Managerial Economics

M.Com. IV Sem.
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Production Theory

Contt.

6.3 Production Function with two Variable Inputs

A firm may increase its output by using more of two variable inputs that are substitutes for each other, e.g., labour and capital. There may be various technical possibilities of producing a given output by using different factor combinations. Which particular factor combination will be actually selected by the firm depends both on the technical possibilities of factor substitution as well as on the prices of the factors of production.

The technical possibilities of producing an output level by various combinations of the two factors can be graphically represented in terms of Isoquants (dealt with in this chapter later).

6.4 Producer's Equilibrium

Before discussing the concept of producer's equilibrium, we must discuss the concepts of Isoquants, marginal rate of technical substitution and isocost line. After learning these concepts, you will be able to understand the concept of producer's equilibrium better.

6.4.1 Isoquants

Isoquants are a geometric representation of the production function. The same level of output can be produced by various combinations of factor inputs. Imagining continuous variation in the possible combination of labour and capital, we can draw a curve by plotting all these alternative combinations for a given level of output. This curve which is the locus of all possible combination is called the 'isoquant'.

Any quantity of a good can be produced by using many different combinations of labour and capital (assuming both can be substituted for each other). An isoquant or an iso-product curve is the line which joins together different combinations of the factors of production (L, K) that are physically able to produce a given amount of output.

Suppose isoquant refers to 100 Kg. of output. This output can be produced by a large number of different combinations of labour and capital. All the different combinations for the same amount of output would lie on the same isoquant.

Example: 10 units of capital and 5 units of labour (A) provide the same output as 3 units of capital and 20 units of labour input (B). The firm can choose any one of these combinations (A or B) or any other combination which lies on the same isoquant to get 100 Kg. of output. The isoquant does not tell us the combination of factor inputs the firm actually uses; (that combination is based on process of the factors) but shows the technically

possible combinations of factor inputs that are required to produce a given level of output. Isoquant I has been drawn by joining these combinations of labour and capital inputs which give out the same amount of total produce i.e., 100 Kg. Points like A which require more capital but less labour represent capital intensive methods of production. Points like B, which require less capital and more labour represent labour intensive methods of production.

Units of Capital

Units of Labour
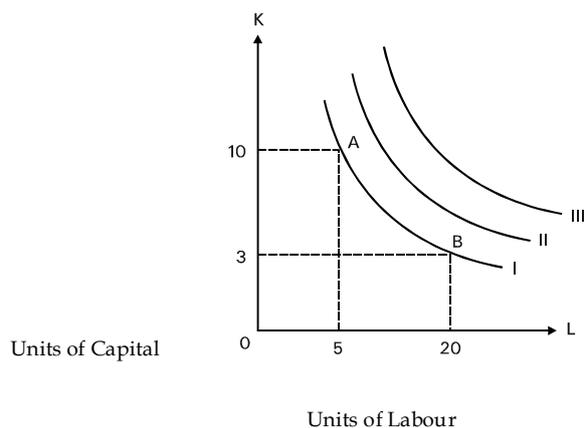
For movements along an isoquant, the level of output remains constant and the ratio of capital to labour changes continuously. However, a movement from the isoquant to another means that the level of output changes.

Types of Isoquants

The production isoquant may assume various shapes depending on the degree of substitutability of factors. The types are discussed in Table 6.2 and the matching graphs are shown in Figure 6.2.

	Table 6.2: Types of Isoquants
Types of Isoquants	**Description**
Linear Isoquants	This type assumes perfect substitutability of factors of production. A given commodity may be produced by using only capital, or only labour, or by an infinite combination of K and L.
Input-output Isoquants	This assumes strict complementarity, that is, zero substitutability of the factors of production. There is only one method of production for any one commodity. The isoquant takes the shape of a right angle. This type of isoquant is called "Leontief isoquant."
Kinked Isoquants	This assumes limited substitutability of K and L. There are only a few processes for producing any one commodity. Substitutability of factors is possible only at the kinks. It is also called "activity analysis isoquant" or "linear-programming isoquant" because it is basically used in linear programming.
Smooth, Convex Isoquants	This form assumes continuous substitutability of K and L only over a certain range, beyond which factors cannot substitute each other. This isoquant appears as a smooth curve convex to the origin.

