolidated income statement includes nonfarm income since employment off-the-farm has become an increasingly important income source in recent years.

1. **Rate of return on asset(ROA)**

This is a measure of profitability, measuring the rate of return that the farm business earns on its average asset base over the period. The higher the return, the more profitable the farm business is. Information for calculating this ratio comes from both the net worth statement and the income statement.

ROA is calculated by **dividing the net farm income plus the interest expense, less the unpaid labour/management costs, by the average value of the farm assets for the period, and is expressed as a percentage**. An appropriate unpaid labor/management cost must be subtracted from the net farm income, in order to get a net return to only the capital invested in the business. Income before interest is used because interest is considered part of the return on your investment and was claimed as an expense in determining the net farm income.

.

**Or**

|  |  |
| --- | --- |
| ROA= | Return to assets |
| Average farm asset value |

Typical ROA’s for many farms are in the 2% to 5% range.

**Example Given:**

* Average farm asset value =$ 725,750.00
* Average owners equity =$ 361,320.00
* Net farm income from operation= $46,800.00( not include gain/loss from sale of capital)
* Total interest expense( non operating expense) =$29,500.00

**Assume:**

* Opportunity cost of family labour------------------$20,000.00
* Opportunity cost of management---------------------$5,000.00

Then find **ROA**: To calculate ROA first we have to make an adjustment, the return on asset is the dollar return to both debt and equity capital, so net farm income from operations must be adjusted. Interest on debt capital is deducted as an expense when calculating net-farm from operation.

|  |  |  |
| --- | --- | --- |
| **A. Total Revenue** |  | **$200,400.00** |
| **B. Expenses** |  |  |
| Operating expense | $124,100.00 |  |
| Total interest expenses | $29,500.00 |  |
| **Total expense** |  | **$153,600.00** |
| **C.(A-B)Net farm income from operation** |  | **$46,800.00** |
| D. gain/loss on sale of capital assets |  |  |
| Machinery | $1,100.00 |  |
| Land | 0 |  |
| Others | 0 |  |
| **Total gain/loss** |  | **$1,100.00** |
| **E.(C+D)Net farm income** |  | **$47,900.00** |

Then any such interest must be added back to net farm income from operations when computing the return to assets. Therefore,

* Net farm income from operation -------------------=$46,800.00
* Plus interest expense ----------------------------------=$29,500.00
* Equals adjust net farm income from operation----=$76,300.00

It is also necessary to make adjustment for unpaid labour and management is provided by the farm operator and the farm family.

Because net farm income from operation includes contribution of family labour and management, so we should have to reduce the opportunity cost, family labour and management.

Thus:

* Adjusted farm income from operation--------------=$76,300.00
* Less opportunity cost of unpaid labour---------------=$20,000.00
* Less opportunity cost of management ----------------=$5,000.00
* ***Equals return to assets----------------------------------=$51,300.00***

|  |  |
| --- | --- |
| ROA= | 51300.00 |
| 725700 |

= 0.0707(7.07%)

Therefore, the profitability of the business is judged by comparing this value with other similar firms (Average of industry).

1. **Rate of return on equity (ROE)**

This is a measure of the return on the equity of the business. Equity is capital that could be invested elsewhere (perhaps not in farming). You can compare farm investment in farming with other alternatives. A typical ROE is in the 4% to 8% range.

It means return on owner’s share of capital.

It is calculated by dividing the net farm income less the unpaid labour/management costs, by the average value of the farm equity (net worth) for the period, and is expressed as a percentage.

|  |  |
| --- | --- |
| ROE= | Return of equity |
| Average Equity |

**Or**

This return can show huge swings from year to year, especially if the farm operates with a large amount of borrowed capital and has little equity in the farm business. A typical ROE for many farms is in the 4% to 8% range.

To find return of equity adjustment must be made;

**Return on equity equals:**

* Net farm income from operation--------------=$46.600.00
* Minus opportunity cost of unpaid labour-----=$20,000.00
* Minus opportunity cost of management-------=$5,000.00
* ***Return on equity equal to-------------------------=$21,800.00***

|  |  |
| --- | --- |
| ROE= | 21800 |
| 361320 |

= **0.0603(6.03%)**

The ROE can be either greater or less than ROA depending on ROA relation to interest rate paid on borrowed money:

* if ROA>i, then ROE>ROA
* if ROA<i, then ROE<ROA

When the ROE is bigger than the ROTA; it is an indication of an economic use of borrowed funds. In other words it was sensible to borrow money because the return on this borrowed capital was greater than the cost of borrowing.

1. **Operating profit margin ratio**

This means operating profit as a percent of total revenue. A higher value means a business is making more profit per dollar of revenue.

The ratio converted to a percentage reflects the part of gross income that is required to cover farm operating expense. Then the first step is computing the absolute dollar value for operating profit.

* Net farm income from operation -----------------------= $46,800.00
* Plus interest Expense -------------------------------------= $29,500.00
* Minus opportunity cost of labour ------------------------= $20,000.00
* Minus opportunity cost of management ------------------= $5,000.00
* ***Operating profit margin-----------------------------------= $51,300.00***

|  |  |
| --- | --- |
| Operating profit margin ratio= | 51300 |
| 200400 |

= 0.256(25.6%)

This means on average every dollar of revenue generates a profit of 0.256 cents.

1. **Return on labour and management**: To find return on labour and management, first we have to calculate opportunity cost of all assets (let say, 8% opportunity cost).

Opportunity cost of all asset= 705750\*0.08=$58060

Therefore, return to labour and management equals net farm income from operation minus opportunity cost of all assets.

