

## UNIT – II

### THEORY OF PRODUCTION AND COST ANALYSIS

#### PRODUCTION FUNCTION

1. **Define production function. Explain Isocosts and Isoquants.**

The production function expresses a functional relationship between physical inputs and physical outputs of a firm at any particular time period. The output is thus a function of inputs. Mathematically production function can be written as

$$Q = f(A, B, C, D)$$

Where “Q” stands for the quantity of output and A, B, C, D are various input factors such

as Land, Labour, Capital and Organization. Here output is the function of inputs. Hence output becomes the dependent variable and inputs are the independent variables.

### ISOCOSTS:

The term Isocosts is derived from the words 'iso' and 'cost' – 'Iso' means equal and 'cost' implies cost. Isocost therefore, means equal costs. Isocosts that refers to that cost curve that represents the combination of inputs that will cost the producer the same amount of money. If the level of production changes the cost changes and thus the Isocost curve move to upward and viceversa.

### ISOQUANTS:

The term Isoquants is derived from the words 'iso' and 'quant' – 'Iso' means equal and 'quant' implies quantity. Isoquant therefore, means equal quantity. A family of iso-product curves or isoquants or production difference curves can represent a production function with two variable inputs, which are substitutable for one another within limits. The curve of Isoquant also called as the product indifference curve. For a given output level firm's production become,

$$Q = f(L, K)$$

Where 'Q', the units of output is a function of the quantity of two inputs 'L' and 'K'.

### Assumptions:

1. There are only two factors of production, viz. Labour and Capital.
2. The two factors can substitute each other up to certain limit
3. The shape of the isoquant depends upon the extent of substitutability of the two inputs.
4. The technology is given over a period.

### Features of ISO quants:

1. Downwardsloping
2. Convex to origin
3. Do not intersect
4. Do not touch axis

## 2. A) MRTS

Marginal rate of Technical Substitution

The MRTS refers to the rate at which one input factor is substituted with the other to attain a given level of output.

5 units of decrease in labor and compensated by an increase in one unit of capital, resulting in MRTS 5:1

$$MRTS = \frac{\text{Change in one input}}{\text{Change in another input}} = - \frac{K \Delta}{L \Delta}$$

## B) Least cost combination

The manufacturer has to produce at lower costs to attain higher profits. The Isocosts and ISOquants can be used to determine the input usage that minimizes the cost of production.

### C) Cobb Douglas production function

Production function of the linear homogenous type is invented by Juntwicksell and first tested by C. W. Cobb and P. H. Douglas in 1928. This famous statistical production function is known as Cobb-Douglas production function. Originally the function is applied on the empirical study of the American manufacturing industry. Cobb – Douglas production function takes the following mathematical form.

Where  $Y = (AK^x L^{1-x})$

Y=output K=Capital

L=Labour

A,  $\infty$ =positive constant

### 3. Explain the law of returns with diagram.

The law of returns to scale explains the behavior of the total output in response to change in the scale of the firm, i.e., in response to a simultaneous change in the scale of the firm, i.e., in response to a simultaneous and proportional increase in all the inputs. More precisely, the Law of returns to scale explains how a simultaneous and proportionate increase in all the inputs affects the total output at its various levels.

When a firm expands, its scale increases all its inputs proportionally, then technically there are three possibilities.

- (i) The total output may increase proportionately
- (ii) The total output may increase more than proportionately
- (iii) The total output may increase less than proportionately.

### 4. Explain internal and external economies of scale?

Production may be carried on a small scale or on a large scale by a firm. When a firm expands its size of production by increasing all the factors, it secures certain advantages known as economies of production. Marshall has classified these economies of large-scale production into internal economies and external economies.

#### Causes of internal economies:

Internal economies are generally caused by two factors

- 1. Indivisibilities
- 2. Specialization.

#### Internal Economies:

Internal economies may be of the following types.

- A. Technical Economies.
- B. Managerial Economies:
- C. Marketing Economies:
- D. Financial Economies:
- E. Risk bearing Economies:
- F. Economies of Research:
- G. Economies of welfare:

#### External Economies.

Business firm enjoys a number of external economies, which are discussed below: \_\_\_\_\_



- A) Economies of Concentration:
- B) Economies of Information
- C) Economies of Welfare:
- D) Economies of Disintegration:

Thus, internal economies depend upon the size of the firm and external economies depend upon the size of the industry.

## 5. Explain the economies of large scale of production.

Internal and external diseconomies are the limits to large-scale production. It is possible that expansion of a firm's output may lead to rise in costs and thus result diseconomies instead of economies. When a firm expands beyond proper limits, it is beyond the capacity of the manager to manage it efficiently. This is an example of an internal diseconomy. In the same manner, the expansion of an industry may result in diseconomies, which may be called external diseconomies. Employment of additional factors of production becomes less efficient and they are obtained at a higher cost. It is in this way that external diseconomies result as an industry expands.