Figure 6.2: Types of Isoquants
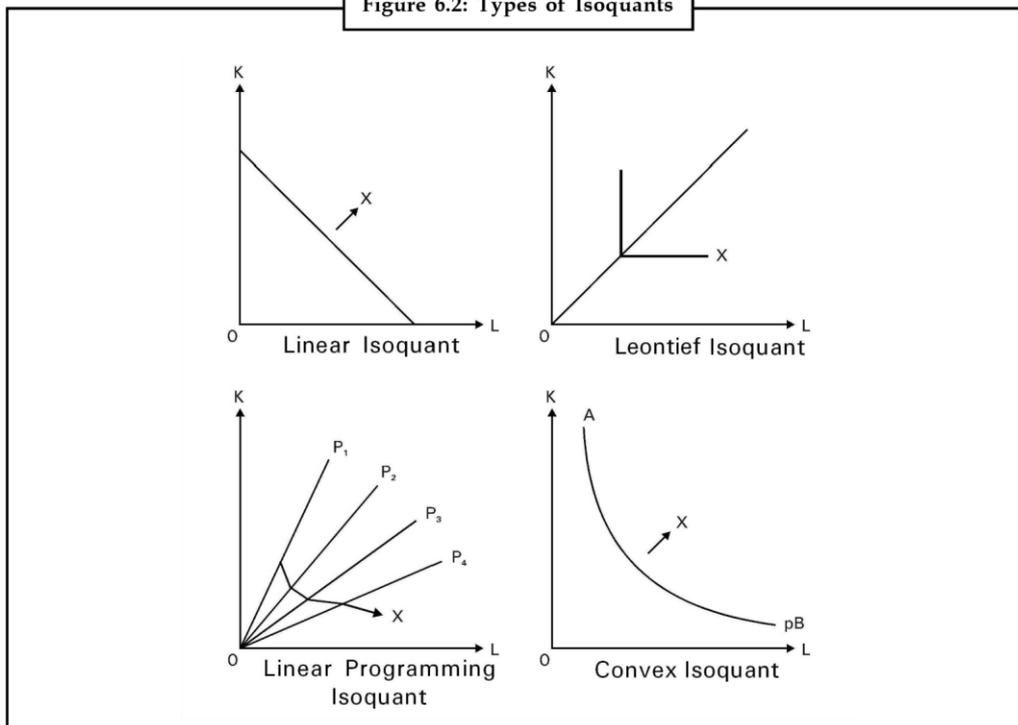
6.5 Total, Marginal and Average Revenue

Revenue is the amount generated from sale of goods or services, or any other use of capital or assets, associated with the main operations of firm before any costs or expenses are deducted. In economics, we have three types of revenues-total revenue, average revenue and marginal revenue-which are discussed in subsequent subsections.

6.5.1 Total Revenue (TR)

Total revenue is the total money received from the sale of any given quantity of output.

The total revenue is calculated by taking the price of the sale times the quantity sold, i.e.
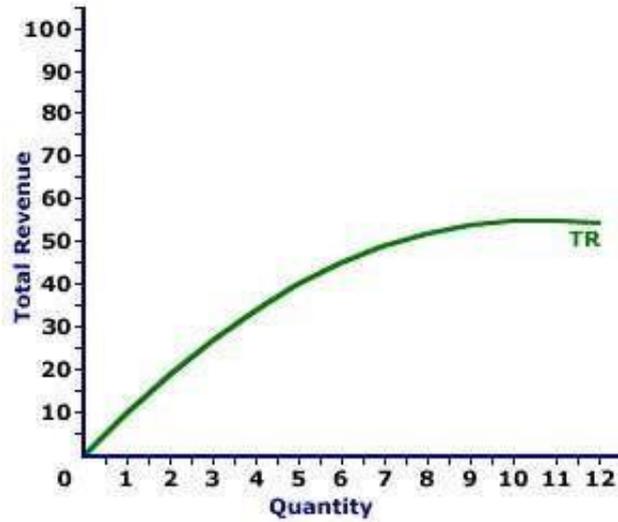
$$TR = \text{Price} \times \text{Quantity}.$$