Return on labour & management= 76300-58060=$18240

**Return to labour**= return on labour & management- opportunity cost of management

=18240-5000=***13230***

Which is less than the opportunity cost of labour ($20,000.00).

This shows that the net farm income is not sufficient to cover at least the opportunity cost of labour, management and capital. The opportunity cost of capital is $58,060.00 but the net farm income is 47,900.00.

Return on management= return on labour & management- opportunity cost of labour

### = 18240-20000=-1760----- it mean that a net farm income is not sufficient to cover opportunity cost of labour and management.

### 6.5.3. Cash Flow

Actual cash flow (farm receipts and expenses) can then be compared with the projection to provide an early check on business progress and an opportunity to make timely adjustments if

required. Cash flow should be prepared on both an annual and monthly basis. The monthly cash flow is of critical importance in determining specific dates when loans are needed, when debt can be repaid, and when inputs will be purchased. The use of the cash flow in estimating amounts and time of financial transactions causes some people to view the document as a whole-farm budget. The cash flow projection estimates the flow of revenue into the farm business and the flow of expenditures out of the business. Those flows are important because they indicate when cash surpluses or deficiencies will occur. Cash flow says nothing about profitability of the business; profitability information is available only from the income statement. Cash flow includes no consideration of inventory change, accounts payable or receivable, or depreciation. The absence of these important adjustments means that profitability decisions based on cash flow will be grossly misleading.

A cash flow projection is important because…

* It requires careful planning and thought in managing all aspects of the farm business, and allows the user to test ideas before they are put into practice.
* The cash flow projection addresses the question of whether or not the business plan will be feasible in the short run.

Under some circumstances, it may be necessary to prepare a cash flow budget for more than one year to fully address feasibility issues and prolonged start-up costs.

* The cash flow statement provides information as to whether or not an operating line of credit will be required during the production period, and if so, when and how much credit will be required.
* The cash flow budget also helps to confirm whether the farm can operate within an existing approved line of credit, and if not, how much more credit will be required and during what time period(s).

The cash flow statement is especially helpful when…

* A new business or enterprise is under consideration,
* The business is being expanded,
* A significant change(s) in production is planned,
* A start-up period is required to get into full production, and…
* A change in financial structure is being contemplated

**Structure of a cash flow statement**

* Cash flow statements can be prepared on an annual, quarterly or monthly basis.
* The report lists the categories of cash inflow on the top left hand side of the report and the cash outflow categories underneath. Each column to the right of these categories represents a period of time during the accounting period.

The surplus or deficit cash positions for each period and the accumulated cash position for the accumulated periods are calculated at the bottom of the cash flow.

* Farm plan builds the cash flow plan starting with the crop and livestock inventory and production plan section. Cash inflow and cash outflow items not covered in this section must be added in the detailed cash flow section and are summarized in the cash flow summary report.
* Farm plan produces either a monthly or a quarterly cash flow, depending on which program is chosen. Since both of these options are written on two separate programs, the choice as to which cash flow is desired must be made before data is entered into either of the two programs. In other words, the quarterly cash flow program cannot be converted into a monthly cash flow program and vice versa, once a program has been selected.

Table6-15: Annual Cash Flow

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Annual Cash Flow** |  |  | |  |
|  | **Line Cash inflow** |  |  | **Line Cash outflow** |  |
|  | **Operating income** | $ |  | **Operating expenditures** | $ |
|  | Crops |  | 28 | Labor, hired | 1,200 |
| 1 | Corn |  | 29 | Machinery repair & maintenance | 6,000 |
| 2 | Milo |  | 30 | Building & fence repair | 1,200 |
| 3 | Wheat | 5,400 | 31 | Interest | 9,924 |
| 4 | Soybeans | 4,620 | 32 | Hay | 2,500 |
| 5 | Cotton |  | 33 | Feed bought | 27,000 |
| 6 | Grass & clover seed |  | 34 | Seeds, twine, etc | 2,762 |
| 7 | Hay, silage |  | 35 | Crop chemicals | 2,482 |
| 8 | Other, crop |  | 36 | Fertilizer & lime | 9,748 |
| 9 | Government payments |  | 37 | Machine hire | 255 |
|  | Livestock |  | 38 | Breed fees & livestock supplies | 9,900 |
| 10 | Milk | 117,000 | 39 | Vet & medicine | 1,800 |
| 11 | Eggs, wool |  | 40 | Gas, fuel, oil | 7396 |
| 12 | Calves | 3,540 | 41 | Rent |  |
| 13 | Market hogs |  | 42 | Taxes | 4,000 |
| 14 | Other market livestock |  | 43 | Insurance | 800 |
|  | Miscellaneous |  | 44 | Utilities, elect, phone | 3,000 |
| 15 | Custom work |  | 45 | Freight & trucking | 475 |
| 16 | Cash rent |  | 46 | Farm auto | 500 |
| 17 | Other, farm |  | 47 | Feeder cattle |  |
| 18 | Total operating income Add L 11-17 | 130,560 | 48 | Assessment | 1,380 |
|  | **Capital sales** |  | 49 | Other expenses (2% subtotal) | 1,846 |
| 19 | Breeding beef |  | 50 | Total operating expense Add L 28-49 | 94,168 |
| 20 | Breeding hogs |  |  | **Capital expenditures** |  |
| 21 | Breeding dairy | 7,800 | 51 | Breeding beef |  |
| 22 | Machinery & equipment |  | 52 | Breeding hogs |  |
| 23 | Total capital sales Add L 19-22 |  | 53 | Breeding dairy |  |
| 24 | Total cash income L 18+L 23 | 138,360 | 54 | Machinery & equipment | 9,000 |
|  | **Other income** |  | 55 | Bldgs & land improvements | 16,000 |
| 25 | Nonfarm income | 6,000 | 56 | Total capital expenditures Add L 51- | 25,000 |
| 26 | Loans |  | 57 | Total farm expenditures L 50+56 | 119,168 |
| 27 | Total cash available L 24+25+26 | 144,360 |  | **Other cash outflow** |  |
|  |  |  | 58 | Principal payments | 7,000 |
|  |  |  | 59 | Family living | 16,600 |
|  |  |  | 60 | Total cash outflow L 57+58+59 | 142,768 |
|  |  |  |  | **Summary** |  |
|  |  |  | 61 | Cash balance L 27-60 | 1,592 |
|  |  |  | 62 | Accumulated borrowing |  |

