**DEBRE MARKOS UNIVERSITY, COLLEGE OF AGRICULTURE AND NATURAL RESOURCES**

**DEPARTMENT OF AGRICULTURAL ECONOMICS**

**FARM MANAGEMENT HANDOUT**

**FOR III YEAR RURAL DEVELOPMENT AND AGRICULTURAL EXTENSION STUDENTS (3 CREDIT HOUR)**

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**Chapter 1**

**BASICS OF FARM MANAGEMENT**

* 1. **Definitions and concepts of farm management**

**Farm-management** is a word made up of two words namely **Farm** and **Management.**

**A) Farm**

Farm is defined as:

-A land devoted to agriculture to rare animals and grows plants by the farm owner.

- The land where crop and livestock ***enterprises*** are taken up under the farmer/ farm family control.

-A productive unit specialized in converting recourses or inputs in to agricultural products.

-In general farm is a socio-economic unit to earn an income and a productive resource under farmer's control.

**B) Management:**

-Is concerned with meeting of goals

-Is making use of available resource or allocating scarce resource in efficient manner.

-Is a process which directs action in to some goals through planning, organizing, leading and controlling of resources (financial and human resources).

-Is making a decision to increase net return or profit.

**-**It isviewed as those activities relating to the organisation and operation of a firm for the attainment of specific ends. It directs resources use after interpreting the goals of those controlling the firm.

**C) Farm Management:**

The Definition of farm management **is** explained by different authors in different ways**.** Their definitions have both similarities and marginal differences among them but there are the common thread through most of them is **decision making about the allocation of resources.**

**Therefore, Farm management is:**

 -A decision making process whereby limited resources are allocated in to a number of production units alternatively to attain some objectives.

-Both art (applied) and pure science of organizing and operating farm business. It is **applied (art)** because it seeks solution to a farm problem like what to produce, how much to produce and how to produce? and it is **pure science** in that it involves in collecting of data, organizing, analyzing, explaining and interpreting of results and coming out with scientific generalization.

-Attainment of farm goals in an effective and efficient way through planning, organizing, leading and controlling of farm resources.

-is a branch of economics (agricultural) that deals with the way how a farmer attempts to accommodate scarcity to his/her needs.

-It is also a science that deals with the proper combination and operation of production factors including land, labor and capital and the choice of crop and livestock enterprises to bring about the maximum of continuous returns to the most elementary operation units of farming.

-Farm management is a decision-making science. It helps to decide about the basic course of action of the farming business. The basic decisions of the farming business are:

(a) What to produce or what combination of different enterprises to follow?
(b) How much to produce and what is the most profitable level of production?
(c) What should be the size of an individual enterprise, which, in turn, will determine the best overall size of the farm business?

(d) What methods of production (production practices or what type of quality of inputs and their combination)

**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/entrepreneur

**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 labor or capital expenditure. In short, land is the short hand extension for natural resources. The payment to land is called **rent**.

**2). Labor** – 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 labor is valued (paid) more than other labor. This is because labor, like land, can be much more valuable. This occurs when individuals devote money and time to increasing their labor skills. We refer to this development of labor skills as investment in human capital- the accumulation of labor enhancing abilities, including health that increases labor’s productivity. **Wages** are the resource payments that entrepreneurs make for the use of labor.

**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, however, 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. E.g. buildings, dams, machinery, livestock etc. These are called ***poly 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 /software energy of human being usedin production to organize, lead, direct and takes risk and bear responsibility. Its reward is **profit.**
	1. **Why study farm management?**

**Because:**

1. Farm management is the most *important* science in developing countries as it deals with the behavior of farming population. It examines the environmental conditions against which the farmer takes decisions and the consequences.
2. Most of the sciences are mainly interested in the physical aspect with less regard to the economic returns of farming businesses. But farm management is the only discipline in which farm and farm life are united together as a tree and its fruits. The farmer is essentially interested in the income flow whereas the latter is closely associated with the farm family satisfaction.
3. In the context of socio-economic changes, farm management has an inherent capacity of developing strategic approaches to make the best use of scarce resources in such a way that it can view the threats and problems that lie ahead as veiled opportunities for showing its potential as one of the nation’s redeemer. Hence, there is a great bound to be aware and understand the role of farm management in the nation’s economy.
4. Furthermore, farm management investigations drives and give directions to farm business improvement by providing useful information to planners, farmers and extension workers.
	1. **Objectives of farm management**

Looking at the farm structure as a whole, it is apparent that the objective has to do with two aspects of the same farm as a producing unit and as a consuming unit along with the harmonization of their behavior and goals. Broadly speaking, the *objectives* of farm management are:

1. To study the existing resources (land, labor, capital and management) and production patterns of the farm,
2. To perform the strategic task of identifying the deviation of the resources from their optimum utilization.
3. To explain the means and the procedures of moving from the existing combination of resources to their optimum use for project maximization.
4. To outline conditions that would simultaneously obtain its objectives of profit maximization and maximization of family satisfaction through optimum use of resources and judicious income distribution.
5. To work out costs and returns on individual enterprises and on the farm as a whole.

**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. **Functions and problems of farm management**

## Functions of Farm Management

Functions of farm management are:

1. Planning
2. Organizing
3. Staffing
4. Directing
5. Controlling

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 implement 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 selected and actions should take place 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 the 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 of 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. **Farm management problems in developing countries**

Farm management problems may vary from place to place depending on the degree of agricultural development and the availability of resources. The following are some of the most common problems:

1. **Small size of the farm business** – obviously in Ethiopia, the average land size or holding is fragmented and too small. Thus, excessive pressure of population creates unfavorable man-land ratio in most parts of the country. This combined with excessive family labor, which depends upon agriculture, and that has weakened the financial position of the farmers and limited the scope for business expansion.
2. **Farm as a household** – in most parts of the country family farms perpetuate the traditional combinations of crops and methods of cultivations. Thus, the equation between agricultural labor and household labor becomes an identity. This makes difficult for the farmer to introduce business content and incorporate new management idea in his/her farm operations. Home management thus heavily gets influenced by farm decisions.
3. **Inadequate capital** – capital shortage is peculiar feature of farming in developing countries. Most often, peasant agriculture (i.e., mostly subsistent) is labor intensive and characterized by serious deficiency of capital. Generally, small size of farms, problems of tenureship and un-remunerative prices have set the farmer under perpetual poverty. New technologies demand higher inputs such as more fertilizers, protection measures, irrigation and better seeds as well as investment in power and machines. Therefore, small farm holders cannot meet the financial requirements from their own funds. Hence, low cost, adequate and timely credit is their most pressing need if they have to put their farms on growth paths.
4. **Slow adoption of innovations** – small farmers usually conservative and sometime skeptical of new technologies or methods. The rate of adoption, however, depends on the farmers’ willingness and ability to use the new information. Since established attitudes and values do not change overnight, the extension take time to get the research results commercially adopted and existed on the farms. It calls for training and substantial financial requirements.
5. **Inadequacy of input supplies** – farmers may be willing to introduce change yet they may face the difficulty in obtaining the required inputs of desired quality, in sufficient quantity, and on time to sustain the introduced changes. Moreover, shortage of foreign exchange in developing countries seriously limits importation of needed supplies and materials. Domestic industries generally lack adequate raw materials, skills, capital or a combination of these to manufacture the needed farm supplies.
6. **Managerial skill –** it is also the most prominent and difficult problem of several small-scale farmers for many years in developing countries. This is necessary for millions of farmers who use the research results to develop progressive attitude and be responsive to the technological changes through education.
7. **Communication and markets –** these are also the other two important elements of infrastructure necessary for introducing economic content in the farm organizations. Lack of these elements set as a major bottleneck in the way of improving the management of farms on business lines. Substantial investments, therefore, need to be made on roads, marketing and other communication facilities.

**Chapter 2 Farm Decision Making and Basic Economic principles Applied to Farm Management**

* 1. Farm decision making

This section elaborates how farm management is applied in deciding on allocation of scare resources in different alternative uses. Hence, farm management is concerned with the allocation of limited resources among a number of alternative uses which require a manager to make decisions. In farm business, goal attainment is confined within some limits set by the amount of land, labor and capital available. These resources may change overtime, but they are never available in infinite amounts. The expertise of the manager may be another limiting resource. If the limited resource could only be used one way to produce one agricultural product, the manager’s job would be much easier. Therefore, ***farm management*** seeks to help the farmer in deciding on economic problems like:

* What to produce? (selection of profitable enterprises)
* How much to produce? (optimum enterprise mix and resource use level)
* How to produce? (selection of least cost production method)

**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 some combination. The manager must select from many alternatives that can maximize the profit or best meet some other goals.

Production is determined primarily by **the number of inputs used and input levels.** A manager is faced with the problems of how much fertilizer and irrigation water to use, seeding rates, feeding levels, labor and machinery use, and determining rates and levels for other inputs. The level of production and profit will be determined by the input levels selected.

**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.

Many agricultural products can be produced in a number of ways. Beef can be produced with a high grain ration or a high roughage ration. Hogs can be produced with a large capital investment in buildings and little labor or with less investment but more labor .Crops can be produced with large machinery and little labor ,or small machinery and more labor .A manager must select the appropriate combination of inputs which will minimize the cost of producing a given quantity of some commodity.

**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. Several problems are associated with this kind of economic activity such as what resources should be used in the production of goods and services, more machines or more laborers?. It is the choices of production techniques.

As a result, problems need to be recognized and defined in order to produce the most acceptable results. Research has indicated that identifications of problems in the farm business surprisingly difficult for farmers. Good managers will pin point more problems as a result of systematic farm business analysis. The farm manager therefore needs to build up plans of expected norms, which are basic in making decisions.

##  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/requires/need a decision. **Decision- making** runs through the whole process of management.

###  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 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

**4. Marketing decision-On buying (inputs)**

 **- On selling (out puts)**

**2.2.2.** Steps of Decision-Making Process

The process of making a decision can be formalized into a logical and orderly series of steps. Important steps in farm decision making process are:

* Identifying and defining the problem,
* Collect relevant data, facts and information,
* Identify and analyze alternative solutions,
* Make the decision – select the best alternative,
* Implement the decision and Observe the results and bear responsibility of the outcomes

**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 and identifying them as quickly as possible. Once the problems identified, they should 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 consider.

**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.

Once a problem is identified, a manager should begin to acquire data and process them into useful information. Using the available information, the manager must make a choice or decision that will maximize profit.

Hence, ***farm management*** may in short be called a *science of decision-making* or *science of choice*. That is, managing a farm is a continuous process of decision-making. The need for it arises out of changes in the farm conditions as well as changes occurring outside of the farm, and hence need of continuous adjustment of farm operations to the changes that become inevitable. The principal changes frequently encountered by the farmers are fluctuations in price, weather variations, and inventions in farming methods, changes in socio-economic environment including changes in government policy and social responses and values.

1. **Economic Principles Applied to Farm Management**

**Why is farm management a part of economics?** Farm management is a part of economics because it uses the principles of economics in decision making. Why use economic principles?

A farmer without knowledge of economic principles is **faced** a problem to reach his goal of **profit maximization and family satisfaction***.* The principles of economics guide him in the setting of goals and lying out of plans on the basis of optimum resource allocation, resource substitution and enterprise combination. They facilitate his task in finding out the causes of the disparity between actual and desired results and make him understand where he is, why he is there and what opportunities are there. They sharpen his decision-making ability and specify the direction in which he should go to attain the twin objectives of profit maximization and maximizing farm family satisfaction.

* 1. **The Basic Economic Principles Applied to Farm Management:**
1. The law of diminishing return
2. The law of equi-mariginal return
3. The law of comparative advantage
4. Cost concepts and principles
	1. **The Law of Diminishing Returns**:

This 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 be declined.

**Marshal**, stated that an increase in capital and labor 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 out put

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.