Example: If price is ₹ 10 and quantity sold is 100, then total revenue would be ₹ 1000.

Figure depicts a total revenue curve.

Total Revenue Curve

6.5.2 Average Revenue (AR)

Average revenue is the revenue received for selling a good per unit of output sold. It is calculated by dividing total revenue by the quantity of output, i.e.

AR= TR/Quantity

Average revenue often goes by a simpler and more widely used term- price. Using the longer term average revenue rather than price provides a connection to other related terms, especially total revenue and marginal revenue. When compared with average cost, average revenue shows the amount of profit generated per unit of output produced. Average revenue is often shown by an average revenue curve, shown in Figure 6.6.
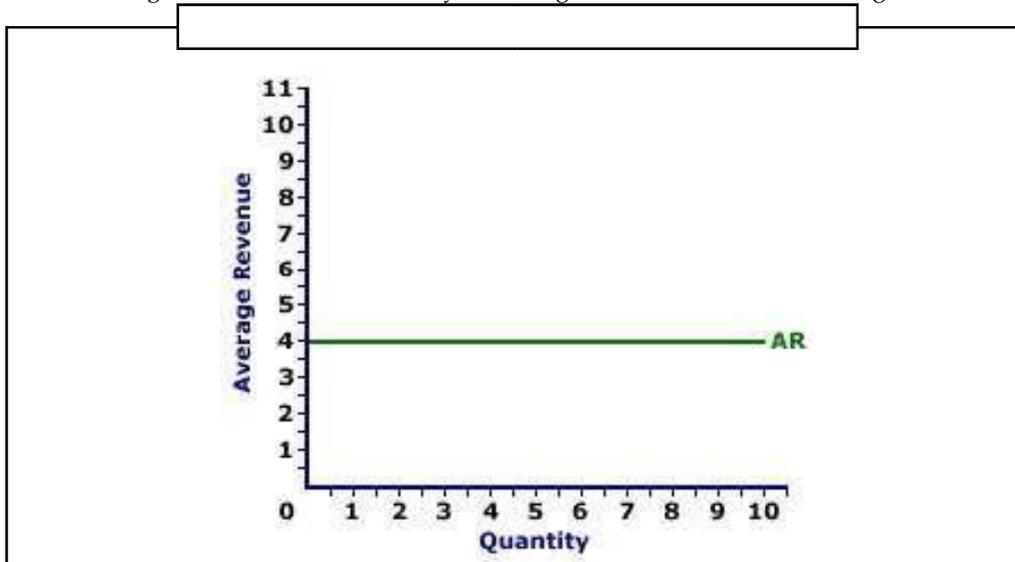

Figure 6.6:

Average Revenue Curve (Under Perfect Market)

6.5.3 Marginal Revenue (MR)

Marginal revenue is the change in total revenue resulting from a change in the quantity of output sold. Marginal revenue indicates how much extra revenue a firm receives for selling an extra unit of output. It is found by dividing the change in total revenue by the change in the quantity of output. Marginal revenue is the slope of the total revenue curve and is one of two revenue concepts derived from total revenue. The other is average revenue. To maximize profit, a firm equates marginal revenue and marginal cost.

MR = Change in TR/Change in Quantity Figure 6.7 depicts a MR

curve under perfect market.