# SUMMARY

Farm record is an account of the various activities carried out on the farm on a regular basis. Records provide information for proper farm planning, useful for sourcing credit, monitoring farm performance, provide basis for conducting research, useful for decision making, etc. Farm records system consists of three parts such as: physical farm records, financial farm records and supplementary records. Farm business record components includevalue of farm production, asset valuation, and depreciation. Market costs, net market price, cost or market, farm production costs, capitalization, replacement cost for equivalent function and cost-minus-depreciation are commonly used methods to value various assets.

Balance sheet is a summary financial statement necessary for implementing, monitoring and control system for the farm business. Balance sheet is a summary of financial position at a given period of time. A balance sheet describes the assets, the liabilities, and the equity of farm business at a particular point in time. A balance sheet is used to measure financial condition of a business and more specifically, its liquidity and solvency. Liquidity is the ability to pay interest and principal to its supplies of short term credit. Solvency is the ability of a firm to pay its short term and long term obligations if all assets are sold.

Income statement is the summary of income and expenditure over a given period of time that is used to find profitability. Primary function or purpose of income statement is to calculate profit in a given period of time. The period of income statement is called accounting period. The income statement can be computed monthly, quarterly, semi-annually, annually, or on some other schedule depending on what is needed for management purposes.

Cash flows are important because they indicate when cash surpluses or deficiencies will occur. Cash flow says nothing about profitability of the business; profitability information is available only from the income statement. Cash flow includes no consideration of inventory change, accounts payable or receivable, or depreciation.

**Learning activity**

i. Review your understanding of the following key words.

Record Asset Liability

Equity Solvency Liquidity Ratio Net farm income Inventory Efficiency Depression Valuation

**ii. Give answers for the following questions accordingly**

1. Write down the importance of farm record keeping
2. Write down and discuss the parts of farm record
3. Write down and discuss methods of value farm assets
4. Write down the methods of depreciation and explain their difference and similarity
5. Write down farm size indicators and explain their similarity and difference
6. Explain difference between economic and physical efficiency
7. Write down purpose and use of balance sheet
8. Write down the types of asset
9. Write down the three basic sources of owner’s equity
10. Based oninformation in Table 6-11 about balance sheet for a livestock breeding company*,* calculate current ratio, debt structure ratio, working capital, solvency ratio, leverage position. Draw conclusions on your business viability and performance.

# CHAPTER SEVEN: RISK AND UNCERTAINTY MANAGEMENT

# Introduction

Dear learner, under this chapter, we deal with concept and definition of risk and uncertainty, types of risk and strategies of risk management.

**Question:** Do you know some producers/ farmers who face any type’s risks in your locality?

Are you familiar with risk and uncertainty?

The agricultural sector is exposed to a variety of risks which occur with high frequency. These include climate and weather risks, natural catastrophes pest and diseases, which cause highly variable production outcomes. Production risks are exacerbated by price risks, credit risks, technological risks and institutional risks. Risk management in agriculture can be informal mechanism like avoidance of highly risky crops, diversification across crops and across income sources to formal mechanisms like agriculture insurance, minimum support price system and future’s markets.

The frequency and severity of risks in agriculture particularly in last few decades has increased on account of climate variability and change. The principal evidence of climatic change has been rising temperatures, erratic rainfall pattern, and increase in the severity of droughts, floods and cyclones which have caused huge losses in agricultural production and the livestock population. India has developed response mechanisms for primary (crop failures) and to some extent secondary (livestock deaths) consequences of climate variability. However, a tertiary mechanism which goes beyond resource transfer to resource generation, through climate forecasting, climate information generation and dissemination, early warning system, mapping of agricultural losses through remote sensing technology and a pre and post climate change response system need to be put in place on a decentralized basis involving at risk communities. Such a response mechanism must include putting to work a catastrophe protection insurance mechanism as also the protection of country’s bankruptcy legislation for the farmers.

Effective risk management is an important aspect of farm and ranch businesses. Risk management involves choosing among alternatives that reduce the financial effects of the uncertainties of weather, yields, prices, government policies, global markets, and other factors that can cause wide swings in farm income.

## 7.1. Definition and Categories of Risk

Dear learner, you know that farmers/producers always make decision under imperfect knowledge of condition. The traditional analyses of decision-making with less than perfect knowledge are divided into two classes, risk and uncertainty.

**Question:** Is risk a four letter word?

Are you willing to pay to avoid risk?

Are you willing to pay to expose yourself to risk?

In almost every case the answer to both of these questions is “yes”.

### 7.1.1. Definition of Risk and Uncertainty

Risk can be defined as imperfect knowledge where the probabilities of the possible outcomes are known, and uncertainty exists when these probabilities are not known (Hardaker).

