*Concepts of Economics*

*Deependra Dhakal*

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*Contents*

## *Background*

The handout is intended for students trying to have basic starting idea on the course of economics. An agricultural economics based approach is taken, to delve in to the concepts of Micro and Macro economics. The note is expected to be helpful to students preparing for upper and lower secondary level examinations.

While teaching Farm Management and Marketing course, I felt the necessity to deliver contents to students in a broad context, afterall farm mangement is just a part wider field of economics. The question solution approach to this note should provide succinct answers to, as well as a more elaborate exposition in a follow through, conceptual questions surrounding the applied course. The contents presented here, however, do not form a sound basis for practical understanding.

## *Questions*

1. State Adam Smiths' definition of economics.
2. Define cost.
3. What is income statement?
4. Give an example of monopoly market.
5. What is Farm Planning?
6. What is Agriculture Marketing?
7. What are the types of utility? Give examples.
8. State the law of supply. Describe with the help of supply curve diagram.
9. What are the characteristics of perfect competition market?
10. What do you mean by price variation? Describe with examples.
11. What are the functions of WTO?
12. Explain the principle of substitution.
13. Write the importance of farm plan.
14. What do you mean by Net-worth statement?
15. Give the differences between complete and partial budgeting.
16. Agriculture commodities are seasonal in nature. Justify.

17. What are the selection criteria of best channel for distribution of agriculture commodities.
18. Write the characteristics of the material welfare definition of economics.
19. Explain in detail about the farm record.
20. What are the objectives of farm management?
21. State the law of demand with its assumptions. Give a description with suitable examples.
22. Define farm management. Highlight its importance.
23. Explain the principle of product substitution in detail.
24. Explain in detail about farm efficiency measures.
25. Describe the role of cooperatives in Nepalese economy.
26. Classify markets of Nepal on different basis.
27. What is a marketing channel? Explain with suitable examples.
28. Define capital.
29. Define cooperative farming.
30. What is marketing margin?
31. What is a whole sale market?
32. Write the features of land.
33. What are the problems of farm record keeping in Nepal?
34. Explain the law of diminishing marginal utility.
35. Write the properties of indifference curve with examples.
36. What is market?
37. Explain the importance of agricultural marketing in socio-economic development of Nepal.
38. Write notes on following topics:
    - Goods
    - Labor
    - Wealth
    - Service
    - Equilibrium
    - Price line
39. What is meant by elasticity of supply?

## *Solutions*

### *Meaning and Definition of Economics*

An economy is a system for coordinating society's productive activities.

- Economics is the social science that studies the production, distribution, and consumption of goods and services.

- Economics is the study of individual choices and decisions. People must make choices because resources are scarce.

  The objective of microeconomics are:

1. Economic efficiency: productive efficiency, consumptive efficiency and allocative efficiency
2. Equity: A distribution of income that is considered to be fair or just.

**Microeconomics** The branch of economics that studies how people make decisions and how these decisions interact.
**Macroeconomics** The branch of economics that is concerned with overall ups and downs in the economy.

The discipline of economics has developed principles, theories, and models that isolate the most important determinants of economic events. In constructing a model, economists make assumptions to eliminate unnecessary detail to reduce the complexity of economic behavior. Once modeled, economic behavior may be presented as a relationship between dependent and independent variables. The behavior being explained is the dependent variable; the economic events explaining that behavior are the independent variables.The dependent variable may be presented as depending upon one independent variable, with the influence of the other independent variables held constant (the *ceteris paribus* assumption).

**Problem of scarcity**

Economics is the study of scarcity– the study of the allocation of scarce resources to satisfy human wants. People's material wants, for the most part, are unlimited. Output, on the other hand, is limited by the state of technology and the quantity and quality of the economy's resources. Thus, the production of each good and service involves a cost. A **good** is usually defined as a physical item such as a car or a hamburger, and a service is something provided to you such as insurance or a haircut. Scarcity is a fundamental problem for every society. Decisions must be made regarding *what to produce*, *how to produce* it, and *for whom to produce*. What to produce involves decisions about the kinds and quantities of goods and services to produce. How to produce requires decisions about what techniques to use and how economic resources (or factors of production) are to be combined in producing output.

## *Positive and Normative economics*

Positive questions have to do with explanation and prediction, normative questions with what ought to be. Positive and normative economics are often synthesized in the style of practical idealism. In this discipline, sometimes called the "art of economics," positive economics is utilized as a practical tool for achieving normative objectives.

**Positive economics**: Positive economics tries to reason the cause and effect of an economic activity. Questions such as "What will happen if?" and "What impact will it have on" are all in the realm of positive analysis. Positive analysis is central to microeconomics. Theories are developed to explain phenomena, are tested against observations, and are used to construct models from which predictions are made.

The use of economic theory for prediction is important both for the managers of firms and for public policy. Suppose the federal government is considering raising the tax on gasoline. The tax would affect the price of gasoline, consumers' preferences for small or large cars, the amount of driving that people do, and so on. To plan sensibly, oil companies, automobile companies, producers of automobile parts, and firms in the tourist industry would all want to know how large the various effects of this tax will be. Government policymakers would also need quantitative estimates of the effects of the tax. They would want to determine the costs imposed on consumers (perhaps broken down by income categories); the effects on profits and employment in the oil, automobile, and tourist industries; and the amount of tax revenue likely to be collected each year.

**Normative economics**: A part of economics that expresses value or normative judgments about economic fairness or what the outcome of the economy or goals of public policy ought to be. Sometimes we want go beyond explanation and prediction to ask questions, such as "What is best?". This involves normative analysis. For example:

> *"The price of milk should be $6 a gallon to give dairy farmers a higher living standard and to save the family farm."*
>
> — Normative economics

This is a normative statement, because it reflects value judgments. This specific statement makes the judgment that farmers deserve a higher living standard and that family farms ought to be saved. Subfields of normative economics include social choice theory, cooperative game theory, and mechanism design.

Normative analysis is important both for managers of firms and for designers of new public policies. Again, consider a new tax on gasoline. Automobile companies would want to determine the best (profit-maximizing) mix of large and small cars to produce once the tax is in place, or how much money should be invested to make cars more fuel-efficient. For policymakers, the primary issue is likely to be whether this tax is in the public interest. The same policy objectives (say, an increase in tax revenues and a decrease in our dependence on imported oil) might be met more cheaply with a different kind of tax, such as a tariff on imported oil. Normative analysis is not only concerned with alternative policy options; it also involves the design of particular policy choices. For example, suppose it has been decided that a gasoline tax is desirable. Balancing costs and benefits, we then ask what is the optimal size of the tax?

The **opportunity cost** of an item-what you must give up in order to get it-is its **true cost**.

"How much" decisions require making trade-offs at the margin: comparing the costs and benefits of doing a little bit more of an activity versus doing a little bit less.

People usually respond to incentives, exploiting opportunities to make themselves better off.

- Market economy: An economy in which decisions about production and consumption are the result of decentralized decisions made by individual producers and consumers.
- Command economy: there is a central authority making decisions about production and consumption.

**Resource**
Anything that can be used to produce something else.

**Scarce**
A state of resource availability of not being able to satisfy all the various ways a society wants to use them.

When the individual pursuit of self-interest leads to bad results for society as a whole, there is **market failure**.

*Pioneers' perspective*

**Adam Smith**

In 1776 book (*An Inquiry into the Nature and Causes of the Wealth of Nations*), Adam Smith wrote about how individuals, in pursuing their own interests, often end up serving the interests of society as a whole. Of a businessman whose pursuit of profit makes the nation wealthier, Smith wrote:

> *"[H]e intends only his own gain, and he is in this, as in many other cases, led by* ***an invisible hand*** *to promote an end which was no part of his intention."*
>
> — Adam Smith

**Alfred Marshall**

A British economist (1842-1924), who developed some of the most important concepts in microeconomics. In his best-known work, Principles of Economics, he retained the emphasis on the importance of costs, which was standard in classical economics. But he added to it, helping to create neo-classical economics, by explaining that the output and price of a product are determined by both supply and demand, and that marginal costs and benefits are crucial. He was the first economist to explain that demand falls as price increases, and that therefore the demand curve slopes downwards from left to right. He was also first with the concept of price elasticity of demand and consumer surplus.