**Laws or returns**: there are three laws of returns namely:

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

**Example: Proportion of returns**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Units of inputs used (x) | Total product(y) | Average product (Ap) | Marginal product(Mp) | ProportionateIncrease | Law of return |
| 1 | 8 | 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 |

The table shows that the marginal product decreases faster than the average product.

* 1. **The Law of Equi-Mariginal 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.

**Example:Total product (TP) and marginal physical product (MPP)**

|  |  |  |
| --- | --- | --- |
| units of N (nitrogen) each unit =40kg | TP | MP |
| Y1Qt/ha | Y2 Qt/ha | Y1Qt/ha | Y2Qt/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 assume that a farmer has 200kg of nitrogen with him for application of two Y1 andY2 High yielding varieties of wheat whose N requirements are 120kg and 140kg per hectare respectively.

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

From the table above 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 i.e. at 10. So by using 80kg of N for Y1 and 120kg of 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 in to 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?

**Additional income from the marginal amount of Br. 500.00**

|  |  |
| --- | --- |
| Amount of moneyspent(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 |

**Q. What inference do you draw from the table?**

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**.

**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** |

* 1. **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 upon the principle of **Comparative advantage**.

The law of comparative advantage states that each region/country should specialize in the production of the goods and services in which it has a **comparative advantage**. It means that the lower 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 a 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 farmer's produces sorghum.
* They 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.

|  |  |  |
| --- | --- | --- |
| **Crop-account** | Region – A | Region - B |
| Ground nut (Br) | Wheat(Br) | Ground nut(Br) | Wheat(Br) |
| Total income per hectare | 500 | 225 | 225 | 220 |
| Total expenditure per hectare | 425 | 200 | 210 | 200 |
| Net income per hectare | 75 | 25 | 15 | 20 |
| Return per Birr spent | 1.18 | 1.13 | 1.07 | 1.10 |
| % of Return above cost of input | 118 | 113 | 107 | 11 |

\*\* From the table, Region A has greater absolute advantage in growing both wheat and groundnut than Region B because the net incomes per acre are Br 75 and Br 25 respectively which are higher than the net incomes from wheat and groundnut in Region B. Farmers of Region A can make more profits by growing both the crops. But they want to make the greatest profits and this can be done by having the largest possible acreage under wheat alone as it is the question of relative advantage. Similarly farmers of Region B have relative advantage in growing groundnut.

* 1. **Cost principle**:

This principle guides the producers in the minimization of losses. Costs are divided into fixed and variable costs. Variable costs are important in determining whether to produce or not. Fixed costs are important in making decisions on different practices and different amounts of production. In the short run, the gross returns or total revenue must cover the total variable costs (TVC). To state in a different way that selling price must cover the average variable cost (AVC) to continue production in the short run. In the long run, gross returns or total revenue must cover the total cost (TC). Alternatively stated, that the selling price must cover cost of production (ATC).

In the short run MR = MC point may be at a level of output which may involve loss instead of profit. The situation of operating the farms when the price of product (MR) is less than average total cost (ATC) but greater than average variable cost (AVC) is common in agriculture. This explains why the farmers keep farming even when they run into losses.

**PROFIT OR DECISION RULES**

1. ***SHORT RUN:***
2. If expected selling price is greater than minimum average total cost (ATC), profit is expected and is maximized by producing where MR = MC.
3. If expected selling price is less than minimum average total cost (ATC) but greater than minimum average variable cost (AVC), a loss is expected but the loss is less than TFC and is minimized by producing where MR = MC.
4. If expected selling price is less than minimum average variable cost (AVC), a loss is expected but can be minimized by not producing anything. The loss will be equal to TFC.

B. ***LONG RUN:***

* + - 1. Production should continue in the long run when the expected selling price is greater than minimum average total cost (ATC).
			2. Expected selling price which is less than minimum ATC result in continuous losses. In this case, the fixed assets should be sold and money invested in more profitable alternative

## PRODUCTION RELATIONSHIPS AND PRODUCTION COSTS

* 1. **Introduction**

***Products*** are the result of the use of resources or services of the available ones. E.g. milk, wheat, maize, etc. ***Production*** is a process of transformation of certain resources or inputs like land, labor (human, animal), seeds, fertilizers, irrigation tools and water into products like wheat, milk and so on.

* + 1. **Production function:**
* It is a technical and mathematical relationship describing the manner or extent to which a particular product depends on the quantities of inputs(s) and service(s) used. i.e., the level of output of a particular commodity depends upon the quantities of inputs used for its production.
* This relationship between inputs and outputs can be characterized as a *production function*. Simply, production function can be defined as the relationship between physical inputs and output of a farm or a firm.
* It is the physical relationship between input and output. The relationship shows the rate of transformation of input to output.

The production function is generally written in the form of equation:

Y= f (X1, X2, X3, -----------, Xn)

 Where; Y= output level

 Xi= inputs in the production process

 f= function of

**Production function rest on two main assumptions:**

1. Technology is invariant (fixed): if the technology changes it would result in an alteration of the input- output relationship depicted by the production function.
2. It s assumed that firms utilize their inputs at maximum level of efficiency.

There are numerous relationships between the resources and farm products, both simple and complex. The major production relationships fall under three categories;

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 ration.

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.

* + 1. Transformation or production period

Time required for a resource to be completely transformed into a product is referred to as transformation period or production period. All resources are not completely transformed in a single year. Long-lived resources such as buildings, tractors etc may not be transformed into product.

* + 1. Production resources (inputs)

***Inputs*** are also called productive resources, and in economic termed as‘factors ***of production’.*** They are usually grouped into four main categories such as land, labor, capital and management (entrepreneurship). The result of combinations of inputs or the transformation of inputs into a product is called ***output (yield).***

The following mathematical equations can represent different forms of production functions. For example, production function involving *one variable input:*

 Y = f(X1/X2, X3 … Xn)

Where: - f stands for the phrase “functions of".

 - the vertical bar “/” is used for separating variable inputs from the fixed inputs,

 **- Y** denotes output per unit of time and

 - X1, X2, ... Xn are different inputs of time.

Specific form of the production or the technical functional relationship between input(s) and products (outputs) can be expressed by a number of functional forms such as *linear*, *quadratic*, *exponential* function, and so on.

## Production Relationships

Major production relationships fall under three categories:

1. *Factor - product relationship*
2. *Factor - factor relationship*
3. *Product - product relationship*
	* 1. Factor-product relationships

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 out-put or yield is generally called total product, which will abbreviated TP. Hence, 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.

Economists classify time period in two categories:

**a) Short run**: is that period of time in which some of the firm’s inputs are fixed.

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

1. **Table/tabular presentation or tabulation:**

**Table2.1. I. for short run production function**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| units of input(labour in hour) | Capital | TP | AP | MP |
| 1 | 5 | 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 |

1. **TP (Total product)**: it is the amount of product produced by different quantities of the variable input used.
2. ***Average product (AP) -*** It is a measure of the output produced per unit of variable input (i.e., dividing the total output by the inputs). Its algebraic representation is:

AP = TP/X = Y/X

* AP measures the productivity of the farm inputs that can produce an output per each unit of utilization.
1. ***Marginal Product (MP)*** – it is also the additional output from each successive unit of inputs. It is the extra output obtained from the use of each additional unit of the variable inputs, being all other inputs kept constant.

 i.e., MP= ∆TP/∆X = ∆Y/∆X

* If the MP remains constant, it is called the *law of constant returns*, if the marginal product goes on increasing; it is called the *laws of increasing returns*. Likewise, when the marginal product declines, it is called the *law of diminishing returns*.

The numerator is the change in TP caused by a change in the variable input. The denominator is the actual amount of change in the input. Marginal product can be positive or negative. It can be also zero if change in input level causes no change in TP. A negative MP indicates too much variable input is being used relative to the fixed input/s and this combination depresses TP

**Table2.2. ii. Long run production function may be represented as in the following table.**

 Output (Q) from various combination of two inputs (long run production function).

|  |  |
| --- | --- |
| number of machines hours(K) | number of labor hours |
| 1 | 2 | 3 | 4 | 5 | 6 |
| 4 | **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** |

# Mathematical presentation of production function

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

 x = an aggregate independent variable (inputs )

 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, labor, 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 TP or output increases at an increasing rate as the input level is increased from zero. As the input level is increased further, TP 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 input/s available. As indicated in the graph (below), as TP increases at increasing rate, both MP and AP are increased (MP is increasing along with AP). Where TP changes from increasing at increasing rate to increasing at a decreasing rate, MP reaches at maximum and declines continuously having a value of zero where TP reaches its maximum. Where TP is at its maximum change in the input level neither increases nor decreases output, and therefore, MP is zero. AP increases over slightly longer ranges than MP before beginning to decline. The relationships between TP, AP and MP used to divide the production function into three regions. Stage I begin at the zero inputs level and continue to the point where AP is maximum and equal to MP. Stage II begins where AP is maximum and ends where MP is zero (or TP is zero). Stage III is the range of input levels where MP is negative and TP is declining absolutely.

In this relationship, there are three stages of production which are depicted below in the graph.

Out put

Input

# Stage -I

* it extends from the origin to the point of AP at maximum(MP=AP)
* at the end of stage -I, MP curve crosses AP curve
* both increasing and decreasing returns
* more of fixed input, less of variable inputs comparatively(fixed inputs not fully utilized)
* MPx>APx
* slope TPx>APx
* Ep>1 to Ep=1
* MPP starts to decline
* Uneconomical region

**Stage-II**

* starts from MP=AP(AP maximum) and ends up where MP=0i.e. TP is at maximum
* here we get only Decreasing return( TP increases at deceasing rate)
* AP>MP
* 0=Ep<1
* AP starts to decline
* Economical region that Economic optimum is found
* But we cannot pin point the optimum production point by looking at the physical output only.

**Stage -III**

* starts ,where MP=0 or TP at its maximum
* TPP starts to decline
* MPP negative
* negative returns(loss)
* Ep<0
* APx>MPx
* more of variable inputs
* Uneconomical region

**Relationship between TP, AP and MP**.

|  |  |
| --- | --- |
| TP Vs MP | MP Vs AP |
| * When MP increases TP increases at increasing rate
* When MP decreases but greater than zero, TP increases at decreasing rate
* When MP=zero, TP is at its maximum
* When MP< zero, TP declines
 | * When MP greater than AP, AP is increasing
* When MP is equal to AP, AP is at maximum
* When MP is Less than AP, AP is decreasing
 |

#

# The Law of diminishing returns: The law stated that, if increasing amounts of one input are added to a production process, while all others inputs are held constant the amount of output added per unit of the variable input will eventually decrease.

The law takes in to 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.

 **Laws of Returns**

There can be three types of input-output relationships in the production of a commodity where one input is varied and the quantities of all other inputs are fixed. The rate at which the changes in output due to varying amount of inputs that is used to explain the different laws of production, popularly known as *laws of returns*. The nature of a single input and a single output relationship can be either of the following types:

1. ***Constant*** *marginal rate of returns (constant productivity)*
2. ***Increasing*** *marginal rate of returns (increasing productivity)*
3. ***Decreasing*** *marginal rate of returns (decreasing productivity)*

***a. Increasing marginal returns (The law of increasing returns)***

* In this case every additional unit of input adds more to the total product than the previous unit, i.e. the addition of total product is improved at an increasing rate.

Table 2.3 Response of different input rates on wheat yield

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Fertilizer rate (in kg) X | Marginal dose (in kg) ∆X | Total production of wheat (in kg) Y | Marginal production ∆Y | Marginal Rate∆Y/∆X |
| 101520253035 | -55555 | 100010251075115012501375 | -255075100125 | -25/5 = 550/5 = 1075/5 = 15100/5 = 20125/5 = 25 |

The above Table (2.3) shows that in every production time as 5 units of fertilizer are added, the marginal addition to the total output will goes on increasing. The relationship is also indicated algebraically as:

 $\frac{ΔY1}{ΔX1 }$< $\frac{ΔY2}{ΔX2} $<……$\frac{ΔYn}{ΔXn}$

***b. Constant marginal returns (The law of constant returns)***

In constant returns or linear relationships, each additional unit of the variable input applied to the fixed factor(s), it will produce equal amount of additional product. That is, the amount of product is increased by the same magnitude for each additional unit of input.