**Risk** - defined as a situation where all possible outcomes are known for a given management decision and the probability associated with each possible outcome are also known. Probabilities are often assigned to other events such as the probability of rain in a weather forecast or the outcome of a sporting event. However they are subjective probabilities based on the judgment and experience of an individual. In any situations the true or actual probabilities can't be determined subjective probabilities are the only ones available, and they may vary from individual to individual.

**Uncertainty**- Defined as imperfect knowledge. We do not know when it occurs. It exists when one or both of two situations exist for a management decision. Neither all possible outcomes nor the probabilities of the outcomes are known. It is lack of knowledge about the state of the world at some future time.

World represents both economic and natural events. There is less uncertainty about tomorrow than is about a year; hence less about a year than about ten years. Long term farm-system planning is far more hazardous than seasonal or annual planning.

Risk and Uncertainty refer to, for most of the same thing: variation and change that cannot be completely controlled. Sometimes, distinctions are made between risk and uncertainty. Risk is used when the decision maker knows all the possible outcomes of an action and the objective probability of each outcome. Uncertainty is used when the decision maker knows part or all the possible outcomes but cannot quantify the probability. In self instruction material, risk and uncertainty are used interchangeably.

Risk management can then be defined as choosing among alternatives to reduce the effects of risk (Harwood, et al). From this point of view, risk management can be defined as choosing among alternatives for reducing the effects of risk on the farm or ranch, which in turn affects the farm or ranch’s welfare position.

Every decision in farm management involves some risk. We cannot avoid risk but by taking risks, we have the chance to accomplish our strategic and financial objectives/goals. The farm manager needs to incorporate risks into his/her management process so risks can be considered explicitly.

The goal of risk management is to balance a farm risk exposure and tolerance with farm’s strategic and financial objectives/goals, such as income, wealth, environmental quality and other personal goals. This balancing is done after considering the source of risk, the methods of reducing risk, the ability and willingness to take risks, and the income potential of alternative strategies. The goal of risk management is not to reduce risk only, but to meet objectives.

Many decisions are made in an environment of relative certainty, while others are not.

### 7.1.2. Categories of Risk in Agriculture

Dear learner, do you understand the definition and concept of risk and uncertainty? Now let us discuss about the types of risk and uncertainty.

There are different types of risk and uncertainty, with one or more applying to most farm management decisions. What are the risks associated with selecting crop or livestock enterprises?

Some risks have to be more explicitly taken into account than others. If potential losses are big, more attention has to be paid to the choice among the available alternatives, as the differences between the various outcomes may be significant. Some risks farmers have in common with other businesses, others are unique to farming. The most important risks can be classified as follows:

**1. Human or personal risks** relate to death, illness or injury of the farm operator and/or its labour force. These risks are common to all business operators and employees. People risk(also called “human resources risk”) includes the four D’s – death, divorce, disability and disagreement. Because a small farm is highly reliant upon the operator and family for its workforce, these incidents can have a huge impact on the viability of the business.

The impacts of death and divorce are obvious. A disability, even short term, leaves the farm without a vital member of the team. The convalescing farmer needs the security of knowing the business can continue while he or she fully recovers. And family businesses are particularly vulnerable to the impacts of serious disagreements. The break up of a family farm partnership can have both financial and personal consequences that are felt for a long time.

Finally, agricultural households, as any other economic entrepreneur, are exposed to personal risks affecting the life and the wellbeing of people who work on the farm, as also asset risks from floods, cyclones and droughts and possible damage or theft of production equipment and any other farming assets.

**2. Asset risks** are those associated with theft, fire and other loss or damage of equipment, buildings and other agricultural assets used for production. Losses are normally covered by insurance or, in case of catastrophic events; public disaster aid may contribute to reduce asset losses.

**3. Production or yield risks** are often related to weather (excessive/insufficient rainfall, hail, extreme temperatures), but also include risks like plant and animal diseases. Production risk includes equipment breakdowns, and anything else that directly affects the quantity and quality of your production.

Yield risk is measured by yield variability, the randomness relative to the mean value in a yield series. Yield variability for a given crops differs considerably from region to region depending on climate, soil type and production method.

It can be measured at farm, regional or country level. “Yield” risk is smaller in the livestock sectorfor most producers, as weather has a smaller influence. The risks mainly stem from disease, mechanical failure in confinement operations and variability in weight gain.

**4. Market Risk or Price risk** is the risk of falling output and/or rising input prices after a production decision has been taken. Price risk is measured by price randomness. As opposed to yields, prices do not follow clear trends.

Price volatility, of course, is for many products mitigated by measures of price support. In open markets, prices are generally more highly correlated across different regions than yields.

The chance that investments will lose money because of changes in the financial markets in agriculture, market risk describes the chance that crop or livestock values will change due to changes in overall market conditions.

Output price variability originates from both endogenous and exogenous market shocks. Segmented agricultural markets will be influenced mainly by local supply and demand conditions, while more globally integrated markets will be significantly affected by international production dynamics. In local markets, price risk is sometimes mitigated by the “natural hedge” effect in which an increase (decrease) in annual production tends to decrease (increase) output price (though not necessarily farmers’ revenues).

In integrated markets, a reduction in prices is generally not correlated with local supply conditions and therefore price shocks may affect producers in a more significant way.

Another kind of market risk arises in the process of delivering production to the market place. The inability to deliver perishable products to the right market at the right time can impair the efforts of producers. The lack of infrastructure and well-developed markets make this a significant source of risk.