**Lionel Robins**

### *Utility*

The specialized language of economics makes broad use of the word "utility." It means much more than just usefulness. It takes on a meaning of satisfaction, or happiness, or fulfillment. If an object has utility in an economic sense, then it is bringing some kind of reward to its owner or the person who is using it. It is a concept applicable to all goods and services. Food has utility because it keeps people alive. A football game has utility because it entertains the spectators. Social friends have utility because they are there to help or to be helped.

**Utility**
Satisfaction derived from consuming a good

### *Cardinal and ordinal utility*

About 200 years ago, Jeremy Bentham (1748-1832) and a number of other economists struggled to find a way to measure utility. They tried to assign an actual numerical value to the amount of satisfaction that each good or service produced and conferred on its user. These economists developed a hypothetical unit, called a "util," to measure consumers' levels of happiness, or satisfaction.

**Utils**
Hypothetical units of satisfaction derived from consumption of goods or services.

**Cardinal Utility**

The assignment of specific, but hypothetical, numerical values to the level of satisfaction gained from the consumption of a good. The unit of measurement is the hypothetical util.

The early Neoclassical approach was developed by Edgeworth, Sidgwick, Marshall, and Pigou. It assumes the following:

- Utility is scale-measurable by observation or judgment.
- Preferences are exogenously given and stable.
- Additional consumption provides smaller and smaller increases in utility (diminishing marginal utility).
- All individuals have interpersonally commensurable utility functions.

With these assumptions, it is possible to construct a social welfare function simply by summing all the individual utility functions. Note that such a measure would still be concerned with the distribution of income (distributive efficiency) but not the distribution of final utilities.

The concept of Cardinal utility can be used as a tool to conveniently communicate how consumer behavior works.

**Ordinal Utility**

It is a way of considering consumer satisfaction in which goods are ranked in order of preference: first, second, third, etc. Ordinal preferences do not depend on specific numbers or values.

In economics, an ordinal utility function is a function representing the preferences of an agent on an ordinal scale. The ordinal utility theory claims that it is only meaningful to ask which option is better than the other, but it is meaningless to ask how much better it is or how good it is. All of the theory of consumer decision-making under conditions of certainty can be, and typically is, expressed in terms of ordinal utility.

### *Marginal Utility (MU) and Total Utility (TU)*

The additional amount of satisfaction gained from consuming one more unit of a good and Total Utility (TU) is the cumulative satisfaction received from the entire collection of the good or service.

- Marginal Utility [MU] = the change in the level of utility when consumption of a good is increased by one unit.

$$MU = \delta TU/\delta Y$$

- Total Utility [TU] = the total level of satisfaction derived from consuming a given bundle of goods and services.

Applying these concepts to a hypothetical example of consumer behavior enhances understanding. The example here is drinking bottles of cold water after a long, hot day of work. In this case, one major prediction regarding consumer behavior is that "first is best." The first unit of a good consumed yields the most satisfaction. The second unit is less satisfying. Additional satisfaction, or utility, comes from each unit consumed, but typically, the amount of satisfaction from each successive bottle of water diminishes.

## *Cost*

The cost refers to the amount of fund used in production.

### *Fixed cost*

Fixed cost are those costs which do not change in relation to the output. This cost is therefore ever present, even when no production is being done. This may be cash or non-cash. e.g.

- Cash fixed cost: Land, taxes, insurance, lease rent, salary, annually hired labor
- Non cash fixed cost: Depreciation of building, interest on money, family labor

### *Variable cost*

Those cost that vary with the level of production. The costs increases when the production is increased and vice versa.

*Average cost*

*Marginal cost*

The additional cost of doing a little bit more (or 1 unit more if a unit can be measured) of an activity.

How do you make a rational decision about when the alarm should go off? What you have to do is to weigh up the costs and benefits of additional sleep. Each extra minute in bed gives you more sleep (the marginal benefit), but gives you more of a rush when you get up (the marginal cost). The decision is therefore based on the costs and benefits of extra sleep, not on the total costs and benefits of a whole night's sleep.

## *Rational decision*

Doing more of an activity if its marginal benefit exceeds its marginal cost and doing less if its marginal cost exceeds its marginal benefit.

Rational decisions are made with Rational choices; that involve weighing up the benefit of any activity against its opportunity cost.

## *Production-Possibility Frontier*

A production-possibility frontier shows the maximum number of alternative combinations of goods and services that a society can produce at a given time when there is full utilization of economic resources and technology.

Table [**?**] shown below, presents alternative combinations of guns and butter output for a hypothetical economy (guns represent the output of military goods, while butter represents nonmilitary goods and services). In choosing what to produce, decision makers have a choice of producing, for example, alternative C– 5,000 guns and 14 million units of butter– or any other alternative presented.

Table 1: Production possibility schedule

| Alternative outputs | Guns (thousand units) | Butter (million units) |
|---|---:|---:|
| A | 0 | 20 |
| B | 2 | 18 |
| C | 5 | 14 |
| D | 9 | 6 |
| E | 10 | 0 |

This production-possibility schedule is plotted in Figure [**?**]. The curve, labeled PP, is called the production-possibility frontier. Point C plots the combination of 5,000 guns and 14 million units of butter, assuming full employment of the economy's resources and full use of its technology, as do all of the alternatives presented in Table [**?**].

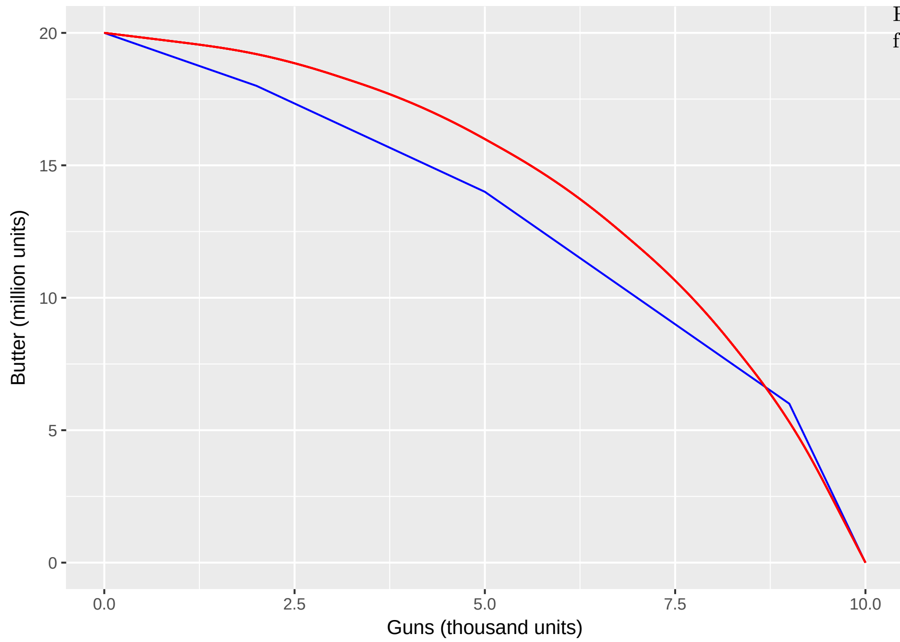


Figure 1: Production possibility frontier

## *Indifference curve*

Each indifference curve is a set of points, each representing a combination of quantities of two goods or services, all of which combinations the consumer is equally satisfied with. The further a curve is from the origin, the greater is the level of utility.

The slope of the curve (the negative of the marginal rate of substitution of X for Y) at any point shows the rate at which the individual is willing to trade off good X against good Y maintaining the same level of utility. The curve is convex to the origin as shown assuming the consumer has a **diminishing marginal rate of substitution**. It can be shown that consumer analysis with indifference curves (an ordinal approach) gives the same results as that based on cardinal utility theory - i.e., consumers will consume at the point where the marginal rate of substitution between any two goods equals the ratio of the prices of those goods (the equi-marginal principle).

A graph of indifference curves for several utility levels of an individual consumer is called an **indifference map**. Points yielding different utility levels are each associated with distinct indifference curves and these indifference curves on the indifference map are like contour lines on a topographical map. Each point on the curve represents the same elevation. If you move "off" an indifference curve traveling in a northeast direction (assuming positive marginal utility for the goods) you are essentially climbing a mound of utility. The higher you go the greater the level of utility. The non-satiation requirement means that you will never reach the "top," or a "bliss point," a consumption bundle that is preferred to all others.