Table 2.4 Constant relationship of wheat response function (hypothetical data)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Doses of fertilizer (X) in kg. | Marginal rateof ∆X | Total production of wheat (Y) in kg. | Marginal yield (∆Y) in kg. | Marginal rate of returns (∆Y/∆X) |
| 01020304050 | -1010101010 | 100013501400145015001550 | -5050505050 | -50/10= 550/10= 550/10= 550/10= 550/10= 5 |

The relationship in the Table 2.3 shows that with every increase in input there is equal or constant increase in the level of output. It is known as *constant marginal returns*. Mathematically, the relationship can be expressed as:

 ∆Y1 = ∆Y2 =…..= ∆Yn

 ∆X1 ∆X2 ∆Xn

1. ***Decreasing marginal returns (The law of diminishing returns)***
* In this type of production function each additional unit of input adds less to the total product.i.e. Diminishing marginal returns exist.
* For example if the first input adds 20 units to the total output, while the second add 15 units, the third adds 10 units, and soon. This function exists in almost every practical situation in agriculture such as: the responses to fertilizers, insecticide, seeds, irrigation, etc, all show diminishing returns.
* A production function of a single variable nature showing diminishing returns throughout is given in table below.

Table 2.5 Application of fertilizers and output of wheat grain

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Fertilizer (X) in kg  | Marginal dose(∆X) | Total wheat yield (Y) in kg | Marginal yield (∆Y) | Marginal rate of change (∆Y/∆X) |
| 0102030405060 | -101010101010 | 500140021002600300032002950 | -900700500400200 150 | -900/10 = 90700/10 = 70500/10 = 50400/10 = 40200/10 = 20 150/10 = 15 |

This Table (2.5) shows that for every time 10 units of fertilizers are added, the marginal addition to the total output goes on decreasing. The curve is ***concave*** to the origin the relationship is also indicated algebraically as:

∆Y1>∆Y2>....∆Yn

∆X1 ∆X2 ∆Xn

Since ∆X1 = ∆X2=..... = ∆ Xn; the value of ∆Y/∆X goes on decreasing pattern as higher and higher input level is adopted. This is the law of biological responses and is applicable in almost all practical situations of agricultural production.

**Rules of profit Maximization**

In the previous discussion, we concentrated 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

MR = change in total revenue (∆TR)

Change in total physical product (∆Q)

**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 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 from producing another unit of output. It is calculated from the equation:

MC = ∆ total input cost

 ∆ Total physical product

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

**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. Once either the optimum input or output level is found the other value can be determined from the production function.

**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 (EX. 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 (EX. 1.5 times output, 2 times in input)

Table 2.7 . Example of ***profit maximization*** (Let Px= 30 Birr Py=10Birr)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Units of laborinput 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 |

We can see from the table that profit is maximized where:

* MR=MC
* ΔY/ΔX=Px/Py
* MVPx= Px or MPPx\*Py=Px, In the table, the profit it maximized at Birr 60 by using 4 units of labor.
	+ 1. Factor - factor relationships

The particular concern of this section is with the possibilities of substituting one factor (X1) for another factor (X2) as product level (Y) is held constant. The relevant production function is defined by a set of i*soquants*. Thus, the objective of this analysis of factor - factor relationships is twofold:

1. Minimization of cost at a given level of output and
2. Optimization of output to the fixed factors through alternative resource use combinations. Each combination of the two inputs produces a unique amount of output.

In order to understand the basic concepts of factor substitution, we confine to only two inputs/factors/ and the same output at varying level.

 Y = f (X1, X2/X3, X4 ,... Xn)

Here, Y is a function of X1 and X2 while other inputs are held constant. The relationship between two variables/factors/ and one output cannot present with two dimensional diagrams of production surface. Hence, as the quantities of X1 and X2 are increased and all other inputs held constant, a **production surface** can be used for the combination of the two inputs.

So 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. 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. 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:

Substitution ratio = amount of input replaced

 Amount of input added

As more of one input is substituted for another, it becomes increasingly difficult to make the substitution and still maintain the same level of out-put. 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 price are needed and the ratio of the input prices is compared with the substitution ratio. The price ratio is calculated from the equation:

Price ratio = price of input being added

 Price of input being replaced

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 X1and 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 of the higher priced input and more of the now relatively less expensive input.

2.2.2.1. Isoquants: Definitions and Properties

Isoquant curves: - ***Iso*** means **‘the same’** and ***quant*** means ‘**product’** or ‘**output’**.

* Shows all possible combinations of two inputs physically capable of producing the same amount of output,
* Represent those input combinations, which will allow the production of an equal quantity of output, the producer would be indifferent between them.
* They explain the production surface - i.e., a surface which shows different quantities of output that can be produced from different input combinations.

**2.2.2.1. Characteristics (Properties) of Isoquants**

* + They have negative slope
	+ They are convex to the origin.
	+ Isoquants cannot intersect each other or be tangent each other.
	+ Isoquants for higher level of output will normally lie above and to the right of isoquants for lower level of output.

**Slope of Isoquant**

 The slope of isoquant is the marginal rate of substitution of one input for another.

The substitution ratio=------- it is the marginal rate of substitution of X1 for X2.

c) **Isocost line:** we call it equal cost line, which indicating all possible combination 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 10units of X2. On a diagram when these two points are joined by a straight line, it forms an isocost line for an outlay of Br.100.00. Any number of X1 and X2 costing the same amount can be traced on the line.

Figure 5. Examples of iso-quant and iso-cost line

 X1

 A B C X2

Any point in the line BA represents an expenditure of Br.100 for the corresponding number of units of X1 and X2.

**Slope of isocost line**

The slope of an isocost 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.

2.2.2.3. Types of factor – factor relationships

The shape of the isoquants will depend upon the manner in which the variable inputs are combined to produce a particular level of output. There can be three categories of such a combination of inputs.

1. **Fixed proportion of inputs** – there are certain enterprises or products which can only be produced if inputs are added or combined in fixed combinations at all levels of production. In this case there is no decision problem because the inputs are combined in fixed proportions. The isoquants are ‘L’ shaped and factors are perfect complements – inputs or resources which can increase output only when combined in a fixed proportion and they leave little or no room for choice in the proportion for their use.

 X1

 L-shap Isoquant

 X2

 Fig.2.3L-shaped isoquant curve

1. **Constant rate of substitution -** the substitution at constant rate take place, when the rate of replacement of one resource by the other resource doesn’t change the added input increases in magnitude. Linear (straight line) isoquants characterizes resources that substitute at constant rate. Inputs that can substitute at constant rate are perfect substitutes. The slope of the isoquant is constant. Consider the following two different input combinations, which are producing 100 units of output.

Table 2.8. Constant rate of substitution

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Woman Labor (X1) | Man Labor (X2) | ∆X1 | ∆ X2 | MRS (∆X2/∆X1) |
| 10 | 1 | 2 | 1 | 2 |
| 8 | 2 | 2 | 1 | 2 |
| 6 | 3 | 2 | 1 | 2 |
| 4 | 4 | 2 | 1 | 2 |

**X2**

  **X1**

Fig. 2.4 Linear isoquant

1. **Varying rate of substitution** – there can be either an increasing or decreasing rate of substitution. MRS varies over the iso-quant curve. The amount of one input (X1) to substitute one unit of the other (X2) at a given level of production increases or decreases as the amount of the one (X1)used to increase. Substituting at a decreasing rate is more common case in agriculture and the resulting isoquant curve is **convex**.

Table 2.9. Varying rate of substitution

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| X2 | X1 | ∆X1 | ∆ X2 | MRS (∆X2/∆X1) |
| 35 | 0 | - | - | - |
| 24 | 2 | 2 | 11 | 5.5 |
| 15 | 4 | 2 | 9 | 4.5 |
| 10 | 6 | 2 | 5 | 2.5 |
| 7 | 8 | 2 | 3 | 1.5 |

**X2**

 **I3**

 **I2**

 **I1**

 **X1**  Fig. 2.5 Convex isoquant curves

2.2.2.4. Marginal Rate of Technical Substitution (MRTS)

Marginal rate of technical substitution refers to the rate at which one input can be substituted for another along an isoquant curve without changing the level of output. It is also called the slope of the isoquant curve. For instance, the MRTS of labor and capital (MRTSLK) may be defined as the amounts of capital, which can be replaced by one unit of labor, while the level of output remaining constant. In mathematical terms:

MRTSLK = - ∆K/∆L

Table 2.10. Example of marginal rate of technical substitution

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Combination of inputs** | **Output** | **Units of labor** | **Units of capital** | **MRTSLK** |
| A | 100 | 1 | 10 | - |
| B | 100 | 2 | 6 | 4 |
| C | 100 | 3 | 3 | 3 |
| D | 100 | 4 | 1 | 2 |

As we move from combination A to B, 4 units of capital are replaced by one unit of labor, without changing the level of output. Therefore, MRTS of labor for capital is 4 at this stage. However, as we move from combination C to D, two units of capital are replaced by one unit of labor and then MRTSLK at this stage is stage 2.

Mathematically, from combination A to B, the MRTSLK= - ∆K/∆L= 4/1= 4

***INPUT RELATIONSHIP***

The relationship between two inputs or resources is of two types;

1. competitive inputs(substitute inputs)
2. complementary inputs

***1. Competitive/substitute inputs:*** are inputs if one can be used to replace the other. For- example, two varieties of crops of equal quality, or two labors of equal efficiency which one can replace the other; artificial fertilizer & compost.

***2. Complementary inputs***: it means that an increase in one input may also increase the amount of other input.

* These are inputs when more of one input used, more of the other is required to increase production. In other words a decrease in one input cannot be replaced by an increase in the other.
* Example, Bullock labors & human labor on ploughing a field, tractor and tractor operator, are used together as complementary inputs of production.

Inputs are a substitute at a given level of output is maintained be decreasing the amount of one input and increasing the amount of the other input to a certain limit. There are inputs in agriculture which serve both as complements and substitutes over different types of production. For example, fertilizer and compost.

## Product- Product Relationship (Output-Output Relationship)

In our previous discussion we have seen two types of production relationships namely factor-product relationship and factor- factor relationship. In factor product relationship=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. 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 farm. He wants to grow Teff (Y1) along with Maize (Y2). It means that the area under Teff (Y1) is 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 choose of possible enterprises.

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

1. substitution ration ()
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
3. ***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.

***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

Two outputs substitute at constant two outputs substitute at decreasing rate

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.

***ENTERPRISE OR PRODUCT RELATIONSHIPS:***

What is enterprise? It is a single line of production. It is the production of crop or livestock. Enterprises have the following relationships to each other according to their relative contribution to farm income. The basic product relationships are:

1. Joint enterprises and/or main enterprises

 2. Competitive enterprises

 3. Supplementary enterprises

 4. Complementary enterprise

5. Antagonistic enterprise

1. **Joint Enterprises:** Joint product relationship exists when more than one product arises from a single production process. 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. Examples; cotton lint and cotton seed; beef/mutton and skin/hide; Cattle and manure; cow and milk/butter; Sheep and wool, wheat and wheat bran
2. **Competitive enterprises:** are those enterprises which compete for the same resources at the same season (labor, land, capital & management). Example, wheat, teff, 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.
3. **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 be one enterprise. Example, in crop production most of the work is seasonal and labor remains unutilized or under-utilized during the slack period. Example, poultry and crop production.
4. **Complementary enterprises;** are enterprises which help each other and do not compute for the same resources (land, labor, equipment etc. 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.
5. **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.
	1. **COST OF PRODUCTION**
		1. **Cost Concepts and Principles**

The term cost generally refers to expenses on goods and productive services. But in economics cost and expense are different. Expense is money incurred in production process, but cost refers to any effort, sacrifice and exertion of human being. But in economics the term cost mean the total effort, sacrifice & energy in our production. So 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. Production costs play a great role in decision making process because profit depends on amount of cost. Profit can be maximized either by increasing the output level or decreasing cost of production.