**5. Institutional risk** is the risk associated with changes in the policy framework (agricultural and other policies) which intervene with production and/or marketing decisions and in the end negatively affect the financial result of a farm. Institutional risks occur due a change in government policy; like fiscal policy, monetary policy, land reform policy, etc.

Another important source of uncertainty for farmers is institutional risk, generated by unexpected changes in regulations that influence farmers’ activities. Changes in regulations, financial services, level of price or income support payments and subsidies can significantly alter the profitability of farming activities. This is particularly true for import/export regimes and for dedicated support schemes, but it is also important in the case of sanitary and phyto-sanitary regulations that can restrict the activity of producers and impose costs on producers.

**6. Technology/Technical risk:** A risk due to a change in from old to new production technology**.**

* Will the new technology perform as expected?
* Will it actually reduce costs and/or increase yield?

These and other questions must be answered before adopting a new technology. Adoption of new technologies in modernizing agriculture such as in introduction of genetically modified crops causes an increase in producer liability risk.

**7. Financial and credit risk** relates to your ability to pay the farm’s cash obligations in a timely manner (liquidity) and protect or grow your equity (solvency.) Obviously, this is closely tied to production and marketing risk. Financial risk also includes the risk of inflation and changes in interest rates.Moreover, financial risks include rising cost of capital, exchange rate risk, insufficient liquidity and loss of equity.

Many agricultural production cycles stretch over long periods of time, and farmers must anticipate expenses that they will only be able to recuperate once the product is marketed. This leads to potential cash flow problems exacerbated by lack of access to insurance services, credit and the high cost of borrowing. These problems can be classified as financial risk.

**8. Legal risk** refers to the possibility of being sued, fined or otherwise penalized for violating a law or regulatory standard. “Tort liability” is the risk of being sued by a customer, worker or visitor, or example if there is an accident due to improper safety procedures on the farm. Product liability reflects the risk that your product may cause harm to others.

For example, if you fail to withhold milk from cows treated with antibiotics, you may have to buy an entire truckload of contaminated milk. Legal risk also includes your liability for environmental problems that might result from your farming practices.

The various risks are often interrelated. For example, the institutional risk of a change in price support has an influence on price risk.

Likewise, imposing environmental restrictions has an impact on yield risk. Risks of all categories have an effect on the income situation of a farm household.

## 7.2. Risk Management Strategies

Dear learner, in the previous topic, we have dealt with the types of risks. Under this topic, we will discuss risk management strategies to reduce different types of risks and uncertainty. Can you mention some of strategies that farmers in your area use to cope with risk and uncertainty prevail in their production activities?

**Strategies to reduce risk:** There are about 3 general reasons why risk- adverse manager would be interested in taking steps to reduce risk are:

1. To reduce the variability of income over time;
2. To ensure some minimum income level to meet family living expenses and other fixed expenses;
3. To survive the business/ to increase farmers capacity to bear the consequences of risk.

Informal and formal risk management mechanisms and ex ante and ex post strategies are applied to reduce risks. According to World Bank (2001), informal strategies are identified as “arrangements that involve individuals or households or such groups as communities or villages,” while formal arrangements are “market-based activities and publicly provided mechanisms.” The ex-ante or ex post classification focuses on the point in time in which the reaction to risk takes place: prior to the occurrence of the potential harming event (ex-ante) or after the event has occurred (ex-post). Among the ex-ante reactions, it can also be useful to highlight the differences between on-farm strategies and risk-sharing strategies.

Several types of risk management strategies are distinguished:

**On-farm strategies** concern farm management and include selecting products with low risk exposure (e.g. products benefiting from public intervention), choosing products with short production cycles, holding sufficient liquidity or diversifying production programmes.

**Risk-sharing strategies** include concluding marketing and production contracts, vertical integration, hedging on futures markets, participation in mutual funds and insurance.

Ideally, markets should provide a wide range of risk management tools.

The most important markets for risk coverage are futures markets and insurance markets: Futures markets help to reduce short term price risks and at the same time increase price transparency.

Table7 -1: Risk Management Strategies in Agriculture

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | *Informal Mechanisms* | *Formal Mechanisms* | |
| e  x-  a  n  t  e    s  t  r  a  t  e  g  i  e  s | On farm | Avoiding exposure to risk  -Crop diversification and inter-cropping  -Plot diversification  -Mixed farming  -Diversification of income source  -Buffer stock accumulation  of crops or liquid assets  -Adoption of advanced cropping techniques (fertilization, irrigation,  resistant varieties) | *Market*  *based* | *Publicly provided* |
|  | Agricultural extension  -Supply of quality seeds, inputs, etc  -Pest management systems  -Infrastructures(roads, dams, irrigation systems) |
| *Sharing*  *risk with*  *others* | -Crop sharing  -Sharing of agricultural equipment, irrigation , sources, etc  -Informal risk pool | -Contract  marketing  -Futures  contracts  -Insurance |  |
| e  x-  p  o  t  s  t  r  a  t  e  g  i  e  s | *Coping*  *with*  *shocks* | * Reduced consumption   patterns   * Deferred / low key social &   family functions   * Sale of assets * Migration * Reallocation of labor * Mutual aid | * Credit | * Social assistance   (calamity relief,  food for- work, etc)   * Rescheduling loans * Agricultural insurance * Relaxations in grain   procurement & procedures   * Supply of fodder * Cash transfer |

### 7.2.1. Informal Mechanisms

Dear learner, what is the difference between informal and formal strategies?

Ex-ante informal strategies are characterized by diversification of income sources and choice of agricultural production strategy. One strategy producers can employ is simply to avoid risk.