The major diseconomies of large-scale production are discussed below:

### Internal Diseconomies:

- A. Financial Diseconomies
- B. Managerial diseconomies
- C. Marketing Diseconomies
- D. Technical Diseconomies
- E. Diseconomies of Risk-taking

### External Diseconomies:

When many firm get located at a particular place, the costs of transportation increase due to congestion. The firms have to face considerable delays in getting raw materials and sending finished products to the marketing centers. The localization of industries may lead to scarcity of raw material, shortage of various factors of production like Labour and Capital, shortage of power, finance and equipment's. All such external diseconomies tend to raise cost per unit.

## COST ANALYSIS

### 6. What is cost analysis? Explain the concept of cost?

Profit is the ultimate aim of any business and the long-run prosperity of a firm depends upon its ability to earn sustained profits. Profits are the difference between selling price and cost of production. In general, the selling price is not within the control of a firm but many costs are under its control. The firm should therefore aim at controlling and minimizing cost.

A managerial economist must have a clear understanding of the different cost concepts for clear business thinking and proper application.

1. Opportunity costs and outlay costs
  2. Explicit and implicit costs
  3. Historical and Replacement costs
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4. Short – run and long – runcosts
5. Out-of pocket and bookscosts
6. Fixed and variablecosts
7. Post and Futurecosts
8. Traceable and commoncosts
9. Avoidable and unavoidablecosts
10. Controllable and uncontrollablecosts
11. Incremental and sunkcosts
12. Total, average and marginalcosts
13. Accounting and Economicscosts

### COST-OUTPUT RELATIONSHIP

A proper understanding of the nature and behavior of costs is a must for regulation and control of cost of production. The cost of production depends on money forces and an understanding of the functional relationship of cost to various forces will help us to take various decisions. Output is an important factor, which influences the cost.

The cost-output relationship plays an important role in determining the optimum level of production. Knowledge of the cost-output relation helps the manager in cost control, profit prediction, pricing, promotion etc. The relation between cost and its determinants is technically described as the cost function.

$$C = f(S, O, P, T \dots)$$

Where:

C= Cost (Unit or total cost)

S= Size of plant/scale of production

O= Output level

P= Prices of inputs



### (a) Cost-Output Relation in the short-run:

The cost concepts made use of in the cost behavior are total cost, Average cost, and Marginal cost. Total cost is the actual money spent to produce a particular quantity of output. Total cost is the summation of fixed and variable costs.

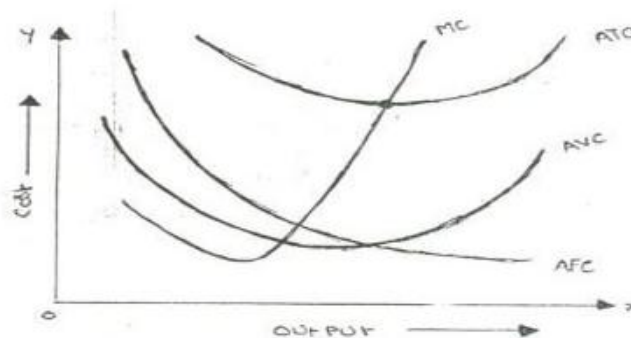
$$TC = TFC + TVC$$

Up to a certain level of production total fixed cost i.e., the cost of plant, building, equipment etc., remains fixed. But the total variable cost i.e., the cost of Labour, Raw Materials etc., Vary with the variation in output. Average cost is the total cost per unit. It can be found out as follows.

$$AC = TC/Q$$

The total of average fixed cost ( $TFC/Q$ ) keep coming down as the production is increased and average variable cost ( $TVC/Q$ ) will remain constant at any level of output.

Marginal cost is the addition to the total cost due to the production of an additional unit of product. It can be arrived at by dividing the change in total cost by the change in total output. In the short-run there will not be any change in total fixed cost. Hence change in total cost implies change in total variable cost only.