* + 1. **Classification of Costs**

***Costs can be classified as:***

***I. Explicit and Implicit Costs***

a). Explicit /cash/ accounting cost:

* These are the actual monetary payments or cash outlays that business firms make to outsides.
* these are those costs appear in the accounting records of the firm
* These are those expenses which actually paid by the firm( paid out costs)
* Example; interest paid(payment) on borrowed fund, salary payment for workers, payment made for raw materials

b). Implicit/non-cash/economic cost:

* the value of non-purchased inputs owned and used by a firm in his own production activities
* these are costs of the firms owned and self-employed resources in carrying out production activities
* Example; the salary of the owner- manager, estimate rent of building, family labor
* The value of these self-owned inputs should be estimated from what they could earn in their best alternative use

***Cost of production represents many types of materials and services which are partially or totally involved in the production process. Therefore; cost can be classified as***

II). ***Material and /or Service and Operational Cost***

Costs from farm operation activities point of view is based on the activities performed by farmers.

* operational costs for crop enterprise
1. Land preparation( 1st, 2nd, 3rd ploughing )cost , fertilization cost
2. Seeding (sowing) and transplanting: these are costs for seed, labor, oxen, etc.
3. weeding
4. irrigation, pumping( labor cost, fuel cost, oil cost)
5. thinning, crop protection, cost of harvesting, threshing, transporting
* ***operational costs for livestock production***
1. Feeding cost, grazing cost, breeding practices, Milk, egg collection. Manure collection, and shearing of wool ( labor cost)

**III). *Economic Cost and Accounting Cost***

 Economic cost/opportunity costs; the opportunity cost of a goods or service is the value of the best alternative that is forgone in order to produce the good or under take the service activity. Opportunity cost also known as economic costs, which include both explicit costs which involve actual payment and implicit costs, which are the benefits that would have resulted from choosing the scarified alternatives but that do not involve a direct payment. In brief, the opportunity cost is the cost of choosing to use resources for one purpose that is measured by the sacrifice of the next best alternative for using these resources.

***IV). Incremental Costs and Sunk Costs:***

Incremental costs are costs incurred due to change in nature & level of business. Ex. replacing machine, Changing distribution channel, while sank costs are costs that do not change due to change in nature and level of the business Ex. depreciation. These costs are irrelevant in decision making process because they do not vary through the production process.

**V**. ***Economic Profit Vs Accounting Profit***

The term “profit” refers to the difference between total revenue and total cost of production of a firm. However, economists and accountants define profit differently. Economist’s measure costs in terms of opportunity costs and they include implicit costs in the calculation of profits. Thus;

 Economic profit= Total revenue - (implicit cost +Explicit cost)

The comparison of revenue to opportunity cost underlies resource allocation decisions and is the foundation for the definition of economic profit which is revenue less opportunity costs. if an economic profit equal to zero means that the activity is earning the same profit as the next best alternative, this is called normal profit.

Accountants, on the other hand do not take in to account implicit costs in the calculation of profit from them, total cost of production includes only the sum of all explicit costs. Therefore,

 Accounting profit= Total revenue- total Explicit costs

* 1. **Classifications of Costs Based On the Length of Time of Production;**

Costs divided in two based on the length of time:

1. Short run cost of production
2. Long run cost of production

a). cost of production in the short run:

 In the short run:

* there is at least one variable and one fixed inputs
* the time is too short for the producers to vary all the factors of production
* cost constitutes both fixed and variable costs

In the short run costs can be divided in to two; Fixed cost (overhead costs) and variable cost (prime costs). When added up these two costs we get a total cost of production in the short run. From the total cost we derive four types of cost concepts:

1. average total cost
2. average fixed cost
3. average variable cost
4. marginal cost

1. Fixed costs (FC):

* refers to the value of services from fixed resources and as such are overhead costs
* Ex; rent, interest, depreciation, property tax, wages of permanent labor

2. Variable costs (VC):

* these costs are related to the outlay on variable inputs( resources), that are used up during the production process

3. Total cost (TC):

* equal to sum of total fixed cost(TFC) and total variable cost( TVC)
* the total cost stands even production is zero( TC=TFC)

4. Average total cost (ATC):

* refers to the average of all costs ( fixed plus variable) per unit of output
* 

5. Marginal cost (MC): it is the change in cost associated with an increase of one unit of output.

* 
* Marginal cost is related to the cost of producing additional units of output. they are affected only by the variable costs
* Fixed cost do not influence the marginal costs, because they neither increase nor decrease with the additional production

6. Average fixed cost (AFC): is a fixed cost per unit of output, since the total fixed cost is the same at all levels of production the average fixed cost falls continually at a deceasing rate as more output is produced. It is because the fixed cost is divided by increasingly large numbers as output increases.

* 

7. Average variable cost (AVC): refers to total variable cost per unit of output.

* 

Hypothetical data showing the relationship among the various cost concepts:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Y(output) | TFC | TVC | TC | ATC | MC | AFC | AVC |
| 0 | 125 | 0 | 125 | 0 | 0 | 0 | 0 |
| 1 | 125 | 30 | 155 | 155.0 | 30 | 125.0 | 30.0 |
| 2 | 125 | 45 | 170 | 85.0 | 15 | 62.5 | 22.5 |
| 3 | 125 | 56 | 181 | 60.3 | 11 | 41.7 | 18.7 |
| 4 | 125 | 58 | 183 | 45.8 | 2 | 31.3 | 14.5 |
| 5 | 125 | 62 | 187 | 37.4 | 4 | 25.0 | 12.4 |

**What information is obtained from the table?**

* 1. **Graphical Presentation of Different Costs:**

**Costs (in Birr)**



**Average cost**



**Figure11 .short run cost curves.**

* 1. **Features of Different Cost Concepts in the Short Run**

***Features of fixed cost:***

* fixed costs are constant throughout the production process
* fixed costs exist only in the short run
* fixed costs do not exist in the long run ( zero)
* fixed costs do not important for decision making process because they do not vary , but important in profit calculation
* Fixed costs are unavoidable; they exist even with no production Ex. depreciation, property tax insurance, interest etc.
* total fixed cost can be cash(tax) or non-cash( depreciation)

***Features of variable costs:***

* variables costs do not exist , if there is no production
* variables cots increases with increasing in production level
* variables cost exist both in short and long run
* variables costs are important in decision making process; because they vary with production level
* What to produce?
* How much to produce?
* the shape of total variable cost depend on the type of production function( linear, quadratic, etc)
* Example; fertilizer, seed, manure, labor, fuel, etc.

***Features of total cost:***

* total cost is the sum of total fixed and total variable cost
* at zero level of production TC is equal to TFC
* the shape of TC curve depends on the shape of TVC curve; i.e. the shape of TC is the same as the shape of TVC

***Features of AFC:***

* It declines throughout the production process as output increases. This is due to the utilization of indivisible factors like, tractor.
* the shape of AFC is rectangular Hyperbola

***Feature of AVC:***

* at initial large amount of AVC, because there is small amount of output, then reaches minimum, then after its value increases as output increases
* it has “U” shaped curve
* Shape of AVC depends on the type of production function.

***Features of ATC:***

* the shape of the curve depends on the type of production function
* it has “U” shaped curve
* initially ATC has maximum value, then it declines and reaches at minimum point, finally starts to rise as out level increases, this is due to overutilization of indivisible factors( tractor and miss management /unable to manage production process

***Features of MC:***

* MC does not depend on TFC
* MC depends on TVC
* The shape of MC curve is “U” shaped
* Mc curve first deciles and reaches minimum ,then after rises as output level increases
* When MC is at minimum , the slope of the MC curve at that point is equal to zero
* MC is important in decision making process

**NB:** in the short run the cost curves (AVC, ATC, MC) are “U” shaped reflecting the law of diminishing return

3.6.**RELATIONSHIP OF DIFFERENT COSTS IN THE SHORT RUN:**

***a. marginal cost and average variable cost***

* **when AVC is declining, MC<AVC**
* **when AVC is increasing, MC>AVC**
* **when AVC =MC, AVC is at its minimum**

***b. marginal cost and average total cost***

* **when ATC is declining, MC<ATC**
* **when ATC is increasing, MC>ATC**
* **when ATC =MC, ATC is at its minimum**

**c. *marginal cost and average fixed cost***

* **there is no relationship between MC and AFC**

## Farm Planning and Budgeting

##  An Introduction to Farm Planning

Planning means taking decisions in advance. It stimulates thinking, broadens understanding & challenges the farmer to move forward. It is a forward-looking approach. The farm plan helps 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, fertilizers, etc. A specific farm plan setting fort his expected output, expenses & income, serves as a sound basis on which a credit institution can give him production credit, based on his productive capability rather than on his net financial assets. Thus the farm plan or the budget is to the farmer what the blue-print of the architect is to a building contractor. It shows what is to be done & how it is to be done. It furnishes an organized & logical approach to his problems & helps him to work out the solution. The farm plan is a process of thinking strategically about the future of the farm.

A successful farm business is not a result of chance good weather and good prices certainly help, but a profitable and growing business is the product of good planning. But what is planning? Why is it important? How does a manager plan? What tools or skills are necessary to develop a profitable plan? Any successful business, no matter it is a mixed small-hold farm or a giant international cooperation, must have right answers for the following questions: Where are we now? Where do we want to go? And how can we get there? The process to find the answers for these questions is actually making a plan.

Farm panning is simply charting a course from where one is to where one wants to go. The procedures and techniques involve the logical formulation of a blue print or guide to at thieve selected goals that have been set for the business. To manage a farm well requires careful planning. In most instances, you should plan for years, if not decades in advance. You should plan both the physical development of the farm property, as well as the development of the farm business. Some of the things which may need to be planned for include: Upgrading facilities to introduce new technology or new procedures, replacing or improving worn out or damaged facilities, Expansion of operations. Changing direction, such as moving from one type of livestock to another, or diversification.

* 1. **The Steps of Farm planning:**

**There are six steps in farm planning**

1. Define the business opportunity/change
2. SWOT analysis
3. Setting up objectives
4. Developing functional plans and budgeting
5. Implementation
6. Monitoring and adjusting.

**1/ Define the business opportunity:**

This is mainly a process to acquire information relevant to the farm business. Technical and business information is essential, such as new technology of cropping and Livestock rearing, price trends, market demands and potential capital resources.

There has been much conjecture about why one person recognizes an opportunity or problem and another does not. Basic findings suggest a preparedness or frame of mind able to recognize and define new conditions or problems.

Consider the cause of the fellow who went to an auto mechanic because his car was making a '' bumping '' sound. He couldn't locate the problems but thought it was in the real end. The mechanic drove the car and came back to tell two fellow he had a bad tire. The fellow with the car recognized he had a problem, but was unable to define it adequately because his level of preparation and / or experience did not provide the framework to do so.

Several factors have been identified as being associated with competence in opportunity / problem recognition Included are:

(a) Experience (growing up on a farm or having farming experience),

(b) Level of schooling (exposure to a broad range of ideas and approaches to problem solving),

c) Motivation by accomplishing a goal, and (d) willingness to take risk

Some managers say defining the opportunity ) problem is equal to achieving one- half of the solution nebulous or unclear problem definition can lead to wasted time and motion, collection of i in appropriate data, and use of incorrect or inadequate analytical techniques. Sometimes wasted motion means a missed opportunity recognizing that the cattle enterprise is not making money is only the beginning. The problem must be brought in to sharper focus by looking at more specific reasons, such as calving percentage, rate of gain, Selling price, cost per hundred weight, birrs of beef sold, and soon.