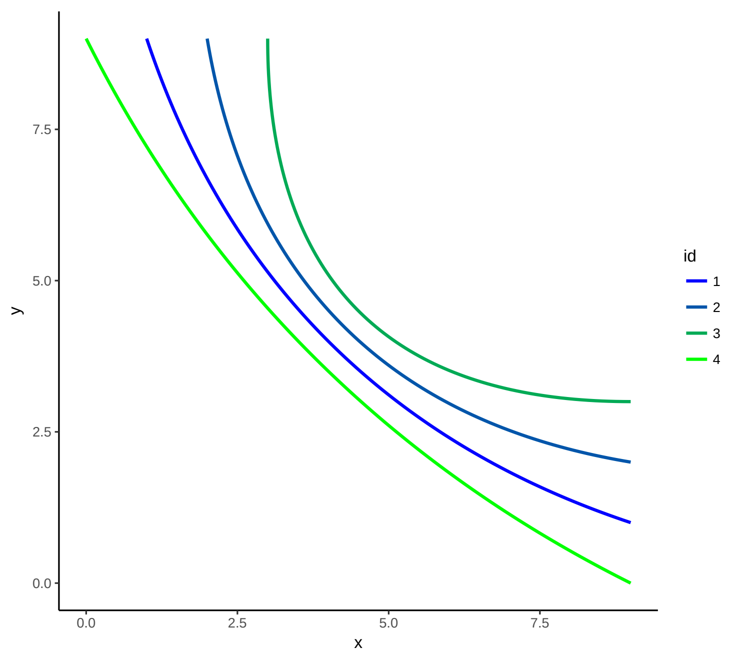


Figure 2: Indifference curves

*Application*

Consumer theory uses indifference curves and budget constraints to generate consumer demand curves. For a single consumer, this is a relatively simple process. First, let one good be an example market e.g., carrots, and let the other be a composite of all other goods. Budget constraints give a straight line on the indifference map showing all the possible distributions between the two goods; the point of maximum utility is then the point at which an indifference curve is tangent to the budget line (illustrated). This follows from common sense: if the market values a good more than the household, the household will sell it; if the market values a good less than the household, the household will buy it. The process then continues until the market's and household's marginal rates of substitution are equal. Now, if the price of carrots were to change, and the price of all other goods were to remain constant, the gradient of the budget line would also change, leading to a different point of tangency and a different quantity demanded.

These price / quantity combinations can then be used to deduce a full demand curve. A line connecting all points of tangency between the indifference curve and the budget constraint is called the expansion path.

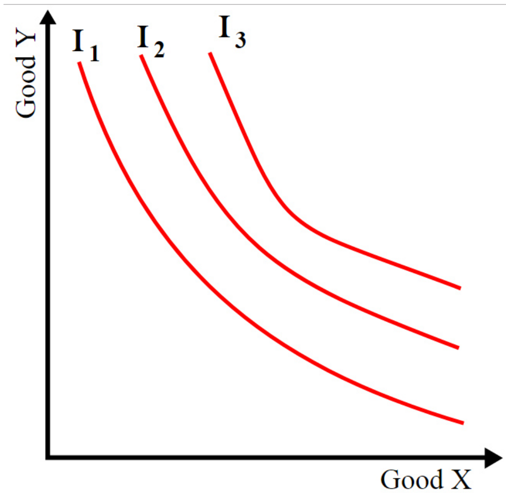


Figure 3: An example of an indifference map with three indifference curves represented.

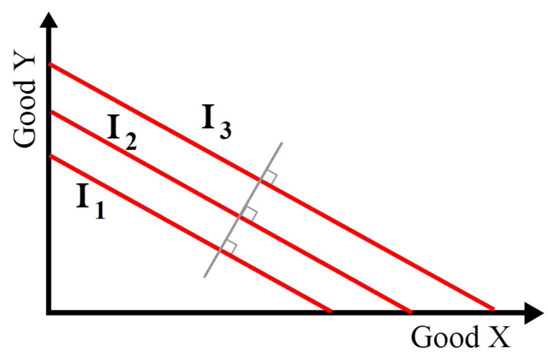


Figure 4: Three indifference curves where Goods X and Y are perfect substitutes. The gray line perpendicular to all curves indicates the curves are mutually parallel.

In Figure [?], the consumer would rather be on I3 than I2, and would rather be on I2 than I1, but does not care where he/she is on a given indifference curve. The slope of an indifference curve (in absolute value), known by economists as the marginal rate of substitution, shows the rate at which consumers are willing to give up one good in exchange for more of the other good. For most goods the marginal rate of substitution is not constant so their indifference curves are curved. The curves are convex to the origin, describing the negative substitution effect. As price rises for a fixed money income, the consumer seeks the less expensive substitute at a lower indifference curve. The substitution effect is reinforced through the income effect of lower real income (Beattie-LaFrance). The negative slope of the indifference curve incorporates the willingness of the consumer to make trade offs.

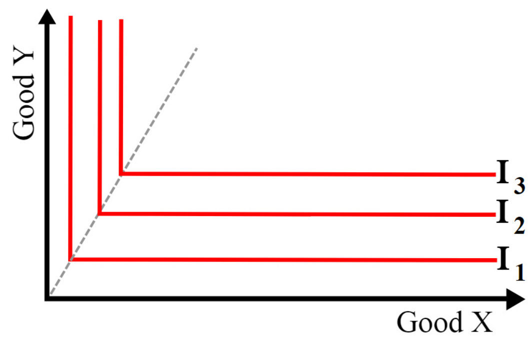


Figure 5: Indifference curves for perfect complements X and Y. The elbows of the curves are collinear.

If two goods are perfect substitutes then the indifference curves will have a constant slope since the consumer would be willing to switch between at a fixed ratio; shown in Figure [?]. The marginal rate of substitution between perfect substitutes is likewise constant.

If two goods are perfect complements then the indifference curves will be L-shaped; shown in Figure [?]. Examples of perfect complements include left shoes compared to right shoes: the consumer is no better off having several right shoes if she has only one left shoe - additional right shoes have zero marginal utility without more left shoes, so bundles of goods differing only in the number of right shoes they include - however many - are equally preferred. The marginal rate of substitution is either zero or infinite.

The different shapes of the curves imply different responses to a change in price as shown from demand analysis in consumer theory. The results will only be stated here. A price-budget-line change that kept a consumer in equilibrium on the same indifference curve:

- in Figure [?] would reduce quantity demanded of a good smoothly as price rose relatively for that good.
- in Figure [?] would have either no effect on quantity demanded of either good (at one end of the budget constraint) or would change quantity demanded from one end of the budget constraint to the other.
- in Figure [?] would have no effect on equilibrium quantities demanded, since the budget line would rotate around the corner of the indifference curve.

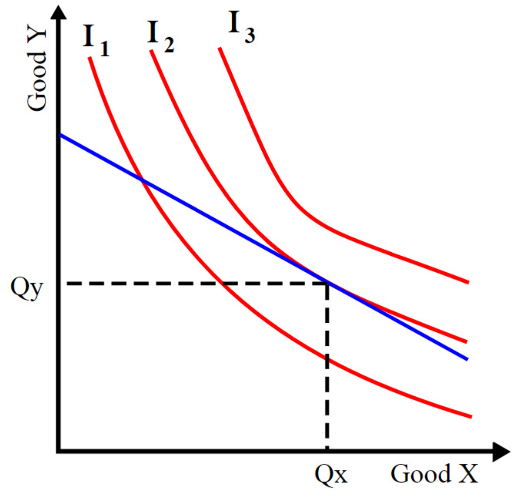


Figure 6: Indifference curves and deduction of demand schedule for a simple good. To maximise utility, a household should consume at (Qx, Qy). Assuming it does, a full demand schedule can be deduced as the price of one good fluctuates.

## *Law of Demand*

### *Demand*

"Demand" and "supply" are the twin driving forces of the market economy. Demand is not just about measuring what people want; for economists, it refers to the amount of a good or service that people are both willing and able to buy. The demand curve measures the relationship between the price of a good and the amount of it demanded. Usually, as the price rises, fewer people are willing and able to buy it; in other words, demand falls (but see giffen goods, normal goods and inferior goods). When demand changes, economists explain this in one of two ways. A movement along the demand curve occurs when a price change alters the quantity demanded; but if the price were to go back to where it was before, so would the amount demanded. A shift in the demand curve occurs when the amount demanded would be different from what it was previously at any chosen price, for example, if there is no change in the market price, but demand rises or falls. The slope of the demand curve indicates the **elasticity of demand**.