Apart from altering agricultural production strategies, households also smooth income by diversifying income sources and thus minimizing the effect of a negative shock to any one of them. Off-farm seasonal labor, trade and sale of handicrafts are also common income sources.

Buffer stock accumulation of crops or liquid assets, and the use of credit present obvious means for households to smooth consumption.

Crop-sharing arrangements in land renting and labor hiring can also provide an effective way of sharing risks between individuals, thus reducing producer risk exposure. Other risk sharing mechanisms, such as community-level risk pooling, occur in specific communities or extended households where members of the group transfer resources among themselves in order to rebalance marginal utilities. These kinds of arrangements are effective for counterbalancing consequences of events that affect some members of the community, but do not work well in cases of covariate income shocks.

Ex-post informal income-smoothing mechanisms are typically the sale of assets, such as land or livestock, or reallocation of labor resources to off-farm labor activities, deferred / low key family functions, reduced consumption patterns, migration.

### 7.2.2. Formal mechanisms

Dear learner, do you distinguish the difference between ex-ante and ex-post strategies?

Formal risk management mechanisms can be classified as publicly provided or market based (Table7-1). Government action plays an important role in agricultural risk management both ex-ante and ex-post. Ex-ante education and services provided by agricultural extension help familiarize producers with the consequences of risk and help them adopt strategies to deal with risk. Supply of quality agricultural inputs is another institutional strategy. Governments also reduce the impacts of risk by developing relevant infrastructure and by adopting social schemes and cash transfers for relief after shocks have occurred.

### 6.2.3. Risk Management Tools for Various Types of Risks

Dear learner, how do farmers manage production risk in your locality?

**1*. Production/Weather Risk Management***

Insurance is another formal mechanism used in many countries to share production risks. However, insurance is not as efficient in managing production risk as derivative markets are for price risks. In contrast, insurance is an appropriate risk management solution for independent risks. Agricultural production risks typically lack sufficient spatial correlation to be effectively hedged using only exchange-traded futures or options instruments. At the same time, agricultural production risks are generally not perfectly spatially independent and therefore insurance markets do not work at their best. In fact, positive spatial correlation in losses limits the risk reduction that can be obtained by pooling risks from different geographical areas. In general, the more the losses are positively correlated, the less efficient traditional insurance is as a risk-transfer mechanism.

**2*. Price Risk Management***

One way producers have traditionally managed price variability is by entering into pre-harvest agreements that set a specific price for future delivery. These arrangements are known as forward contracts and allow producers to lock in a certain price, thus reducing risk, but also foregoing the possibility of benefiting from positive price deviations. In specific markets, and for specific products, these kinds of arrangements have evolved into futures contracts, traded on regulated exchanges on the basis of specific trading rules and for specific standardized products. This reduces some of the risks associated with forward contracting (for example, default).

A further evolution in hedging opportunities for farmers has been the development of price options that represent a price guarantee that allows producers to benefit from a floor price but also from the possibility of taking advantage of positive price changes.

With price options, agents pay a premium to purchase a contract that gives them the right (but not the obligation) to sell futures contracts at a specified price.

The problem of matching supply to demand requires coordinated actions amongst producers.

Such coordination can arise from the dissemination of market information and price discovery mechanisms. Price support mechanisms have been limited to some regions only.

In most cases, farmers face a serious price risk, because of the immediate necessity to dispose of stocks for want of storage, as also to repay loans.

Contract marketing / farming is an important price risk mitigation tool, becoming popular in the country. Contract farming also has many more direct benign impacts on farm incomes. Market risks are large in specialty crops and vegetables that deter most farmers from investing in them.

Through price insurance, credit and technological inputs, contract farming could be an important mechanism by which small farmers can supply high value crops to urban and international markets, while benefiting from assured higher incomes.

**3. Diversification**

Diversification thus reduces overall risk. However, there may be a trade-off with cost increasing effects linked to this strategy, i.e. higher cost for additional equipment and costs in terms of foregone economies of scale which would alternatively be achievable with higher degrees of specialization. Lack of managerial expertise and market outlets as well as climate, soil quality or the availability of water may limit the opportunities for diversification of farm activities.

Diversification includes off-farm strategies as well. Taking-up off-farm employment which reduces dependency form agricultural income, can be considered such a strategy, although off-farm employment may have other reasons as well, for instance, the fact that agricultural income is too small to support a whole family.

**4. Contracts and vertical integration**

In a marketing contract, a farmer agrees to sell a commodity at a certain price to a buyer before the commodity is ready to be marketed. The farmer retains full responsibility for all production management decisions. The contracts can take many forms. They can be based on a fixed price, or alternatively depend on the development of the commodity’s futures price. The latter type of contract does not eliminate price risk completely.

Price risk is zero only in those cases, where the exact price to be paid to the producer upon delivery is fixed.

Production contract typically give the contractor (the buyer of the commodity) considerable control over the production process. These contracts normally specify the production inputs to be used, the quality and quantity of the final product and the price to be paid to the producer. The contracts vary in the degree of control exercised by the contractor. Apart from other possible advantages for the farmer, the contract partially shifts price risk to the processor. On the downside, the farmer depends to a large extent on one buyer, thus incurring a risk of losing his only outlet following contract termination.

Vertically integrated firm retains ownership control of a commodity across two or more levels of activity. There are many complex reasons to vertically integrate; risk reduction is only one of them. Vertical integration helps to reduce risks associated with a variation in quantity and quality of inputs (in the case of backward integration) or outputs (in the case of forward integration). Vertical integration is more common in the livestock sector, with integration backward into inputs (feed manufacturing) or in the fresh vegetables sector with forward integration into sorting, assembling and packaging.