The problems and / or opportunities in most agricultural business are particularly limitless. Wise managers select problems / opportunities which, when solved, promise a high pay off in terms of a goal of the business. One of the most important sources of information to the farmers is the extension service. Field days, visits to research institutions can enrich farming information. Radio, television, newspapers and magazines also provide some useful information. The farmer's experience and judgment is the most reliable factor in defining the business opportunity.

**2/ The Swot Analysis**

SWOT analysis is concerned with the identification of specific views, feelings and information that is directly collected from different sources such as customers, managers, labors, competitors, etc. Issues to be identified include the strength or achievements, the weakness or constraints, the opportunities for improvement and the threats which are considered as external negative forces which increase the risks of failure. Swot is therefore the abbreviation formed by the first letters of the words. Strengths ( s) , weaknesses (w) , opportunities ( o) and Threats ( T) . The swot analysis is to identify the internal and external factors of a farm.

Swot is a tool to help a manager /farmer to identify the advantages and disadvantages of a farm undertaking by analyzing the internal forces (strengths and weaknesses) and the external forces (opportunities and threats) that affect the development process/ production process (see table below )

Strengths Internal factors including product,

 Facilities, technology and finance.

Weaknesses

Opportunities External factors including economy, market,

 Customers, competition, natural condition,

 Threats condition, assess situation.

What key strengths of the operation can you build your plan on? What weakness in the operation must your plan address? Before selecting viable strategies ( i.e. courses of action or areas of activity), management should undertake an analysis of its farm strengths and weaknesses , so that it can determine what marketing, producing, technical and financial know how the farm can contribute to potential areas of activity. In particular, management should assess the capabilities of competitors in terms of managerial competence, products, access to markets and organizational and physical facilities. By comparing its own capabilities with those of its competitors, it will be possible to determine the areas where the farm is outstanding or deficient.

The findings of the swot analyses can be used to establish the structure of a new farm. Question to be asked by the undertaker of swot analysis are similar to the following.

What have been your achievements so far? What constraints have you failed in the past and at present? What external factor can help you to improve the present situation? What external factors are threats to further improvement?

**Table 4. 1. A Swot Matrix**

|  |  |  |
| --- | --- | --- |
|  | Opportunities | Threats |
| Strengths | using strengths to use opportunities | Using strengths to avoid threats |
| Weaknesses | Removing weaknesses to use opportunities | Removing weaknesses to avoid threats |

**3/** **Setting up objectives**

In would make little sense to start out on a trip without a pretty of idea where you are going. Yet agricultural business owners and managers are frequently criticized for just that the establishment of objectives appears to be one of the most neglected phases of management. Several reasons have been offered.

1/ It takes time to decide on objectives. A manager will frequently respond, '' I am too busy for that''

2/ Coming to grips with the many, and often conflicting objectives and selecting the more important ones is a demanding task. Some managers do not have the preparation or experience. Others lack confidence or ability.

3/ as the ramifications of problems become more numerous, objectives become more difficult to define.

4/ some managers have never thought about the need to set or the means to arrive at objectives. They see their major objective as surviving for another year and fail to reorganize that survival is but one of many objectives. But other objectives are contingent up on survival

The objective answer the question'' what are we trying to accomplish'' It gives purpose and direction to decisions and actions. For planning purposes it is necessary that a farm's objectives specifically indicate the direction in which the resources of the organization should be pointed. They must be defined so as to serve as a measure of success or failure therefore, the importance of objectives is ( a) set direction, (b) provide performance targets, and (c) constrain decisions.

Among suggestions that have been made for setting up objectives are:

**1. Have some specific objectives**: Strategic or long range planning requires the specification of objectives towards which the primary objective of business organization is the maximization of the present value of future cash flows. These may range from realizing 1000 br/ha above cash costs to making certain purchases for the farm home. Specific objectives provide define ends to words which to strive and can give a manager an effective basis for his actions. The resources to use and the risks to take are easier to determine when the objectives are specific therefore; objectives should be specific (clear as to what is to be accomplished).

**2. Recognize the time dimensions of objectives:** Some objectives are readily attainable in the short-run others are long term, ultimate, and more difficult to obtain. Thus, objectives should be time –based /have a time for completion.

**3. Choose practical objectives**. This means set realistic, attainable objectives. It is well to aim high, rather than too low, but a manager who never attains some of the established objectives can become very frustrated. Therefore, objectives should be challenging, but achievable.

**4. Have a hierarchy of objectives**: objectives have different weights. There is Br. 100 objective and Br 10,000 objectives they should be treated accordingly.

**5. Have measurable objectives**: This means some way of assessing performance. The objective of a farm could be measured either by index of production, such as out put of grain, fruit, vegetable and livestock or by index of income such as total income of the family and net income per capital.

**6. Recognize the multiple and shifting nature of objectives:** managers have not one, but a multiplicity of objectives. Maximization of earnings may be one. But there are likely many others, such as security, prestige, and leisure. Some of these may be competing objectives. Future, because change is a fact of life, objectives may med to be altered. Objectives may shift due to economic conditions, changing family circumstances, or new knowledge.

## 4.2. Farm Budgeting

A budget is a written quantified plan for future action. It could either be long- term or short-term. Budgeting is important tool used by farm mangers for planning and decision- making. It is very useful for analyzing alternatives which was a step in the decision- making process. Budgeting can be used to select the most profitable plan from among a number of alternatives and to test the profitability of any proposed change in a plan. There are several types of budgeting, each of which adapted to a particular size, purpose, and type of planning problem.

### 4.2.1. Different Types of Farm Budgeting & Planning

**There are three main types of farm budgeting:**

* Single Enterprise budgeting
* Partial budgeting
* Full or complete budgeting & planning.

#### 4.2.1.1. Single Enterprise Budgeting

 **An enterprise**: is defined as a single crop or livestock commodity. Wheat, corn, coffee, etc are examples of crop enterprises/ commodities and dairy cattle, beef cattle, pig (swine) production, etc are examples of livestock enterprises.

**An Enterprise budget**: is an estimate of all income, expenses and profit/ loss associated with a specific enterprise.

The enterprise budgets are the input-output relationship for individual enterprises. An enterprise budget includes all the variable resources required per unit (a hectare/animal/tree, etc.) of an enterprise & its cost, the expected output, gross returns, etc.

It is an enterprise consists of a single crop production. For example, a budget for only "teff" or for only wheat is an enterprise budget. Estimating costs of an enterprise involves recording the cost of all inputs and all activities plus any interest that the farmer has to pay if a loan was taken out to purchase inputs. The benefits include crop residues and crop consumed at home as well as crop sold. A single enterprise budget should give the answer to the question: what will be the profit (or loss) of a particular enterprise? A format of an enterprise budget is given in Table 4-9.

Enterprise budgets provide useful information regarding the resources requirements & the relative profitability of different enterprises. Thus these budgets, considered in the framework of farm resources, are the alternatives from among which the most profitable ones are to be selected. In this context, the enterprise budgets need to be prepared at different levels of technology, as

**(a) The existing level of technology; and**

**(b) The improved or recommended level of technology.**

A comparison of the enterprise budgets at the **existing & improved levels of technology** provides the scope or the potential of making farm improvements. The enterprise budgets lack in one important aspect that these do not consider the complementary & supplementary relationships amongst themselves which are quite common among farm enterprises at low level of production, but they simply assume to be competitive to one another right from the beginning. But these relationships are taken care of in complete planning & budgeting.

**How Enterprises can be compared?**

Each enterprise budget is developed in the basis of a small common unit such as 1 lecture for crops or 1 head for livestock. This permits easier comparison of the profit for alternative and competing enterprises. The estimated profit can be compared with the estimated per hectare profit for other crops and used to select the more profitable crops and crop combinations to be grown each year.

Enterprise budgets are developed to aid farmers in evaluating alternative plans. They represent common, workable combinations of inputs that can achieve a given out put. Amount of seeds, types and quantities of fertilizer, chemicals, and other items reflect local extension service recommendations and the experience of many farmers. The specific combinations of inputs and prices presented will not likely precisely reflect any given farm. In practice, actual cost will be higher or lower than shown. Thus the most important column is '' your Budget''.

**An enterprise budget has the following characteristics?**

1/ it estimate costs and returns expected for a single enterprise.

2/ it represent one combination of inputs such as seed, chemicals, and fertilizer to produce some level of output. It is not the only combination of inputs that can be used to produce this crop. For example, soil type and extent of prior fertility build up can cause fertilized requirements to vary widely.

3/ it is a written plan for a future cause of action including estimated costs and returns for that particular farm.

4/ it provide a format and a basis for developing farm budgets appropriate for a given situation.

**The techniques of enterprise budgeting**

Enterprise budgets can be organized and presented in several different formats, but typically contain three sections: income, variable costs, and fixed costs.

**1/ estimating the total production and the expected output price**

The first step in developing an enterprise budget is to estimate the total production and the expected output price. Both of these values will obviously have a great effect on enterprise profitability, and they should be carefully estimated. The estimated yield should be the average yield expected under normal weather conditions given the soil type and input levels to be used. Input levels must be considered because seeding rates, fertilizer levels, chemical use, and tillage practices all affect yield. Since enterprise budgets are used for forward planning or making future. Plans, the output price should be the manager's best estimate of the average price expected during the next year or next several years depending on the planning horizon.

No costs are included for grain storage. If an improved price reflected in your farm due to storage or marketing strategies, then any increased costs to achieve that price should either be netted out of returns or added to costs. Multiple outputs for livestock budget should be at counted, such as milk, calves and cull cows for a dairy enterprise. All the income from dairy cattle should be prorated to eat h milking cow.

**2/ estimating the variable costs.**

Variable costs are estimated next, and some, such as for seed, fertilizer, and chemicals, are relatively easy. The quantities to be used and input prices are generally known or easy to obtain. Other variable costs such as fuel, machinery repairs, and labour are more difficult to estimate, particularly on a per hectare basis. These costs depend on machinery type and size and the number of tillage operations to be performed. Records for several years and enterprise analysis are good sources of information along with research and extension bulletins available from state colleges of agriculture. The costs of fuel, machinery repairs and labour should be prorated to specific enterprise on a per hectare basis.

If machinery is contracted, the rent cost may be shown as a variable cost. All labour required in the enterprise would be earning a daily wage, whether hired or operator labour. Farm-raised feed such as hay should be valued at market value pasture maintenance is the items such as fertilizer, seed and chemicals that are used on the livestock posture. A prorated charge for repairs to fences, buildings and equipment should be included.

The interest of variable costs should be included in the budget. i.e., enterprise budgets include a charge for the opportunity cost on capital invested in the variable costs. This charge covers the time period between expenditure of the capital and harvest when the income is or can be received. The management charge represents the cost for communication selling and other indirect production activities. Miscellaneous includes supplies, utilities, soil tests, small tools, etc...

**3/ estimating the fixed costs**

The fixed cost include the land, building, machinery and breeding livestock cost. Machinery and building used on the farm .They must be prorated to the specific crop enterprise on a per hectare basis. The amount of machinery fixed costs will be depend on the size, age, and number of machines used in producing the crop as well as the tillage practices used. These costs are often difficult to estimate unless all machinery work is hired on a custom basis.

Most crop enterprise budgets take the rent as land charge. If the land is double cropped, the charge should be shared between crops. The land charge is the oppo0rtunity costs of land and represents a return for its use in crop production.

**4) Interpretation of returns / the enterprise budget**

The example enterprise budget for Teff production presented in Table1 shows an estimated profit of Br.2432 per hectare above all costs. Return above total costs would be used to examine '' long-run'' decisions. This return is useful in determining whether planning the specific crop or livestock will be profitable year after year, given the current prices reflected in the budget.