Policymakers seek to manipulate aggregate demand to keep the economy growing as fast as is possible without pushing up inflation. Keynesians try to manage demand through fiscal policy; monetarists prefer to use the money supply. Neither approach has been especially successful in practice, particularly when attempting to manage short-term demand through fine tuning.

**Demand curve**

A graph showing the relationship between the price of a good and the amount of demand for it at different prices.

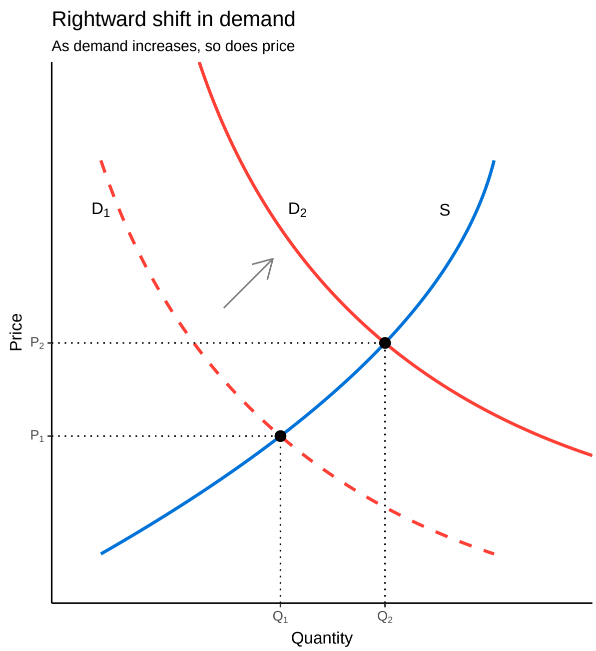


Figure 7: Demand and supply curves showing change in demand

## *Law of Supply*

## *Farm management*

### *Definition*

**Farm management** is a systems-related professional discipline which relates to the description, construction, analysis and evaluation of farm systems of farm-household systems (Order Level 12, as described below). To a layman farm management probably means just that - a body of activities and procedures carried out by a farmer in the ongoing management of his or her farm and for which advice may be available from professional specialists in farm management.

Farm management as carried out by farmers has been defined (Dillon 1980, p. 258) as 'the process by which resources and situations are manipulated by the farm manager in trying, with less than full information, to achieve his [or her] goals'.

### *Meaning*

Farm management is the science (and art) of optimizing the use of resources in the farm component of farm-households, and of achieving the optimal functioning of these systems in relation to household-specified objectives; and since Order farm-household systems consist structurally of subsystems, farm management is also concerned with the operation of subservient subsystems of lower levels (Order Levels below 9) in such fashion as to optimize the whole-farm system. But when dealing with small farms, that farm management extends also to the family or household component, thus its true scope extends to Order Level 12 systems. Sometimes, upper order levels are also the necessary considerations while making economic decisions.

It is also a very pertinent branch of economics as economics is the science of making choices so as to best achieve desired objectives. It comprises making rational choices, e.g., choice of which crops to grow or to the choice between using an insecticide or using environmentally friendly integrated pest management. Aside from this wide applicability of economic analysis, financial analysis of farm, a subset of economic analysis, is the natural way in which to economic analysis is conducted. It is however restricted to matters that are of a financial or monetary nature. In some cases it may be feasible to facilitate economic analysis of possible choices by imputing money values to possible gains and losses. And in yet other cases, such as assessing the resource sustainability and environmental compatibility of alternative farm systems, it may often be infeasible to impute money values to the gains and losses of alternative choices. Decisions must then be made using economic analysis based on non-money values, intuition and judgement.

*Characteristics/Features of farm management*

Features of farm mangement can be drawn from the structural elements that comprise a farm-household system:

1. Boundaries: The boundaries of the farm-household system set it apart from other systems and from the world at large. These boundaries are provided partly by the structural characteristics of the particular *type of farm* (small subsistence, small independent, large, commercial, …), and partly by the purpose of analysis, i.e., to some extent they are subjective and relate to more than the simple physical boundary of the farm.

2. Household: The household plays two roles: first, it provides purpose and management to its associated farm system and, second, it is the major beneficiary of its associated farm system. In its first role it provides purpose, operating objectives and management to the farm component of the farm-household system according to its broad domestic and social goals. Obviously these goals vary widely with culture, tradition and the degree of commercialisation and external influences to which the household is exposed. However, one would probably be not too far wrong in offering a generalization

that the primary economic goal on most small farms is security and the primary non-economic goal is social acceptance (Clayton 1983). If this is correct, the primary objectives for the farm are, first, production of a low-risk sustainable subsistence for primary system beneficiaries; second, generation of a cash income to meet needs not directly met in the form of food and other farm-produced materials; and third, pursuit of both of these in ways which are not in conflict with local culture and tradition.

3. Operating plan: The above objectives are pursued through preparation and execution of a farm operating plan. The core of this may be taken as selection of the best possible mix of agro-technical processes, activities, enterprises and fixed capital.

4. Production-enabling resources: The resource pool

5. Final product-generating enterprises

6. Resource-generating activities: They are intended to supplement or entirely supply the resource pool

7. Agro-technical processes: These are defined as systems of Order Levels 1 and 2. Processes may be of a biological or mechanical kind. They are a shorthand designation of all the potentially complex and interrelated physical and biological factors underlying production from crop or livestock species, only some of which may be economically relevant.

8. Whole-farm service matrix: consists of fixed farm capital which provides a flow of services to all other elements of the system, particularly to Elements 5, 6 and 7 but it is not specific to any one of them.

9. Structural (interdependence) coefficients

10. Time dimension.

The other broader relevant features of farm management are:

1. Practical science It is the practical science because concepts of farm management imparts farmer the knowledge regarding choices and economic decision making process of crop production, livestock production, and enterprise integration. It includes enabling farmer to adequately consider his/her condition – Availability of resources, factors of production such as land, soil and environmental status that determine the productivity, volume and schedule of work, distribution of family labor, financial necessities, etc.

2. Profit oriented Farm management aims at maximization of return or profit on investment. Although the scale at which profit can be derived depends on several factors such as nature of enterprise (whether it is more risk prone or extractive, or is it more precautionary). A floriculture business seeks prolong the storage and production of cut-flowers. As well as, in the first place, it seeks a more profitable market where potential customers have higher buying capacity for the flower product.

3. Integration of science The FM has far-reaching/wide integration to other fields of sciences. Basic facts and information of applied sciences, i.e., Horticulture, agronomy, plant protection, animal husbandry, soil science have special place in running a farm enterprise. Mainly, technical efficiency and problem solving/enterpreneurial skills are acquired through subject matter expertise.

4. Micro approach It has a mico approach to management of farm units. A farm household on the whole is a single unit of management. Testing of and recommendations for resource are based on the farm status and suitability. With regard to availability of resources, opportunities that arise and the problem needed to be tackled, each farm is unique and therefore requires a microeconomic approach to management.

5. Broader field Although concepts of micro-economics have high relevance to FM, it integrates principles and practices of several disciplines in the real life scenario. Since it appreciates knowledge from many other fields of sciences, farm management specialist has to be a good learner and a broad practitioner. Thus the branch of economics suits "Jack of many trades and Master of one" principle.

6. Farm unit as a whole Individual farm is the unit of decision making, and the unit that has widest implication of the decision. Similarly, the farm resources availablity status of the farm that is being managed influence the most on planning and decision making process of the farm. When integrated systems are of concern, optimization of whole farm rather than a single enterprise is sought.

*Farming system order level*

Meaning of farm management can be clearly derived from the **farming system order level** description.