Figure 6.7: MR Curve
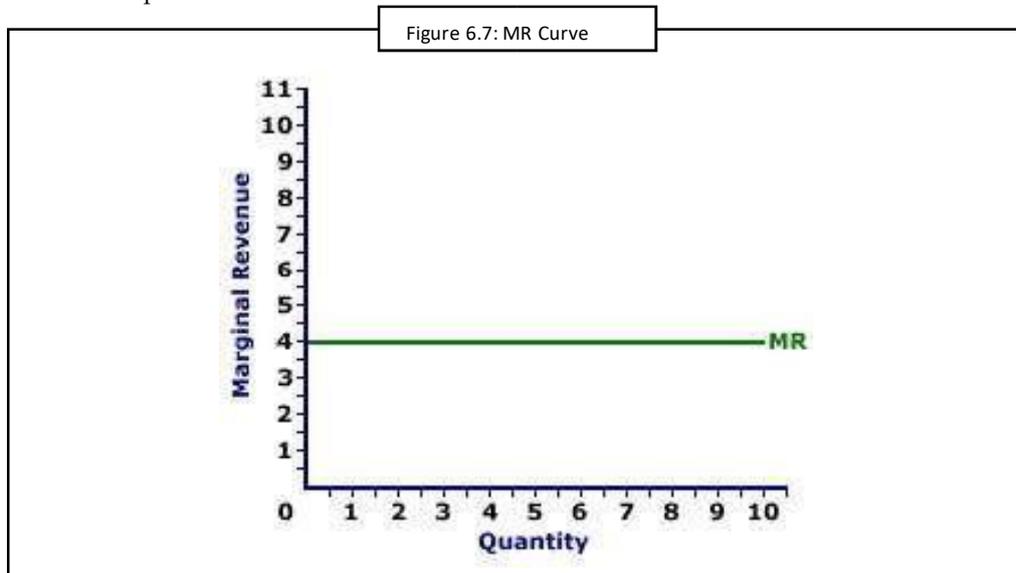
6.6 Summary

- Production means conversion of inputs or resources into usable commodities or services.

- Inputs are the resources used in the production of goods and services and are generally classified into three broad categories — labour, capital and land or natural resources.

- Production is a process in which economic resources or inputs are combined by entrepreneurs to create economic goods and services.

- An expansion path is formally defined as the set of combinations of capital and labour that meet the efficiency condition.

- Isoquants are a geometric representation of the production function. Various combinations of factor inputs can produce the same level of output.

- The marginal rate of technical substitution of L for K (denoted by $MRTS_{L,K}$) is defined as the number of units of input K that a producer is willing to sacrifice for an additional unit for L so as to maintain the same level of output

6.7 Keywords

Isoquants: These are a geometric representation of the production function

Kinked isoquant: This assumes limited substitutability of capital and labour.

Marginal revenue product of labour: Marginal product of labour times the marginal revenue from the sale of extra output produced

Production function: A function that states the maximum amount of an output that can be produced with a certain combination of inputs, within a given period of time and with a given level of technology

Production: Transformation of inputs into output

6.8 Self Assessment

Fill in the blanks:

1. Production refers to the .... of inputs or resources into output of goods and services.

2. .... are the resources used in the production of goods and services and are generally classified into three broad categories-labour, capital and land or natural resources.

3. .... are those that can be varied easily and on very short notice.

4. The time period during which at least one input is fixed is called the ....

5. Mathematically, the production function can also be shown as: ....

6. The MPP of factor is a change in .... resulting from a change in a factor of production.

7. Linear isoquant assumes .... substitutability of factors of production.

8. Kinked isoquant assumes .... substitutability of factors of production.

9. Kinked isoquant assumes .... substitutability of capital and labour.

10.   Average Revenue is, generally, also referred to as ……………………

Answers: Self Assessment

1.	Transformation	2.	Inputs
3.	Variable Inputs	4.	Short Run
5.	$Q = f(X_1, X_2 \ldots \ldots \ldots X_k)$	6.	output
7.	perfect	8.	limited
9.	limited	10.	Price