The estimated profit can be compared with the estimated per hectare profit for other crops and used to select the more profitable crops and crop combinations to be grown each year. However, the profit figures must be properly interpreted, as they are the return or profit above all costs including opportunity costs on owned inputs. In some cases, the return above total costs is negative. That does not mean the farmer should quit from cropping (if no better alternative crop), since the labour cost is variable if the labour force is in surplus, and the fixed cost should be compensated somehow.

|  |
| --- |
| **Table.4-9. Simplified format for computing costs and benefits** |
| **Type of crop: Teff** |  |  |
| **I. variables costs** |  |  |
| **A. Labour and machine costs** |  |
| **Activities** | **Value of person-days** | **Value of pair of oxen-Daysor machine rent** | **Totalcost** |
| **Person days(a)** | **Unit Cost(b)** | **totalcost(a\*b)=c** | **days(d)** | **Unit Cost(e)** | **totalcost(d\*e)=c** | **(c+f)=g** |
| **land clearing** | **8** | **8** | **64** |  |  |  | **64** |
| **1st ploughing** | **4** | **8** | **32** | **4** | **10** | **40** | **72** |
| **2nd ploughing** | **4** | **8** | **32** | **4** | **10** | **40** | **72** |
| **3rd ploughing** | **4** | **8** | **32** | **4** | **10** | **40** | **72** |
| **4th ploughing** | **4** | **8** | **32** | **4** | **10** | **40** | **72** |
| **5th ploughing** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| **Ploughing and plantingat the same time** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| **Input transport** | **0** | **0** | **0** | **2** | **5** | **10** | **10** |
| **Planting and fertilizer application** | **4** | **8** | **32** | **4** | **10** | **40** | **72** |
| **Herbicide application** | **1** | **8** | **8** | **0** | **0** | **0** | **8** |
| **Rental of herbicide sprayer** | **0** | **0** | **0** | **1** | **2** | **2** | **2** |
| **1st weeding** | **16** | **7** | **112** | **0** | **0** | **0** | **112** |
| **Thinning and shilshlo** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| **3rd weeding** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| **Insecticide application** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| **Guarding, bird-watching** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| **Harvesting and Stacking** | **20** | **10** | **200** | **8** | **5** | **40** | **240** |
| **Preparation of threshing ground** | **2** | **5** | **10** | **0** | **0** | **0** | **10** |
| **Threshing** | **12** | **10** | **120** | **20** | **4** | **80** | **200** |
| **Transport to threshing area** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| **Transport to storage** | **4** | **10** | **40** | **4** | **5** | **20** | **60** |
| **Storage cost ( variable)** | **0** | **0** | **0** | **0** | **0** | **0** | **0** |
| **Marketing cost** |  |  | **2** |  |  | **5** | **7** |
| **Total labour and oxen cost** |  |  |  |  |  |  | **1073** |

|  |
| --- |
| **B. Material input costs and storage loss** |
| **Item** | **Quantity** | **Unit cost(birr)** | **Total cost(birr)** |
| **seed** | **Local(kg)** | **0** | **0** | **0** |
| **Improved(kg)** | **100** | **0.5** | **50** |
| **Fertilizer** | **DAP** | **0** | **0** | **250** |
| **UREA** | **0** | **0** | **230** |
| **Pesticide** | **Herbicide** | **0** | **0** | **50** |
| **Insecticide** | **0** | **0** | **0** |
| **Empty grain sacks** |  | **13** | **3** | **39** |
| **Interest on inputs** |  | **580** | **0.105\*9/12** | **46** |
| **Total material input cost** |  |  |  | **665** |
| **Storage loss** |  |  | **100** | **100** |
| **Total material and storage loss** |  |  |  | **765** |
| **Total Variable cost****TVC=A+B****A=1073****B=765****Total Variable cost=1838** |
| **II. Foxed costs** |  |  |  |
| **Item** | **Quantity** | **Unit cost(birr)** | **Total cost(birr)** |
| **Land and income tax per hectare** |  |  |  | **10** |
| **Land rent** |  |  |  |  |
| **interest** |  |  |  |  |
| **Sub-Total fixed cost** |  |  |  | **10** |
|  |  |  |  |  |
| **III. Depreciation** |  |  |  |
| **item** | **Construction cost** | **Divided by years** | **Total cost(Birr)** |  |
| **depreciation** | **60** | **3** | **20** |  |
| **Total Fixed cost** |  |  | **30** |  |
|  | **IV. Total costs** |  |  |  |
|  | **TC=TFC+TVC** |  |  |  |
|  | **TC=1838+30** |  |  |  |
|  | **TC=1868** |  |  |  |
| **V. Gross income (Gross revenue)** |  |  |
| **Item** | **Quantity(kg)** | **Unit value(birr)** | **Total value(birr)** |
| **5.1. Grain** | **2000** | **2** | **4000** |
| **5.2. Straw**  |  |  | **300** |
| **Total** |  |  | **4300** |
|  |  |  |  |  |
| **VI. Net Income** |  |  |  |
| **6.1. Total Revenue** | **4300** |  |  |
| **6.2. Total costs** | **1868** |  |  |
| **Net income/loss per hectare** | **2432** |  |  |

#### 4.2.1.2. Partial Budgeting

Partial budgeting is a method of making a comparative study of the cost-and-return analysis resulting from a change in a part of the business organization. This change may be made through a careful selection from among alternative methods of production or practices, the choice of which is based on the opportunity cost of relative profitability & does not affect the total farm organization vitally. This technique helps to make decisions whenever small changes in the existing farm organizations are contemplated. The partial budget analysis can help Identify opportunities by varying projected inputs or technology, including marketing. The analysis enables the farmer to choose which crop to produce as well as what, how and how much to produce.

A partial budget is a budget, which predicts only the changes in income and expenditure resulting from a policy decision. It is used to calculate the expected change in profit for a proposed change in the farm business. It has to show only that part of the financial information which will be affected by the change being contemplated. A partial budget contains only those income and expense items, which will change if the proposed modification in the farm plan is implemented. Only the changes in income and expenses are included and not the total values. The final result is an estimate of the increase or decrease in profit. To make this estimate, a partial budget systematically organizes the answers to four questions relating to the proposed change.

1/ what new or additional costs will be incurred?

2/ what current income will be lost or reduced?

3/ what new or additional income will be received?

4/ what current costs will be reduced or eliminated?

The first two questions identify changes which will reduce profit by either increasing costs or reducing income. Similarly, the last two questions identify factors which will increase profit by generating additional income or lowering costs. By comparing the total reduction in profit found by answering the first two questions with the total increase in profit shown by the answers to the last two, the net change in profit can be computed. A positive value indicates the proposed change in the farm plan will be profitable. However, the manager may want to consider additional factors such as additional risk uncertainty, and capital requirements before implementing the change.

**The following four points are important in setting up a partial budget:**

* Additional returns from change
* Reduction in unit cost
* Reduction in yield, if any
* Addition in cost incurred

 **The usual layout for a partial budget is as follows**

Cost side of the budget Benefit side of the budget

 Income lost new income gained

 + +

 New costs incurred Former costs saved

 -------------------------------------------------------------------------------------

Great care must be exercised to include all items which will change as a result of the proposed new policy. If one is omitted, the conclusion drawn from the budget will be false and misleading.

**Table 4-10. Formats for partial Budgeting**

Partial budget

Proposed Change------------------------------------------------------------------

Additional Costs (Br)…. Additional income (Br)……

Reduced income (Br)….. Reduced costs (Br)……….

A. Total annual additional B. Total annual additional costs and reduced income Br…….. Income of reduced costs Br………

 \* Net change in profit (B minus A) Br………….

Thus partial budgets deal with such changes in the farm organization as can increase farm incomes without changing the total farm organization. The farmer would know the total net benefit from the change, the complete details of what he should do at what cost & what he is not to do after the change & come out with higher profits.

**Example of Partial Budgeting**

Supposing the addition of 50 beef cows to an existing herd needs additional 60 hectares of forage, which is currently in grain production and will have to be converted to forage production. There will be additional fixed costs including additional interest on the increased investment in beef cows, depreciation on bulls and additional property taxes. Herd replacements are assumed to be raised, so there is no depreciation included on the cows. Variable costs will also increase as shown, including and annual change for fertilizer and maintenance costs on the new 60 hectares of pasture. Income from the grain now being produced on the 60 hectares of land has no longer received and this reduced income is estimated in Br. 28,000 making the total annual additional costs and reduced income equal Br. 35,215.Additional income will be received from the sale of cull cows, steer calves, and heifer calves several items are important in estimating this income in addition to carefully estimating prices and weights. it is unrealistic to assume every cow will wean a calf every year , and this example assumes 46 calves from the 50 cows.

This example assumes herd replacements are raised rather than purchased, so 6 heifer calves must be retained each year to replace the 6 cull cows, which are sold. This is reflected by only 17 heifer calves being sold each year compared with 23 steer calves. The reduced costs include expenses, which will no longer be incurred from planting the 60 hectares of grain no reduction in machinery fixed costs included, as the machinery complement is assumed to be no different after the proposed change. Labour cost are also assumed to be unaffected by the change, so no additional or reduced costs for labour are included.

The total additional income and reduced costs are 48,730 birr. or +13, 515 birr more than the total additional costs and reduced income, indicating the proposed change would be profitable.

**Table 4-11. Partial budget for adding 50 beef cows**

|  |  |  |  |
| --- | --- | --- | --- |
| Additional cost | Br | Additional income | Br |
| Fixed cost | Br | 6 cull cows(300gk/cow)2Br/kg | 3600 |
| Interest on cow herd | 2500 | 23 steer calves(280kg/heed/2Br/kg | 12880 |
| Bull depreciation | 200 | 17heifer calves(200lg/head/3Br/kg | 10200 |
| Taxes | 0 |  |  |
| Variable costs |  |  |  |
| veterinary and health | 500 |  |  |
| Feed and hay | 2000 |  |  |
| Hauling | 200 |  |  |
| Miscellaneous | 100 |  |  |
| Pasture maintenance | 1500 |  |  |
| Interest on variable costs | 215 |  |  |
| Total additional costs | 7215 | Total additional income | 26680 |
| Reduced income |  | Reduced costs |  |
| Grain production(40t,700br/t) | 28,000 | Fertilizer | 12000 |
|  |  | Seed | 3000 |
|  |  | Chemicals | 1000 |
|  |  | Machinery cost | 5000 |
|  |  | Interest on variable costs | 1050 |
|  |  | Total reduced cost | 22050 |
| Total annual additionalcosts and reduced income | 35,215 | Total annual additional income and reduced costs. | 48,730 |
|  |  | Net change in profit | +13515 |

#### 4.2.1.3. Complete Planning & Budgeting

In preparing complete plans for the farm, all the sophisticated analysis of studying an individual cultivator's opportunities, constraints & problems is done. Every little aspect of the farm organization is examined & then suitable adjustments are studied & a suitable combination as fits in rationally with that given farm organization is suggested.

Small scale farmers usually grow more than one crop. Then an enterprise budget should be prepared for each crop. The summary of all the enterprises gives the budget for the whole farm. The estimation of cost and return for the entire farm as a single unit is called **a whole farm budget**. For example, if the farming is mixed and includes crop production, dairy, poultry or fishery, the statement showing estimated return and expenses of all these enterprises combined is the complete or whole farm budget of that farm.

**A** whole farm budget is a summery of the expected income, expenses, and profit for a given farm plan. It considers the costs and returns of operating: the whole farm or particular crop and livestock enterprises in order to derive the net returns. Complete budgeting is especially useful for someone planning to enter farming to have an idea of the profitability of the particular farm enterprise. Complete budgeting also useful to estimate net returns or profit. In general, the whole farm budget could be used to compare alternative plans for profitability, and estimate the operating capital and total input requirements. It can also be used for further cash flow budgeting and controlling.

**A Complete or whole farm budget is necessary where**:

a/ the farmer wants to start a new farm, and

b/ both the direct costs and the fixed or semi fixed costs are all likely to be affected.

A complete budget, as the name implies, covers every item of expenditure and income. In preparing a complete farm budget, the following steps that have advocated:

1. Formulation of farm objectives

2. Take the farm inventory which may include farm buildings, land, land improvements, e.g. irrigation, breeding stock.

**Uses of whole farm budgeting:**

In addition to providing an estimate of net farm income, a whole farm budget has several other potential uses.