- Order Level 1: Uni-dimensional process systems. Systems of this lowest order are of an agro-technical nature. They involve an issue or problem which for purposes of analysis or management is

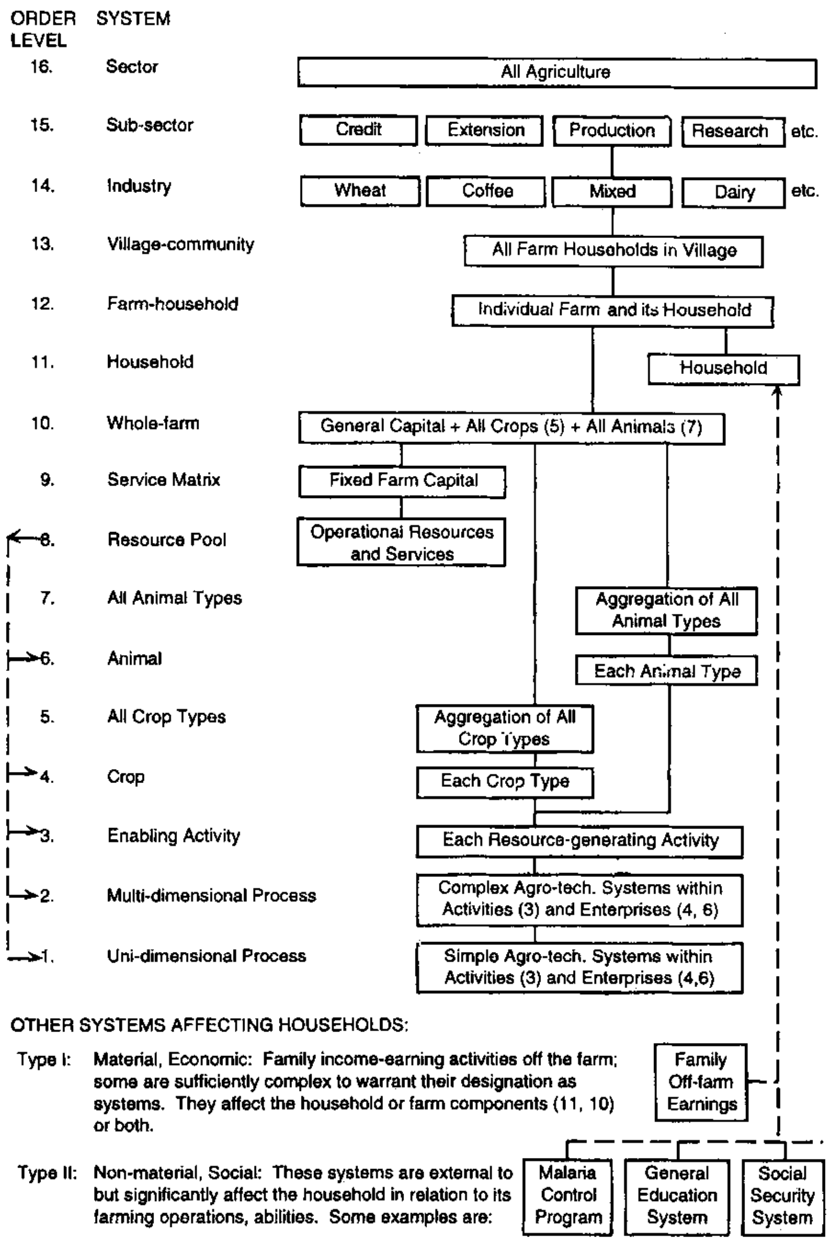


Figure 8: Farming system order levels

abstracted from the context in which it naturally or normally occurs. One example is the application of a single fertilizer element, say nitrogen (N), to a crop and consequent plant response to N in terms of crop yield Y. As noted previously, systems of this order are primarily the domain of physical scientists, but those systems which have practical relevance for farmers thereby also have an economic dimension and so fall within the scope of farm economics. Such simple single-dimensional systems are examined as processes and as input-output response relationships.

- Order Level 2: Multi-dimensional process systems. Systems of this second order are also concerned with limited agro-technical relationships and again they are primarily the domain of physical scientists. They differ from Order Level 1 systems in that they take - or are defined to take - a wider and more realistic view of a subject or problem. To use the same example of fertilizer response: at Order Level 2 an agro-technical system might involve the response of plant growth or yield Y to not one but to several or a large number of input factors such as nitrogen, phosphorous, irrigation water, crop hygiene, soil tilth etc. These multi-dimensional systems too are examined as processes and as response relationships. Order Level 2 systems can be viewed as aggregations (often interactive) of constituent Order Level 1 systems.

- Order Level 3: Enabling-activity systems. Systems of this order are certain enabling activities which generate an intermediate product intended for use as an input/resource by enterprises which do produce a final product. An example is offered by a legume crop turned under to provide fertility for a following (final product-generating) paddy crop. There will often be alternative ways of obtaining this resource: e.g., stripping leaves off leguminous trees, keeping cattle for their manure, or buying a bag of fertilizer. These are all enabling, resource-generating activities but only some of them, the complex ones, warrant designation as systems. They are intended to supply resources to systems of Order Levels 4 and 6.

- Order Level 4: Crop systems. Systems of this order relate to the production of individual crops; but if these are primarily intended to produce inputs for other crops or livestock, they are regarded as systems of Order Level 3. On many small farms, crop and livestock enterprises produce both final products and resources.

- Order Level 5: All crop systems. Systems of this order, known also as cropping systems, refer to the combined system of all the individual crops on a farm. On a farm with a single mono-crop, this Order Level 5 system will obviously be equivalent to an Order Level

3 system; but on small mixed farms there will usually be four, five, six or more different crops (of Order Levels 3 and 4) grown in some degree of combination and as many as 20 or more on the highly diversified forest-garden farms of South Asia.

- Order Level 6: Animal systems. These systems relate to single-species animal enterprises or activities - e.g., dairy cows, camels, fish, ducks. They are the animal equivalent of Order Level 4 (i.e., individual crop) systems.

- Order Level 7: All animal systems. These systems are the aggregation of all Order Level 6 (sub)systems on a farm. Known as livestock systems, they are the animal equivalent of Order Level 5 (i.e., all crop) systems.

- Order Level 8: Resource pool. This subsystem is a conceptual device for farm-system planning in which resources and fixed-capital services required by other subsystems are 'stored' in a 'resource pool' from which they are allocated to the other subsystems (of Order Levels 1, 2, 3, 4 and 6). The resource pool is central to operation of the whole farm-household system.

- Order Level 9: Farm service matrix. A system of this Order Level consists of all the fixed capital resources of a farm which are pertinent to the operation of the farm as a whole but are not assigned to the exclusive use of any particular enterprise or activity: land, fences, barns, irrigation channels and work oxen are common examples. Some of these capital items are true (sub)systems, having interdependence among their component parts (as in an irrigation storage/delivery/distribution network, a grain drying facility, an integrated network of soil conservation structures etc.). Some are only things (e.g., fences, a plough, a barn). But, in its totality, such capital is managed and manipulated as a system for the purpose of providing general services which, while not specific to them, enable the functioning of lower Order Level systems of the farm.

- Order Level 10: Whole-farm systems. Systems of this Order Level consist of all the lower Order Level (sub)systems which go to make up a farm. They consolidate in a single entity all the farm fixed capital, all the operating capital, all the final-product enterprises, all the activities and all the agro-technical processes which underlie such enterprises and activities. Structuring and managing systems of this Order Level are the main tasks or focus of farm management as carried out, on the one hand, by farmers and as investigated, on the other hand, by farm management economists in their professional capacity of providing advice to farm managers, development agencies and governments.\newline The terms *farm system* and *farming system* are often used interchangeably. The practice is to use farm system to refer to the structure of an individual farm, and farming system to refer to broadly similar farm types in specific geographical areas or recommendation domains, e.g., the wet paddy farming system of West Java or the grain-livestock farming systems of Sind.

- Order Level 11: Household systems. On small farms the household itself is the most dynamic and complex of all farm-level systems, although it is a social system not an agricultural one. It dominates the agricultural systems which comprise the farm component. It has two functions: as household it provides purpose and management to the farm component, and as major system beneficiary it receives and allocates system outputs to itself and other beneficiaries.
- Order Level 12: Farm-household systems. These consist of two components or (sub)systems of Order Levels 10 and 11, i.e., the whole-farm system and its associated household system, respectively. The term is a very useful if not mandatory one when used to refer to the small farms of Asia. It carries an insistence that the technical analysis will amount to nothing at all unless it is applied to achieving the real needs and aspirations of the household - which might be quite a different thing from evaluating the performance of a farm system according to the subjective or preconceived ideas of agricultural technicians and economists (Chambers and Ghildyal 1985; Rhoades and Booth 1982). As the peak farm-level system, the farm-household system may be described in system terms as a goal-setting (i.e., purposeful) open stochastic dynamic system with a major aim of production from agricultural resources. These attributes are sufficient to make it also a complex system. The purposefulness of a farm-household system is ensured by its human and social involvement which enables the system to vary its goals and their means of achievement under a given environment. The openness of the farm-household system is obvious from its physical, economic and social interaction with its environment. The non-deterministic or stochastic nature of the farm-household system is guaranteed both by the free-choice capacity of its human (and, if present, animal) elements and by the stochastic nature of the environment with which it (and all its subsystems) interacts. Necessarily, a farm-household system is also dynamic by virtue of its purposefulness, openness and stochasticity which ensure that the system changes over time. Too, any farm-household system is a mixture of abstract and concrete elements or subsystems. The concrete elements are associated with the physical activities and

processes that occur in the system. The abstract elements relate to the managerial and social aspects of the system.