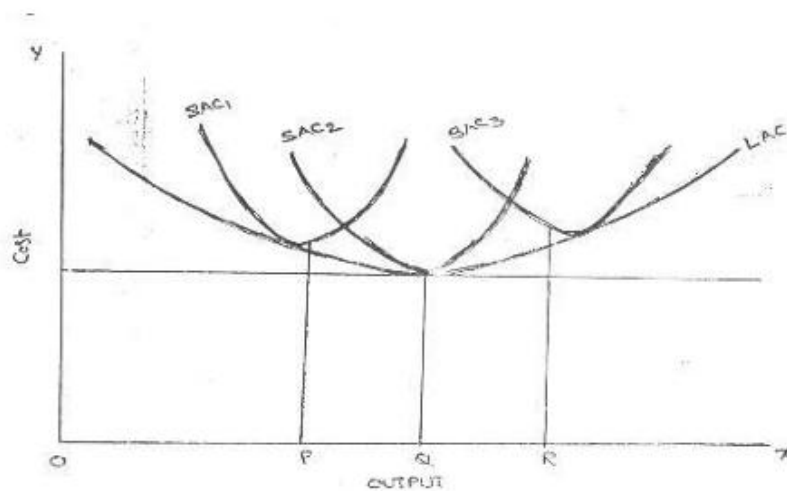
### b. Cost-Output Relationship in the long-run:

Long run is a period, during which all inputs are variable including the one, which are fixed in the short-run. In the long run a firm can change its output according to its demand. Over a long period, the size of the plant can be changed, unwanted buildings can be sold staff can be increased or reduced. The long run enables the firms to expand and scale of their operation by bringing or purchasing larger quantities of all the inputs. Thus, in the long run all factors become variable.

The long-run cost-output relations therefore imply the relationship between the total cost and the total output. In the long-run cost-output relationship is influenced by the law of returns to scale.

In the long run a firm has a number of alternatives in regards to the scale of operations. For each scale of production or plant size, the firm has an appropriate short-run average cost curve. The short-run average cost (SAC) curve applies to only one plant whereas the long-run average cost (LAC) curve takes in to consideration many plants.

The long-run cost-output relationship is shown graphically with the help of "LCA" curve.



## 7. Explain the Break-Even Point?

**Break – Even- Point:** If we divide the term into three words, then it does not require further explanation.

**Break-**Divide

**Even-**Equal

**Point-**Place or Position

Break Even Point refers to the point where total cost is equal to total revenue. It is a point of no profit, no loss. This is also a minimum point of no profit, no loss. This is also a minimum point of production where total costs are recovered. If sales go up beyond the Break Even Point, organization makes a profit. ~~If they come down, a loss is incurred.~~

1. Break Even point (Units)=  $\frac{\text{Contribution per unit}}{\text{Fixed expenses}}$
2. Break Even point (In Rupees)=  $\frac{\text{Contribution}}{\text{Sales}}$

### Important:

- 1) Profit and Loss Account
- 2) Relationship between cost, volume and profit
- 3) Long term planning
- 4) Useful for forecasting
- 5) Serves as a tool of cost control

## 8. What is break-even analysis? State its merits and demerits?

The study of cost-volume-profit relationship is often referred as BEA. The term BEA is interpreted in two senses. In its narrow sense, it is concerned with finding out BEP; BEP is the point at which total revenue is equal to total cost. It is the point of no profit, no loss. In its broad sense, it helps to determine the probable profit at any level of production.

### Merits:

- a) Information provided by the Break-Even Chart can be understood more easily

than those contained in the profit and Loss Account and the cost statement.

- b) Break Even Chart discloses the relationship between cost, volume and profit. It reveals how changes in profit. So, it helps management in decision-making.
- c) It is very useful for forecasting costs and profits long term planning and growth
- d) The chart discloses profits at various levels of production.
- e) It serves as a useful tool for cost control.
- f) It can also be used to study the comparative plant efficiencies of the industry.
- g) Analytical Break-even chart presents the different elements, in the costs – direct Material, direct Labour, Fixed and Variable Overheads.

#### Demerits:

- a) Break-even chart presents only cost volume profits. It ignores other considerations such as capital amount, marketing aspects and effect of government policy etc., which are necessary in decision making.
- b) It is assumed that sales, total cost and fixed cost can be represented as straight lines. In actual practice, this may not be so.
- c) It assumes that profit is a function of output. This is not always true. The firm may increase the profit without increasing its output.
- d) A major drawback of BEC is its inability to handle production and sale of multiple products.
- e) It is difficult to handle selling costs such as advertisement and sale promotion in BEC.
- f) It ignores economics of scale in production.
- g) Fixed costs do not remain constant in the long run.
- h) Semi-variable costs are completely ignored.
- i) It assumes production is equal to sale. It is not always true because generally there may be opening stock.
- j) When production increases variable cost per unit may not remain constant but may reduce on account of bulk buying etc.
- k) The assumption of static nature of business and economic activities is a well-known defect of BEC.

#### 9. Explain in details the concepts of BEA?

The concept of Break-Even analysis is -

- A. Fixed cost
  - B. Variable cost
  - C. Contribution
  - D. Margin of safety
  - E. Angle of incidence
  - F. Profit volume ratio
  - G. Break-Even-Point
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