1/ it provide a basis for comparing alternative plans for profitability. This can be particularly useful when planning for growth and expansion.

2/ the cash expenses in the budget provide an estimate of the operating capital the business will need during the year.

3/ much of the information needed to complete the cash flow budget has already been gathered and organized in the whole farm budget.

4/ a detailed whole farm budget showing the estimated profit can be used to help establish credit and borrow the necessary operating capital.

5/ the worksheets used to prepare the budget contain estimates of total input requirements. Orders for inputs such as fertilizer, seed chemicals, and feed can be placed using this information.

6/ the whole farm budget can also be used as part of a system for monitoring and controlling the business during the year.

**The complete farm budget format**

The enterprise gross margins used in planning do not contain all the farm expenses. Fixed costs were excluded, and there may be additional variable costs, particularly general overhead costs. These types of costs must be included in the complete budget, since they affect the actual profit even though they do not affect the section of enterprises. The total for each variable cost can be found by calculating the total for each enterprise and then summing across the enterprises. In actual practice, variable expenses such as building repairs, vehicle expenses, utilities and other farm overhead expenses are very difficult to allocate to specific enterprises. They can be omitted in the calculation of gross margin, but should be included in the complete budget.

Much of the information needed to complete the budget will a ready have been gathered during the development of the whole farm plan. The following tables are examples of whole farm budget. Total farm income is calculated for each of the enterprises included in the plan and totals.

The next step is to estimate the variable costs by type or category such as seed, feed, fertilizer, and repairs many of these variable costs will be the same as those used to estimate the gross margins needed in the planning procedure. The total for each variable cost can be found by calculating the total for each enterprise and then summing across the enterprises. A whole farm budget, as a summary of the expected income, expenses, and profit for a given plan, can be prepared in the following manner.

**Table 3-16 Example of A whole farm budget showing projected income, expenses, and profit**

|  |  |
| --- | --- |
| **Income** |  |
| **Cotton** | **Birr 54,000** |
| **Maize** |  **.. 43,000** |
| **Wheat** |  **.. 13,000** |
| **Stocker steers** |  **.. 40,000** |
| **Total income** |  **.. 150,500** |
| **Variable expenses** |  |
| **Fertilizer** | **Birr 11,900** |
| **Seed**  |  **.. 3,600** |
| **Chemicals** |  **.. 7,900** |
| **Fuel, oil greas** |  **.. 4,050** |
| **Machinery repairs** |  **.. 2,650** |
| **Feed purchased** |  **.. 1,600** |
| **Feeder livestock purchased** |  **.. 29,000** |
| **Other livestock expenses** |  **.. 1,100** |
| **Custom machine hire** |  **.. 10,250** |
| **Miscellaneous** |  **.. 2,450** |
|  **Total variable expenses** |  **.. 74,500** |
| **Fixed expenses** |  |
| **property taxes** | **Birr 2,600** |
| **Insurance** |  **.. 1,250** |
| **Interest on debt** |  **.. 22,000** |
| **Machinery depreciation** |  **.. 7,000** |
| **Building depreciation** |  **.. 3,200** |
|  **Total fixed expenses** | **Birr 36,250** |
|  **Total Expenses** | **Birr 110,750** |
| **Net farm income ( profit)** | **Birr 39,750** |
| **Income** |  |
| **Wheat** | **Birr 3,500** |
| **Beef cow** |  **.. 2,100** |
| **Sheep** |  **.. 800** |
|  **Total income** |  **.. 6,400** |
| **Variable costs** |  |
| **Fertilizer** | **Birr 520** |
| **Seeds** |  **.. 250** |
| **Chemical** |  **.. 200** |
| **Machinery & tool repairs** |  **.. 30** |
| **Feed purchased** |  **.. 400** |
| **Pasture improvement** |  **.. 200** |
| **Feeder livestock purchased** |  **.. 0** |
| **Veterinary & Medicines** |  **.. 50** |
| **Other livestock costs** |  **.. 200** |
| **Labour cost** | **.. 2430** |
| **Miscellaneous** |  **.. 300** |
|  **Total variable costs** |  **.. 4580**  |
|  **In come above variable costs ( GM)** |  **.. 1820** |
| **Fixed costs** |  |
| **Depreciation** | **Birr 12** |
| **Land and property taxes** |  **.. 30** |
| **Interest on dept** |  **.. 500** |
|  **Total fixed costs** |  **.. 542** |
| **Total costs** |  **.. 5,122** |
| **Net farm profit** |  **.. 1,278** |

The estimated profit also needs to be carefully interpreted. No opportunity cost has been charged for the owner's capital invested in land, buildings, and machinery for the owner's labor and management. Including these opportunity costs as additional expenses will further reduce the net farm income (profit).

1. **FARM RESOURCES MANAGEMENT**

Farm resources such as land, labor, capital, management are need 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.

##  Land Management

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.

###  Unique Characteristics of Land

**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 cannot moved** **to combined with other resources**, but others resources like machinery, seed, 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 in to 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 cannot be manufactured when the demand increases.

Therefore, changes in the profitability of agricultural production are eventually factored in to land prices, rent and the land owner receives the economic benefits of losses.

###  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.

* 1. **Labor Management**

Labor is one of the production resources which mobilize other resources. Labor 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 something)
6. job opportunity
7. social customs( festivals, holydays etc------)

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

1. if it is less expensive than labor, 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 Labor Are;**

1. family labor
2. hired labor( full time or part time)
3. exchange labor

**Unique Characteristics of Agricultural Labor** (that affects its use & management)

1. labor is a continuous flow input:
* mean that the service it provides is available hour by hour and day to day
* it cannot be stored
* it must be used as it become available or it is lost
1. full time labor 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 labor 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 labor management plan.

**PLANNING FARM LABOUR RESOURCES:** It helps to avoid costly and painful mistakes

Major steps to be followed for labor resource planning are:

1. To assess the farm’s labor 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 labor might be Full time Or part time( used at peak period, seasonal)
* most managers judge quantity of labor needed by observation and experience
* but if new enterprise is being introduce, typical labor requirements from published enterprise budget can be used
1. Develop tentative job descriptions: for regular workers and occasional workers(hire as needed)
2. Match present employees and job description
* good match
* change description to fit employee
* shift employ to new job
* shift employ and adjust description

iv. Develop job descriptions for remaining tasks

V. Hire employees who fit job description

**MEASURES OF LABOR EFFICIENCY:**

**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).it is affected by:

* business size
* type of enterprise
* the amount of machinery used
* other labor saving equipments used

**b). labor cots per hectare (area crop);** it is found by dividing the total crop labor cost for the year by area of cropped. The opportunity cost of family labor and operator included in total labor 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 labor used for crop related activities.

## Capital Management

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 labor 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 many potentials

The equi-marginal principle provides the guide lines and rules to ensure that the allocation is done in such a way 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.

**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” without 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 cots- 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 without 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

**NB:**

* **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 has a reasonable limit
5. it should has 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

Therefore his character is expressed by:

 **3 (three) R’s of credit**

1. returns( how much profit he would gain)
2. repayment capacity( financial position)
3. Risk bearing capacity( financial position)

**3 (three) C’s of credit**

1. Character ( honesty-----)
2. Capacity
3. Capital (how much capital he has?)

**5 (five) P’s of credit**

1. purpose ( for which purpose he needs credit)
2. person
3. Productivity ( how much he plan to produce)
4. payment of installment
5. protection ( security)

## FARM RECORD KEEPING (FRK)

Objective of FRK

 - To control and manage the use of resources

## 6.1. Importance/Uses of Record Keeping:

It is important to:-

* Measure the financial success
* it helps us to prepare soil map
* it helps us to prepare farm map
* Establish a realistic basis for comparisons with the past year
* the goal set Plan for the future
* 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

## 5.3. Types of Farm Records

Farm records system consists of three (3) parts.

**1. Physical Farm Records: - Non-monetary**

 - Essential to implement the financial records and financial decisions

 a) Farm map

 b) Land utilization records

 c) Production and disposal record for crops livestock, poultry and others.

 d) Labor records

 Paid labor- hired - full- time

 - Part-time

 \* Market wage rate is taken

 Unpaid labor- operator (family) labor

 \* Opportunity cost is calculated

 **NB** labor days used on crops 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

**FORMS FOR MAINTAIN FIELD RECORDS:**

**a) For crop production**

Year \_\_\_\_\_\_\_\_\_\_ crop\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Soil Type\_\_\_\_\_\_\_\_\_\_\_\_\_, Slope\_\_\_\_\_\_\_\_\_\_

Field number\_\_\_\_\_\_\_\_\_\_\_ area/ha\_\_\_\_\_\_\_\_\_\_\_\_\_\_ irrigated or not \_\_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Date | Seed  | Fertilizer | chemical | machinery |
| Variety | amount | type | amount | type | amount | type | amount |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |

**b) For live stock**: 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\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Month/Date | Beginning inventory | transfer | purchase | produced | sale | death |
| NO | value | In(+) | Out(-) | NO. (+) | value | NO.(+) | value | NO.(-) | value | NO.(-) | value |
|  | . |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
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|  |  |  |  |  |  |  |  |  |  |  |  |  |

\*\* Out- transfer refers to culling, which is negative to the live stock

 In- positive

**ii). feed record**

It is a daily activity and we should record on a separate sheet.

Year\_\_\_\_\_\_\_\_\_\_ kind of animals\_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Month/Date | No. of animals | grain | commercial | Forage  | pasture |
| corn | wheat |  | Fagulo |  |  | silage | hay |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |
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|  |  |  |  |  |  |  |  |  |  |  |  |  |

**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\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Month/date | Hours used | Fuel | Oil& lubricant | repairs |
| amount | value | amount | value | Cost  | description |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |

d). labor record

Year\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Month/date | Crop enterprise | Livestock enterprise | machinery | Farm over head |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
| * farm over head : the labour which can not attribute to either of crop or livestock
 |

**2. Financial Farm Records- expressed in monetary terms**

 - Important to provide information regarding the profitability of the whole farm business over a given period.

 - All the cash incomes from the operation and expenditures to the operation are recorded

 - Year day and mouth should be included

 - Include the following

a. Farm inventory

 - All kinds of goods purchased and consumed during the operation are recorded

 - The 🡱es (increases) and 🡳es (decreases) in inventory 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

## 5.4. Valuation of Farm Assets

The data for values of assets may get from:

* records
* inventory( list of the assets of the items of the farm and their value at a particular time
* Research( if there is records & inventory the only method is research by using, survey, census, statistical, experimental)

### 5.4.1. Methods to Value Farm Assets

**1. Valuation at cost or market price:** it is a good method if we have currently bought assts and non-duarable assets. Any normal marketing charges, such as transportation, selling commission, and other fees are subtracted.

**2.** **Valuation by reproductive value:** this means items produced on the farm can be valued at their farm production cost. i.e. by counting what we incurred to get it up. Example, growing crops should be counted by costs incurred to get it up.

**3. Valuation by capitalization:**

* cost less accumulated depreciation
* estimated value equal to book value
* It takes in to account discount expected income over service lift of the asset. ex, land
* book value was defined earlier as cost less accumulated depreciation

**4. Inventory method:**

* Valuing at cost, mean items that have been purchased can be valued at their original cost.
* it considers the value of the asset at that particular time
* This method works well for items that have been purchased recently and for which cost recodes are still available.

**Example:** different methods that can be used to determine a land large

a**.** based onan opportunity cost/ interest based on the current value of land

* Interest rate\* land value (income we gat from the land)

b. based on the owners rental income from a typical crop share lease

* value of the owner’s share crop less any crop production expenses paid by the owner

c. A typical cash rent charge

* based on the amount of Birr we get from rent

### 5.4.2. Value of Farm Production and Its Importance

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 value of farm production is different from ret income because out of the assed valve, all other cash costs & the fixed costs of labour, investment , etc. would have to be paid, The value of production is some times called as gross profit. The physical units of different products cannot be added to get a meaningful valve the valve of farm production is one of the basic indices to measure the farm performance and if widely used in statistics and accounting.