*Objectives of farm management*

The goal is to maximize socio-economic welfare of farm families. The term 'welfare' is used broadly to include money income, sustenance food, farm-produced consumption goods and factors of production, non-material benefits such as those enabling the attainment of education and health standards, and satisfactions derived from work well done as well as from cultural and religious sources.

Whichever of these system outputs/family benefits are relevant in a particular farm situation will depend on the farm type and on the values held by the particular family - values which will normally reflect the society and cultural context in which the farm-household exists. Welfare maximization is conditional because it is constrained by resource availability and, as relevant, legal constraints and socio-cultural mores.

The objective is to achieve the farm household's goals as efficiently as possible, which implies obtaining maximum possible net benefit over time from the operation of the farm system. Net benefit is measured, as appropriate, in terms of output or profit or, more broadly, as satisfaction or utility. Thus the broad objectives of farm management are:

- Efficient use of available resources and opportunities
- Minimization of costs

These broad objectives can be achieved through:

- Short term strategies: Includes those programs that focus on maximization of profit during a single year. For e.g. Planning and layout, selection of crop varieties, selection of farm management tools for a single year. Achievement of short term objectives depends mainly on production inputs availability and the market opportunities. One of the important tool for meeting short term strategy is the finance, the other is labor input.

- Long term strategies: An important feature of farm resources is the time dimension. Most farm resources take time to restore or recover. For example, loss in soil fertility, erosion of land, exhaustion of diversity etc are some of the factors that influence the productivity which take relatively more time for improvement of their status or revert back the negative changes. A long term strategy of farm mangement is to maximize the output from these components over the years through efficient and sustainable use. This is the basis for achievement of long term objectives.

*Importance of farm management*

- Increase in farm income through suitable farm adjustment
- Techological progress
- Industrial development of society
- Generation of employment opportunities
- Farm management as an education tool
- Opportunities with foreign exchange
- Opportunities of resource sharing among enterprises
- Utilization of marginal resources. For e.g. slopy land utilization by pig-cum-poultry farming.
- Improvement of living standard of farmer, and the level of satisfaction
- Reduction in poverty
- Increase in national income
- To bring about agricultural revolution

*Relationship of farm management with other disciplines*

As a disciplinary interface to farm-level *economics*, It is obvious that other farm and family-related disciplines will be involved in systems' construction of farm mangement: *agronomy*, *animal husbandry*, *soil and water conservation/management*, *human nutrition* etc. However, except in the case of special-purpose technical systems (e.g., when the farm-household unit is analysed in terms of nutritional or energy flows among components as discussed below), these other disciplines should play subordinate contributing roles coordinated by farm management economics as the lead discipline. since this type of higher-than-farm-level analysis will be concerned with a range of subject matter in addition to farm economics - *processing*, *marketing*, *transport*, *research*, *extension* etc. - farm management can operate in different levels of indirect interest to farming household too.

Moreover, in an integrated farming system, such as that of Nepal, farm management has close associations with other disciplines as these are of direct interest to a farmer and are subject of analysis and part of thought process in decision making. For example:

- A farmer allocates his land parcel (production factor) with the consideration of two or more outputs, which sustain complementaty enterprises in most cases, like legume crop for both farming family nutritional needs along with cereal crop providing for straw to feed livestock.
- By carrying on parallel crop activities by growing one variety/type for the market and another for the family's own use. The first, typically a high-yielding improved variety, might be deficient in

taste and storability but will generate cash. The second might be capable of long storage and possess other qualities valuable in rural but not in sophisticated urban markets.

- Livestock kept primarily for manure production (as well as for other purposes). Growing a green manure crop serves a similar purpose. Growing and lopping the leaves from leguminous trees for paddy fertilizer is still common in Java.

Nevertheless, the disciplinary basis of farm management remains economics - but economics of a special wide-ranging kind, the core of which is *production economics* supported by other branches of economics of which marketing, resource economics, *agricultural credit* and *data analysis* (including operations research, econometrics and risk analysis) are probably the most important. When working with the household component, especially of small traditional farms, the most important supporting disciplines are *sociology* and *social anthropology*.

## *Economics of production*

It describes the physical relationship between inputs and outputs, and describes the economics of transforming inputs into products; resources into goods.

### *The production function*

The production of goods and services is a logical place to begin studying the economics of agricultural production. During the production process, firms, or producers, combine inputs into outputs for sale to consumers. The process can be quite complex. Then follows the production activities undertaken by firms. The discussion then shifts to the behavior of consumers, or households. All of this leads to consideration of the interactions of consumers and producers in markets. **Production** is the process of producing goods and services. This process requires scarce resources.

Inputs have several different names: Inputs = factors = factors of production = resources = A, L, K, M

**A**:Land (Natural and biological resources, climate.)
**L**:Labor (Human resources.)
**K**:Capital (Manufactured resources, which include buildings, machines, tools, and equipment.)
**M**: Management (The entrepreneur, or individual, who combines the other resources into inputs.)

*Wheat production in Bhairahawa, Rupandehi*

Consider a wheat producer in Bhairahawa, Rupandehi, a leading wheat producing district in Nepal. Let $Y$ = output = wheat, measured in tons (ton), where $f$ = the mathematical relationship between inputs and output:

$$Output = f(Inputs)$$

$$Y = f(K, L, A, M)$$

The relationship is fairly complex, with multiple variable inputs. Thus, to reduce complexity let us consider the relationship between inputs and outputs, and concentrate on just one input: The capital. In this case, the choice of capital is entirely arbitrary, since any one of the inputs could fit into the example.

The *ceteris paribus* assumption isolates the relationship between output and the single input, capital.

A mathematician writes an equation to say that the variable Y is related to, or depends on other variables $x_1, x_2, x_3, ..., x_n$. The equation is written as:

$$Y = f(x_1, x_2, x_3, ..., x_n)$$

Following mathematical convention, the variable $x_1$ to the left of the vertical bar is free to vary, but all variables to the right of the vertical bar, in this case, $x_2, ..., x_n$ , are held constant:

$$Y = f(x_1|x_2, ..., x_n)$$

We, can rewrite the example equation that of wheat production in Bhairahawa for varying just one input $(K)$ to the left of the vertical bar as follows. Real physical production is a complicated biological process. Therefore, one input at a time must be isolated:

$$Y = f(K|L, A, M)$$

This equation is what mathematicians refer to as a function. Economists provide a more descriptive term by calling it a **Production Function.**

The production function is a purely physical relationship used to describe the quantity of inputs required to produce a given quantity of output. Since there are no money (Rupees) values associated with it, it is not an economic relationship.

To determine the optimal use of the fertilizer nitrogen on wheat fields, agronomists can run controlled experiments to determine what happens to wheat yields as the amount of nitrogen is changed: either increased or decreased. They do this type of experiment on test plots, or small wheat fi elds that are typically adjacent to each other to keep constant the weather, growing conditions, and soil conditions across all of the plots. The idea behind the controlled experiment is to hold all inputs constant except for nitrogen, and measure how the different levels of nitrogen $(N)$ affect the wheat yields. The wheat production function would look like this:

$$Y = f(N, L, K, M, A)$$

Think of what can be closest syntactic production factors replacements for $L, K, M, A$

HOW ABOUT LAND, LABOR, MACHINERY AND SEED?

To isolate the relationship between nitrogen and wheat yields, the agronomists (or other biophysical scientists) will hold constant all inputs other than the one that they are isolating, in this case nitrogen.

$$Y = f(N|L, K, M, A)$$

This relationship is highly important, since too little nitrogen means the yields will be lower than the potential, and too much nitrogen will "burn" the crop, causing smaller yields. Figure [**?**] shows the connection between nitrogen applications and wheat yields.