**5. Hedging in futures and options**

On spot or cash markets, prices are set for goods that are immediately available. Production and marketing contracts as well as futures markets add the time dimension to these markets. They allow users to hedge their price risk by locking in the price of a commodity they wish to purchase or sell at a future date.

**Future market contracts** differ in three important issues from production and marketing contracts.

Firstly, they are standardised in terms of contract terms and thus they can be more easily traded. Secondly, they are traded in organised exchanges under rules and regulations. Thirdly, while production and marketing contracts usually involve physical delivery of goods at maturity, in futures markets this is the exception.

A farmer would usually use the instrument as follows: At the beginning of the growing or feeding period, he sells a futures contract, thus entering an obligation to sell after the end of the production cycle a certain quantity of a commodity at a certain price.

The futures position (“short futures position”) is held until the product is ready for sale. Before the end of the delivery period of the futures contract, the farmer typically buys an off-setting futures position (“long futures position”).

Hedging largely eliminates price risk, but leads to what is called basis risk. Basis is the technical term for the difference between the price of a commodity on the spot market and the price of the corresponding futures contract. The basis reflects differences in price across space (transportation costs, exchange rates), time (storage costs), and quality (difference between actual quality and standard quality specified in the futures contract). The effectiveness of hedging on futures markets may also be reduced by yield variability. Uncertainty about effective yields makes it not advisable to sell a futures contract for the total expected output, because of the potential obligation to buy additional quantities in order to fulfill a mature contract. Generally the effectiveness of hedging to reduce risk diminishes as yield variability increases. The effectiveness of hedging furthermore depends on the correlation between yield and price for a given commodity. If there is a strong negative correlation between yield and price (a “natural hedge”, with yield and price fluctuations offsetting each other), hedging becomes - because of the cost associated with it - inefficient. With increasing trade liberalisation negative correlation will decrease.

***6*. Crop Insurance**

Crop insurance is a means of “protecting the farmers against uncertainties of crop yields,

arising out of practically all natural factors beyond their control”. It is a financial mechanism in which the uncertainty of loss in crop yields is minimized by pooling most uncertainties that impact crop yields, so that the burden of loss can be distributed.

It is one of methods of managing risks. There are several crop insurance forms or programs. Multi-peril crop insurance, catastrophic risk protection, crop revenue coverage, revenue assurance, income protection and group protection are the commonly implemented programmes of crop insurance. Each of this crop insurance coverage has administrative fees, and the fees differ from program to program. Except the catastrophic risk protection, all the crop insurance programs involve a premium attached to them.

1. **Unit structure**

Unit structure is a ban insurance coverage selection that enables farmers to combine crops for coverage purposes. Four types of unit structures are available: basic, optional, enterprise, and whole-farm. Each of the types of unit structures is discussed briefly below.

* In basic unit structure, 100% of share land is grouped together in one unit. Land shared with each different land owner is another basic unit of its own.
* In optional unit structure, acreage of a given insurable crop can be divided into separate units such as by section, and fields with different planting patterns as long as the pattern doesn’t cross section line.
* In enterprise unit structure, all insurable acres of the same insurable crops are lumped together into one unit regardless of land location rental arrangements.

1. **Catastrophic risk protection(CRP)**

Catastrophic risk protection is the minimum level of crop insurance coverage. It covers losses to crop yield only. There is what is called actual production history (APH) which is used in the coverage calculation. APH requires a minimum of four to ten years of production records. There is no premium for CRP coverage, but there is administrative fee.

CRP insurance will cover crop yield reductions that are 50% or more below established yields. The payment rate will be 55% of the market price guarantees.

1. **Multi-peril crop insurance(MPCI)**

What does this type of insurance try to provide?

MPCI provides comprehensive protection against weather-related causes of loss and certain other unavoidable perils. It protects against losses to crop yields only.

The coverage is available at 50% and 75% of the APH for the farm. Premium amounts per acre vary by crop and are partially subsidized by the government. MPCI includes the choices of either basic or optional unit structure.

**Price insurance is** feasible only for those products, for which objective price data are available.

To avoid moral hazard and adverse selection problems, loss assessment should be based on a price that cannot be influenced by the farmer (futures price, spot market price). The major obstacle for price insurance is the high correlation of prices which is associated with a systemic risk.

If losses resulting from a loss of quality are excluded from coverage, then price insurance provides less protection for the farmer. However, including loss of quality may involve significant moral hazard problems, as quality depends to a certain extent on management decisions.

**Revenue insurance** is a combination of price and yield insurance. It has the potential advantage of being cheaper than either price or yield insurance; as the risk of a bad outcome is smaller (low yields may be offset by high prices and vice versa). Revenue insurance can be set up on a commodity-per-commodity basis or for a portfolio of commodities. The latter could again be cheaper for the farmer, because low revenues from one enterprise are likely to be partly offset by higher revenues from another (if the revenues are not positively correlated).

**Income insurance** is potentially more attractive to farmers than other forms of insurance (e.g. yield, price), because it deals with losses affecting farmer´s welfare more directly.

It could be based for instance on net farm income of family workers (farm revenue - including subsidies - minus variable costs, taxes, depreciation, rent, interest and compensation of employees).

Insurance of individual income risks poses is considerable problems of moral hazard and adverse. Potential losses do not only occur by accident but depend to a large extent on how well a farmer manages his business.