#### 5.4.2.1. The Methods of Valuing Farm Production

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.) custom work performed for ethers, government payments. 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.

Net market price places a value on an inventory item equal to current market price. This method can be used for items which could be sold in a short time and for which current market prices are easily obtained, such as grain, coffee and feeder livestock. Original cost works well for items which have been purchased recently and for which cost records are still available, such as feed, fertilizer, supplies and purchased feeder livestock. Farm production cost can be used to value the items produced on the farm and still on hand. This cost is equal to the actual cost of producing the item but should hot include profit or any opportunity costs.

Established but immature crops can be valued by the actual production expenses to date. It is not appropriate to value a growing crop using the expected yield and price because poor weather or lower prices could drastically change the value before harvest and final sale. Cost less depreciation can be used for property which provides servile to a farm over a period of years but loses value because of age, use, or obsolescence, such as machinery, buildings, fences & purchased breeding livestock.

### .4.3. When to Value Production (The Time to Value Production)

For most of the farms, an annual value of farm production covers a January 1 to December 30 time period. The calendar year is a common period for farms to calculate the production value, although other time period can be used. It covers a complete production cycle for most agricultural enterprises, and the end of the year is generally a slow period in the financial and production activities. The time to value farm production should also consist with the accounting period of the farm. The accounting period is the time period covered by an income statement. An income statement is a summary of income and expenses over a period of time. The calendar year is a common accounting period for most of the farms.

## 5.5. Analysis of Farm Records

 A number of methods of analysis can be used for analysis of farm records, depending on the type of record system selected in the farm.

**A. CASH ANALYSIS:**

The cash analysis system of farm records depends on (as its name implies) the keeping of an account book in which the cash transaction are recorded and analyzed. Non- cash transactions are not included. both cash sales expenses are recorded during the production period

**Merit of cash analysis:**

* it is simple
* it will give a clear and accurate results with the minimum labour

Example:

|  |  |
| --- | --- |
| Expenses( debit) |  Receipts “sales” (credit) |
| Wage | Wheat |
| Fuel | Barely |
| Feeding  | Potatoes |
| Seeds | Milk |
| Fertilizer | Others |
| Rent | Plus opening cash balance |

**RECORDS OF SALES AND RECEIPTS**

|  |  |  |  |
| --- | --- | --- | --- |
| date | Name & details | Total received | Different enterprises |
| cereals | potatoes | milk | others |
|  | Year, 2000 opening balance | 11000 |  |  |  |  |
|  | Wheat | 5000 | 5000 |  |  |  |
|  | Barely | 3000 | 3000 |  |  |  |
|  | Potato | 2000 |  | 2000 |  |  |
|  | Milk | 1500 |  |  | 1500 |  |
|  | Others | 800 |  |  |  | 800 |
|  | Total(A) | 30500 | 8000 | 2000 | 1500 | 800 |
|  | Opening balance being cash in bank | 18100 |  |  |  |  |

**RECORDS OF PURCHASE AND EXPENSE**

|  |  |  |  |
| --- | --- | --- | --- |
| date | Name & details | Total paid | Different forms of expenses |
| cattle | wage | Feeding staffs | Seed & fertilizer | rent |
|  | Cattle purchase | 4000 | 4000 |  |  |  |  |
|  | Wage | 3400 |  | 3400 |  |  |  |
|  | Feeding | 1400 |  |  | 1400 |  |  |
|  | Seed | 460 |  |  |  | 460 |  |
|  | Fertilizer | 1340 |  |  |  | 1340 |  |
|  | Rent | 1800 |  |  |  |  | 1800 |
|  | Total(B) | 12400 |  |  |  |  |  |
|  | Closing balance being cash in bank | A-B= 18100 |  |  |  |  |  |
|   | Total | 30500 |  |  |  |  |  |

**B. BALANCE SHEET ANALYSIS.**

It helps us to see the financial position of the farm at the end of the year. it includes both cash non cash transactions as well as inventories of livestock , crops, and implements on the farm.

 **General balance sheet has a form of :**

|  |  |
| --- | --- |
| Assets | Liabilities & capital |
| Current asset | \*\*\*\* | Current liabilities | \*\*\* |
| Non-current asset | \*\*\*\* | Non- current liabilities | \*\*\* |
|  |  | Total liabilities | \*\*\* |
| Total Asset | \*\*\*\*\* | Owners equity | \*\*\*\* |
| Total liability& capital | \*\*\*\*\* |

**C. INCOME STATEMENT ANALYSIS (RECEIPTS AND PAYMENT ANALYSIS)**

Income statement is the summary of revenue and expenses for a given accounting period. it some times called an operating statement or a profit or loss statement. Its purpose is to measure the difference between revenue and income. A positive difference indicates profit and a negative difference indicates loss for accounting period. Therefore, the income statement analysis answers the question; did the farm business have a profit or loss/ and how large was it.

|  |  |  |
| --- | --- | --- |
| List of revenue & expenses |  |  |
| **Revenue** |  |  |
| * cash crop sales
* cash livestock sales
* inventory changes
* crops
* livestock
 |  | \*\*\*\*\*\*\*\*\*\*\*\* |
| Total |  | \*\*\*\*\*\* |
| **Expenses** |  |  |
| * feed
 | \*\*\* |  |
| * Fertilizer
 | \*\*\* |  |
| * Labour
 | \*\*\* |  |
| List of revenue & expenses |  |  |
| * fuel
 | \*\*\* |  |
| Depreciation | \*\*\* |  |
|  Total operating expenses | \*\*\* |  |
| Net farm income from operation |  | \*\*\* |
| Gain or loss on sale of capital assets* machinery
* land
* others
 | \*\*\*\*\*\*\*\*\* |  |
| Net farm income |  | \*\*\* |

## 5.6. Measures of Farm Performance

Common ways to measure farm performance

 1. **Farm size** - can be measured by

**a. Total area-** indication of space

* Says nothing above
* Amount of investment on land
* Land productivity or
* Adaptability to various enterprises
* Not good measure for comparing d/t types of farms
* Best used for comparing the size of crop farms of the same soil type.

 **b. Total number of livestock**

* Used for comparing size among farms is the same class of livestock

 **c) Value of farm production (VFP)**

* Same times called as gross profit as it does not include cash and fixed costs of labour
* An effort to get at the real production on a farm
* Measures the volume of production in monetary terms.
* Given as:

VFP= total cash receipt (gross sale)

* Plus Inventory increase
* Plus Value of farm products used in home
* Minus Inventory decreases
* Minus Livestock and feed purchases

**d) Total labour used:** This measure is affected by the amount of labour saving technology used

 e.g. oxen ploughing by tractor

**2. Economic efficiency measured by:**

 **a) Capital investment**

 i. Total capital investment

* The total value invested on land, buildings, machinery and livestock
* Allows an easy comparison f 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): Measure of labour efficiency



v) **Net farm income per labour** (NFI/L): Another measure of labour efficiency

 

**N.B** if VFP/L>NFI/L 🡲labour efficiency is good but some cost problem exists

c) **Cost performance**

 i) **Material costs**- 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 = 

**3. Physical efficiency:**

 Measures:-

a) Total output b) Grain yield per hectare c) Milk sold per cow d) Feed conversion ration (FCR)



e) **Commercial output**:- the actual sold amount of farm product in the period.

f. **The average output per capita**

 Total output of farm product

=

 Total family members

**4. Finance:**

 Measures-

a. **Liquidity**- the ability to meet cash obligations as they come due to

 1. Current ratio (CR): Measure of business liquidity

 CR= Total current assets

 Total current liberties

* Should be greater than one
* If less than one the business may be facing a liquidity problem.

b. **Solvency**

 **1. Net capital ratio (NCR)**

* Measures business solvency
* A farm is solvent if total assets are greater than total liabilities
* High NCR may indicate a manager reluctance or failure to incur debt to take advantage of profitable investment opportunities.
* Given as -

 NCR = Total assets

 Total liabilities

2. Debt/Asset Ratio= Total debt

 Total asset

 **c. Profitability:**  Refers to the size of profit relative to the size of the business

 i) Return to total farm capital/ return on investment=

* Net farm income
* Plus Interest paid on dept capita
* Minus Value of unpaid family labour

\* 

 ii) Return to equity (owner's) capital = Net farm income - unpaid family labour

\* 

**N.B** A business which is both solvent and liquid is not necessarily a profitable business.

1. **Risk and Uncertainty in Farming**
	1. **Definition of Risk and Uncertainty**

Risk and uncertainty may be distinguished as follows:

**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 estimated „objectively‟ based on data collected over time.

Probabilities are often assigned to other events such as the probability of rain in a weather forecast or the outcome of a sporting event. .

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:** Situations where the probabilities of the outcome are established „subjectively.‟

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.

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.

* 1. Sources of risk and uncertainty

There are 5 main sources (kinds) of risk in farming. These are:

**1. Production risks**

* + - * Relate to the possibility of getting **lower yield** or **output** levels than expected.
			* Major causes of production risks arise from unfavorable weather condition (drought, flooding, excessive or lack of rainfall, frost), diseases, pests and insects.
1. **Marketing (price) risks**
* Marketing risks relate to the possibility that you will lose the market for your products or that the price received will be less than expected.
* Stem from the **variability** of input and output prices because of the uncertainty of future market prices.

**3. Financial Risks**

* Relate to the possibility of having insufficient cash to meet expected obligations, lower than expected profits, and loss of net worth.
	+ - * Financial risks commonly result from production and marketing risks.
			* Besides, they may also be caused by increases in interest rates, excessive borrowing, lack of adequate cash or credit reserves, and changes in exchange rates.
1. **Institutional (Legal) risks**
* Arise from unpredictable changes in the provision of services from institutions that support farming such as cooperatives, banks, and marketing organizations.
* Besides, unpredictable changes in government policies like land use policy, export/import policy, monetary policy, fiscal policy, price support/subsidy policy are part of institutional risks.

**5. Human Resource Risks**

* + - * Human resource risks pertain to risks associated with individuals and their relationships to each other, their families and the farm business.
			* Sources of human resource risk include the 3 D’s:
			* Divorce,
			* Death, or
			* Disability of a business owner, manager, employee or family member.
			* It also includes risks arising from poor communications and people-management practices.
	1. Strategies for reducing risk and uncertainty

**1. Contracts**

* Future marketing is one of the strategies to deal with farming price risk.
* Entering into contractual agreements for the sale commodities at a later date in the future allows a farmer to reduce price risks.
* Price uncertainty may be eliminated by making advance contracts with buyers. Farmers may contract with suppliers to provide inputs at specified prices and also to avoid the risk that key inputs will be unavailable at critical times. There are, however, risks with contract farming to be considered. For example, if a cash crop is produced the world market price may collapse leaving the buyer unable to honor the contract.

**2. Diversification**

* Diversification is a strategy long used by farmers for dealing with both price and output uncertainty.
* The idea behind a diversification strategy is to let profits from one type of livestock or crop enterprise offset losses in another enterprise.
* By diversifying the number of farm options, it is possible to reduce the effect of price and output risks on farmers welfare.
1. **Insurance**
* Entering in to insurance is also another strategy against farming risks like crop failure or livestock death.
* If a farmer purchases an insurance policy, he/she can reduce income variability resulting from the farm.

Private companies or governments may guarantee a certain amount of money in the event of a major catastrophe, in return for an annual premium.

Some countries will ensure against crop loss from hail or hurricane. Farmers must give up a certain amount of their yearly income in return for this security.

Crop insurance is an example of agricultural 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.

Crop insurance 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 programmers 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. **Off-farm employment**
* Off-farm investment includes all business activities in secondary and tertiary sector activities that use raw physical intermediate inputs and process them into manufactured goods or produce services.
* Hence, being engaged in off farm activities like petty trade, processing mill, etc will rescue a farmer from upcoming possible farm risks.