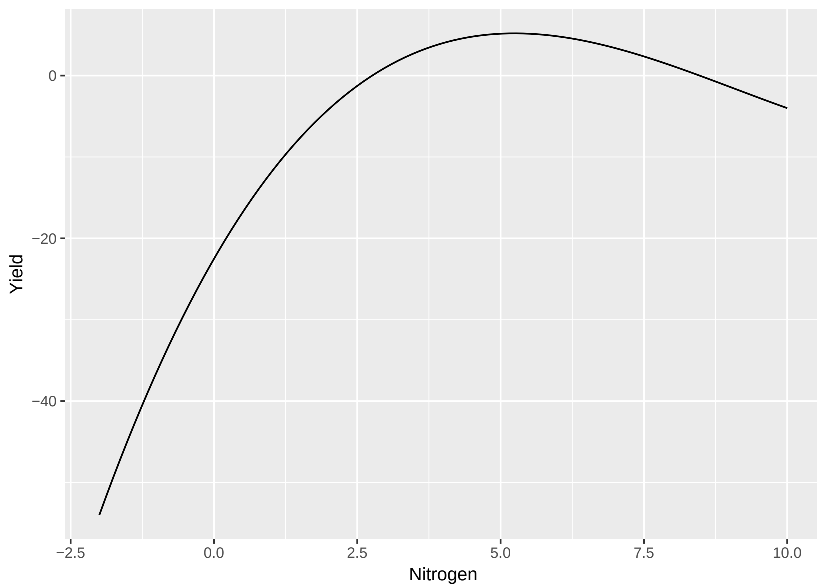


Figure 9: Relationship between Nitrogen application and Yield

## *Yield versus Productivity*

The point of maximum physical wheat yield (N*) is not always the optimal economic wheat yield. This is because nitrogen is a scarce resource, and costs money to purchase. In fact, fertilizer is one of the major costs of production for farmers in most agricultural regions in the United States. If nitrogen were free, then the optimal application to a wheat field would always be N* in Figure 2.1 , since this is the level of nitrogen that maximizes production.

However, since it costs money to purchase and use fertilizer, the farmer will stop applying it at a point to the left of N*. Finding the optimal amount of nitrogen to apply requires application of economic principles. Economic reasoning will help determine the exact point where the benefits of using N minus the costs are maximized. For now, note that producers will not maximize production, because it costs too much. Instead, they will maximize profits.

The study of production functions applies to many situations, events, and circumstances. A student studying for an exam is involved with a kind of production. In this situation output ($= Y$) might be test performance, or grade, and the input ($= X$) is the number of hours that the student studies. The output of this production process will depend on how many hours the student studies and other factors, such as intelligence and previous knowledge. However, if the student constantly drinks coffee (or Mountain Dew) and stays up all night, the test performance may actually fall. Too much studying can result in too little sleep, which in turn results in poor test performance. Thus, the relationship between the number of hours studied and the grade on a test will have the same general shape as the graphs for wheat production. Because of differences in intelligence, preparation, alertness, and academic ability, each individual student will have a different "production function" for the examination.

**Profit maximization**

In general, every producer tries to maximize their profits. Because, any business owner who does not pay attention to potential profits is unlikely to remain in business for long in a market economy. Profit is denoted by greek letter pi ($\pi$)

$$\pi = TR - TC$$

Profits are defined as total revenue (TR) minus total cost (TC).

Total revenue is simply the dollars earned from the sale of a good. Let the quantity of a good sold be given by $Q$ units, and the price of the good by $P$ dollars per unit. Then, the total revenue earned by the producing firm is equal to $TR = P * Q$. The units for total revenue are in Rupees, since $P$ is in (Rupees/unit) and $Q$ is in (kgs, tons, dozens, or some other appropriate measure), when $P$ is multiplied times $Q$, the units cancel and $TR$ is in (Rupees). Total costs represent the costs of production of the good, and are also in Rupees units. Producers of goods and services alter their production and marketing activities in a neverending effort to maximize profits. The ability of business firms to make changes in how they produce and sell goods depends on the product that they produce. If the product is corn, major adjustments are possible at least once each year with a small number of changes occurring throughout the year. If the product is walnuts, major production decisions come only once in a generation, or even longer, but a small number of minor adjustments are possible during each growing season. If the product is lettuce grown in greenhouses, major adjustments occur almost continually. Time and timing are the critical issues. Length of time is of great importance in making profit-maximizing decisions.

*Length of time: immediate run, short run, long run*

In economics, these terms have specific meanings, but not meanings related to a specific length of time such as minutes, days, or weeks. The length of the long run, the short run, and the immediate run depend on the specific situation.

The **Immediate Run** is a period of time during which all of the inputs available to a producer are fixed and cannot be changed. The producer cannot change the quantity of any input. A wheat producer purchases land, labor, seed, machinery, fertilizer, and chemicals. After the planting season, the producer is unlikely to be able to alter or use either more or less of the quantity of these inputs to affect the progress of the crop. This situation defines the immediate run.

As time passes, the producer will have more flexibility to change the quantities of inputs. In a three-month period, this producer is able to alter the number of hours of work hired, but cannot change the number of acres of land that are in production or, after a certain period, add more fertilizer. This situation is called the **Short Run** , defined as a period when some inputs are fixed (the quantities of inputs used cannot be altered) and some inputs are variable (the quantities of inputs can be changed).

The quantities of some agricultural inputs are not easy to change in the short run. Land is a common example. Most producers cannot acquire more land in a short length of time. Therefore, the acres of land available to one producer remain fixed in the Short Run (SR). Similarly, machinery and equipment (combines, tractors, and plows) are very expensive, and many producers cannot rapidly increase or decrease the number of these inputs. During that period when a farmer is unable to alter the quantity of inputs, the inputs are fixed, and the farmer is in the Short Run (SR). However, in the short run, some inputs are variable. For example, the producer could alter the level of chemicals, fertilizer, labor, or management. In the **Long Run** (LR), all inputs are variable.

Over long run, producer may buy or sell machinery or land. They can also adjust the size of their farm. the long run is however long it takes to adjust the levels of inputs. This differs from farm to farm and from business to business.

THINK OF SOME EXAMPLES OF EACH OF IMMEDIATE, SHORT, LONG RUN.

Can a time period of 5 minutes be a period of long run? How ?

### *Inputs*

**Fixed input** = An input whose quantity does not vary with the level of output.

**Variable input** = An input that when changed affects the level of output.

## *Physical production relationships*

Understanding the production function requires discussion of transforming inputs into outputs. Suppose a wheat farmer in Bhairahawa uses capital, labor, land, and management to produce corn. Recall the generalized production function for his farming activity:

$$Y = f(L, K, A, M)$$

Understanding the impact of labor on corn output requires holding the levels of all other inputs constant.

$$Y = f(L|K, A, M)$$

This leads to an understanding of production efficiency, explained in the next section.

### *Constant, increasing, decreasing, and negative returns*

The level of inputs as reported in the production function determines the level of output (the production function describes the physical relationship between inputs and output). The production process can take on different forms: Constant Returns, Increasing Returns, Decreasing Returns, and Negative Returns . The word *returns* refers to changes in output that occur as quantities of inputs increase incrementally. Think of increasing the level of inputs by one unit at a time, and measuring how output responds to each change. This incremental way of approaching a problem is one cornerstone of "**thinking like an economist.**" In a production process characterized by Constant Returns , each additional unit of input is equally as productive as all other units of input.

- **Constant Returns**: when each additional unit of input added to the production process yields a constant level of output relative to the previous unit of input. Output increases at a constant rate.

- **Increasing Returns**: when each additional unit of input added to the production process yields an increasing level of output relative to the previous unit of input. Output increases at an increasing rate.