Furthermore, a farmer can easily manipulate certain elements influencing his income (e.g. compensation of employees, operating costs, inventories). These two factors make it difficult for an insurance company to calculate the probability distribution of a bad outcome and to fix a sound premium accordingly.

# 

# SUMMARY

Agricultural business is full of risk. That is, agricultural business suffers from production risk, price risks, credit risks, technological risks and institutional risks. Climate and weather, natural catastrophes, pest and diseases are the main responsible causes for production risk. Risk management involves choosing among alternatives that reduce the financial effects of the uncertainties of weather, yields, prices, government policies, global markets, and other factors that can cause wide swings in farm income. Under this chapter, the most important risks can be classified in two eight groups such as: human or personal risks, asset risks, production or yield risks, market risk or price risk, institutional risk, technology/technical risk, financial and credit risk, and legal risk.

Informal and formal risk management mechanisms and ex ante and ex post strategies are applied to reduce risks. The goal of risk management is not to reduce risk only, but to meet objectives.

Objectives of risk management are to reduce the variability of income over time; to ensure some minimum income level to meet family living expenses and other fixed expenses; and to survive the business/ to increase farmers capacity to bear the consequences of risk.

Contract marketing, diversification, hedging in futures and insurance are commonly used to reduce various risks. Crop insurance is a means of “protecting the farmers against uncertainties of crop yields, arising out of practically all natural factors beyond their control”.

It is a financial mechanism in which the uncertainty of loss in crop yields is minimized by pooling most uncertainties that impact crop yields, so that the burden of loss can be distributed.

Insurance is one of the most important parts of your risk management plan. By purchasing insurance, individuals can transfer their personal risk to a third party—the insurance company.

People like you pay **premiums** to insurance companies to cover potential losses associated with their belongings. The insurance company takes those premiums and pulls them together in one pool of money. Those funds are available to pay for the losses suffered by members of the pool.

Insurance premiums are based on the potential risk and potential losses they will have to pay to the group members.

# Learning Activity

**i. Review your understanding of the following key words.**

Market risk Legal risk Financial risk Risk management Informal management Formal management Insurance Diversification Risk Uncertainty Revenue insurance

ii. **Fill in the blank in a given space.**

2.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ can be defined as choosing among alternatives for reducing the effects of risk on the farm or ranch, which in turn affects the farm or ranch’s welfare position.

3.\_\_\_\_\_\_\_\_\_\_\_\_associates with death, divorce, disability and illness or injury of the farm operator and/or its labour force.

4.\_\_\_\_\_\_\_\_\_\_ are those associated with theft, fire and other loss or damage of equipment, buildings and other agricultural assets used for production.

5.\_\_\_\_\_\_\_\_\_\_\_\_ occurs due a change in government policy; like fiscal policy, monetary policy, land reform policy, etc.

6.\_\_\_\_\_\_\_\_\_\_refers to the possibility of being sued, fined or otherwise penalized for violating a law or regulatory standard.

**iii.** **Give answers for the following questions accordingly.**

7. Define risk, uncertainty and risk management

8. Explain production risk and market risk

9. Explain the difference between formal and informal mechanism and list their example.

10. Write down three general reasons for applying risk- adverse strategies

11. Define and explain the concept crop insurance

# ANSWERS FOR EXERCISES

Chapter three

**13.** Table3-10: Marginal revenue, marginal cost and the optimum output level  
**Chapter three**



14. Table 3-11: Irrigation level for corn, determining the profit-maximizing production

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  | Marginal | Margianl | Marginal |  |  |
| Irrigation | Corn yield | physical | value | input | Marginal | Marginal |
| water | per acre | product | product | cost | revenue | cost |
| (acre-inch) | (bu) | (MPP) | (MVP) | (MIC) | (MR) | (MC) |
|  |  |  |  |  |  |  |
| 10 | 104.0 |  |  |  |  |  |
| 12 | 116.8 | 6.4 | 16.00 | 3.00 | 2.50 | 0.47 |
| 14 | 128.6 | 5.9 | 14.75 | 3.00 | 2.50 | 0.51 |
| 16 | 138.2 | 4.8 | 12.00 | 3.00 | 2.50 | 0.63 |
| 18 | 144.8 | 3.3 | 8.25 | 3.00 | 2.50 | 0.91 |
| 20 | 149.0 | 2.1 | 5.25 | 3.00 | 2.50 | 1.43 |
| 22 | 151.8 | 1.4 | 3.50 | 3.00 | 2.50 | 2.14 |
| 24 | 153.6 | 0.9 | 2.25 | 3.00 | 2.50 | 3.33 |
| 26 | 154.2 | 0.3 | 0.75 | 3.00 | 2.50 | 10.00 |
|  |  |  |  |  |  |  |

Chapter four

1. A

Chapter five

i. 1.F, 2. E, 3. D

Chapter six

10.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Liquidity analysis | | | | | |
|  | | | Cost | | |
| Current ratio | = | Total current assets / Total current liabilities | 30.000€÷15.000€ | = | 2 |
| Working capital | = | Total current assets – Total current liabilities | 30.000€-15.000€ | = | 15.000€ |
| Debt structure ratio | = | Total current liabilities / Total liabilities | 15.000€/ 60.000€ | = | 0.25 |
| Solvency analysis | | | | | |
|  | | | Cost | | |
| Net worth | = | Total assets - Total debt | 100.000€- 60.000€ | = | 40.000€ |
| Leverage ratio | = | Total liabilities / Net worth | 60.000€ ÷ 40.000€ | = | 1.5 |
| Solvency ratio | = | Total liabilities / Total assets | 60.000€ ÷100.000€ | = | 0.6 |

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