Table 2: Physical Production relationship: constant rate of returns

| Y (Output; wheat yield) | X (Inputs; planting density) | Added output (\\delta Y/ \\delta X) |
|---:|---:|---:|
| 0 | 0 | |
| 1 | 1 | 1 |
| 2 | 2 | 1 |
| 3 | 3 | 1 |
| 4 | 4 | 1 |
| 5 | 5 | 1 |

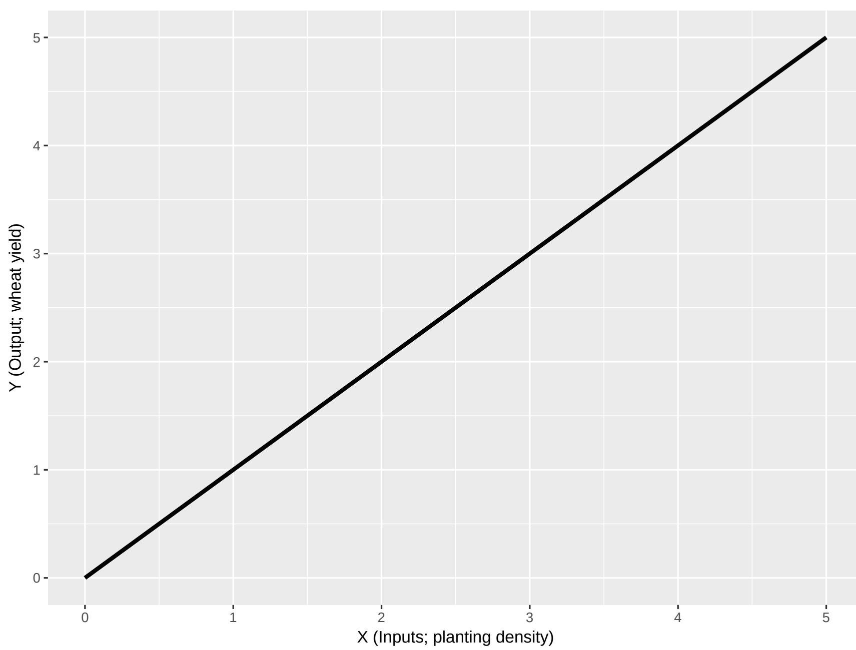


Figure 10: Wheat yield: constant returns

- **Decreasing Returns**: when each additional unit of input added to the production process yields less additional output relative to the previous unit of input. Output increases at a decreasing rate.
- **Negative Returns**: when each additional unit of input added to the production process results in lower total output relative to the previous unit of input. Output decreases.

Table 3: Physical production relationship: increasing rate of returns

| Y (Output; wheat yield) | X (Inputs; planting density) | Added output (\\delta Y/ \\delta X) |
|---|---|---|
| 0 | 0 | |
| 1 | 1 | 1 |
| 2 | 2 | 1 |
| 3 | 3 | 1 |
| 4 | 4 | 1 |
| 5 | 5 | 1 |

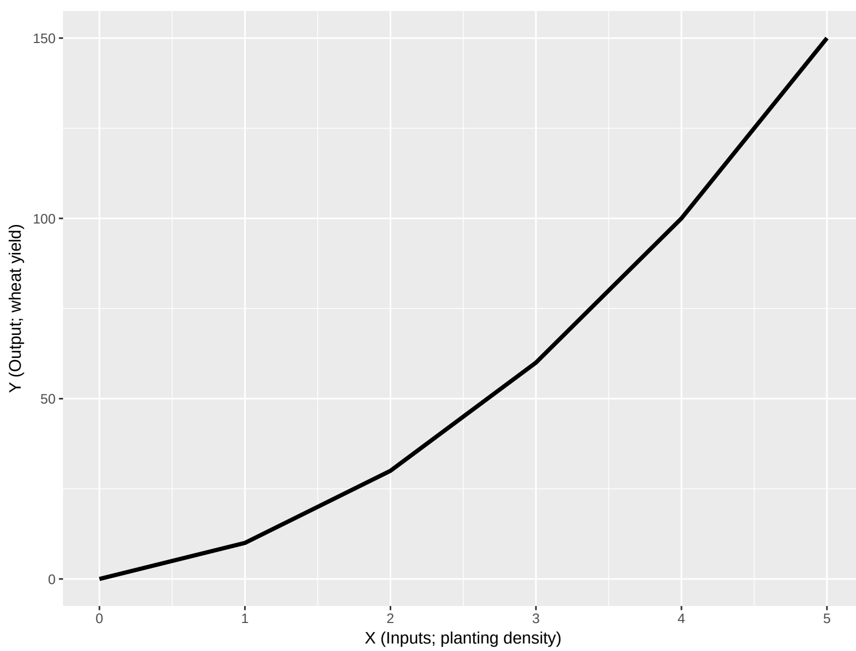


Figure 11: Wheat yield: increasing returns

## *References*

Table 4: Physical production relationship: decreasing rate of returns

| Y (Output; wheat yield) | X (Inputs; planting density) | Added output (\\delta Y/ \\delta X) |
|---:|---:|---:|
| 0 | 0 | |
| 10 | 1 | 10 |
| 18 | 2 | 8 |
| 24 | 3 | 6 |
| 28 | 4 | 4 |
| 30 | 5 | 2 |

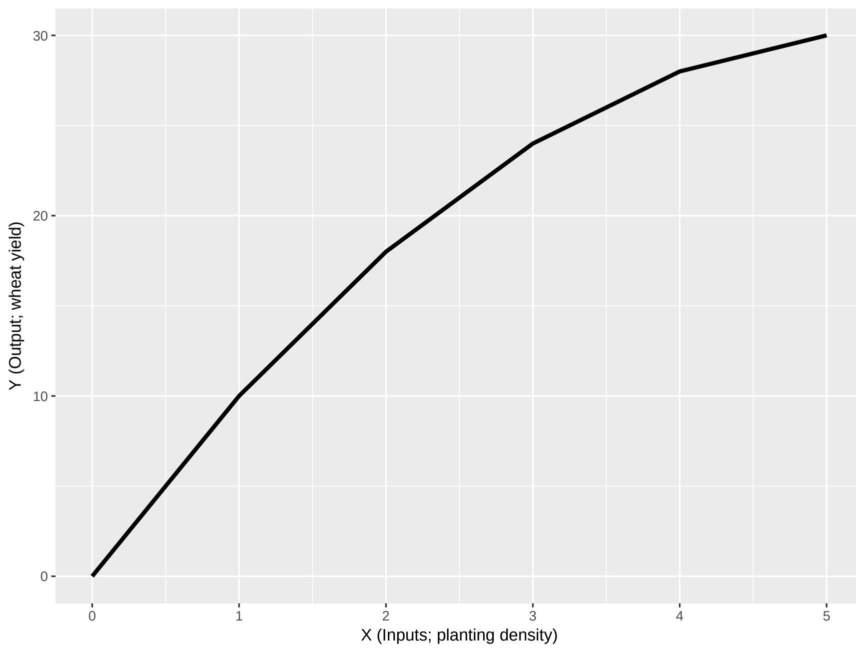


Figure 12: Wheat yield: decreasing returns

Table 5: Physical production relationship: negative rate of returns

| Y (Output; wheat yield) | X (Inputs; planting density) | Added output (\\delta Y/ \\delta X) |
|---:|---:|---:|
| 0 | 0 | |
| 1 | 1 | 1 |
| 2 | 2 | 1 |
| 3 | 3 | 1 |
| 4 | 4 | 1 |
| 5 | 5 | 1 |

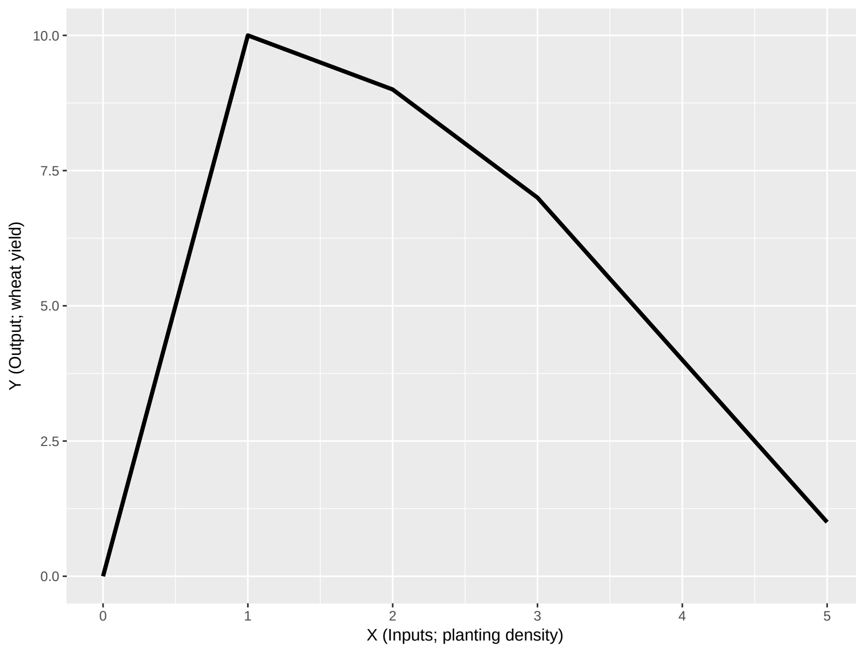


Figure 13: Wheat yield: negative returns