Chapter- 3: **MICRO ECONOMICS**

Production and Costs

Production:- It is mainly transformation of resources into commodities.

Production Function: Physical inputs. Production function of a firm describes the relationship between the output and the factors of production which are being used in the production process. It shows the required number of inputs needed to produce the maximum level of final output.

The following formula is used to express the production: $Q=f(x_1, x_2)$

Where

Q = final units of output

x_1 = amount of production factor 1

x_2 = amount of production factor 2

The above equation shows that the final units of output can be produced by using production. Factors 1 & 2.

Types of Production Function:

There are two types of Production Function.

1. **Short-run Production Function:** In this production function one factor of production is variable and all others are fixed. So, law of return to a factor is applied. It is also called variable proportion type of production function.

It is a time period which is not enough to make change in all inputs. In this level of production can be changed by changing the variable factors.

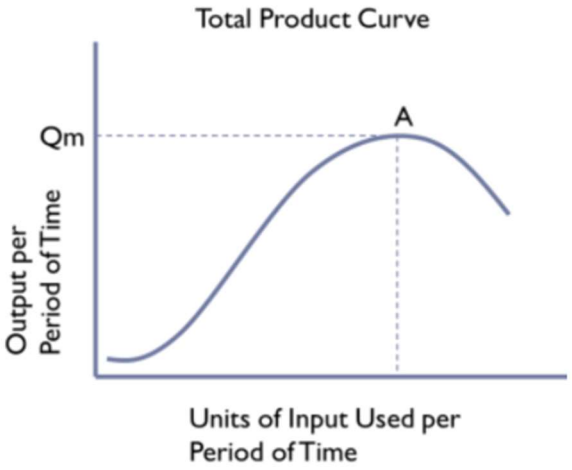
2. Long-run Production Function: In this production function all the factors of production are variable. So, law of returns to scale is applied. It is also called constant proportion type of production function.

It is a time period which is enough to make change in all inputs; all inputs are variable in the long run. In this level of production can be changed by changing all inputs.

Total producer or Total physical product:- Total product is the summation of the final units of output produced by a firm by using the given amount of inputs during a particular period of time. Total product is the relationship between variable factors of production and final units of output when all other factors of production are held constant. The following formula can be used to express the total product:

Total product = $\sum Q_x$

The above formula shows the relationship between variable factors of production and the summation of the total output.



Average production is the per unit production of variable factor.

$$AP = \frac{TP}{\text{Variable input}}$$

Marginal product refers to the change in total product resulting from the employment of an additional unit of variable factor. In other words, it is the contribution of each additional unit of variable factor to output.

Marginal Product of an Input= Change in Total Product/Change in Variable Product

Relation between Total, Average and Marginal Product

$$MP = \frac{\Delta TP}{\Delta L} \text{ or } MP_n = TP_n - TP_{n-1}$$

1. When TP increases at an increasing rate, MP also increases.
2. When TP increases at a diminishing rate, MP declines.
3. When TP is maximum, MP=0.
4. When TP begins to decline, MP becomes negative.

Labour	MP	TP	AP
1	2	2	2
2	3	5	2.5
3	4	9	3
4	3	12	3
5	1	13	2.6
6	0	13	2.16
7	-2	11	1.6

1. When MP > AP, AP rises.

2. When MP = AP, AP is maximum and constant.

3. When MP < AP, AP falls.

4. MP may be zero or negative, but AP continues to be positive.

5. AP increases, even when MP falls but MP should lie above AP.

Returns to a factor: It refers to the behaviour of output when only one variable factor of production in increased in short run and fixed factors remain constant.

Law of variable proportion: The law states that when more and more units of variable factors are employed to increase the output, initially output increases at an increasing rate and finally falls.

Stage I (Stage of increasing Return to factor): TP Increases at increasing rate: In the initial phase as more and more units of variable factors are employed with fixed factor total physical production increases at increasing rate, MP increases.

Cause for increasing return: (a) Underutilisation of fixed factor

(b) Indivisibility of factor

(c) Increased efficiency of variable factor

Stage II (Stage of Diminishing Return to factor): TP increases at decreasing rate: As more and more units of variable factors are employed with fixed factors then total product increases at diminishing rate, MP decreases but is positive. At the end of this phase TP maximum and MP becomes zero.

Cause of diminishing return: (a) optimal use of fixed factor

(b) Imperfect factor substitutability

Stage III (Stage of negative Return to factor): TP falls: As more and more units of variable factors are employed with fixed factors, total production starts decreasing and marginal product becomes negative.

Cause of negative return:

(a) Poor co-ordination between fixed factor and variable factor.

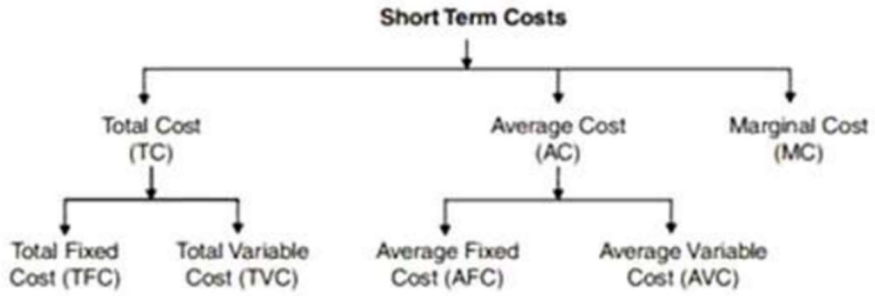
(b) Over utilisation of fixed factor

Economic Cost: It is the sum total of explicit and implicit cost.

Explicit Cost: Actual money expenditure incurred by a firm on the purchase and hiring the factor inputs for the production is called explicit cost. These are entered into books of accounts. For example-payment of wages, rent, interest, purchases of raw materials etc.

Implicit cost is the cost of self-owned resources of the production used in production process. Or estimated value of inputs supplied by owner itself. These are not entered into books of accounts.

Normal Profit: It is the minimum amount required to keep the producers into business In other words, it is the minimum supply price of the entrepreneur. It is also called the wage off an entrepreneur.



Total cost refers to total amount of money which is incurred by a firm of production of a given amount of a commodity.

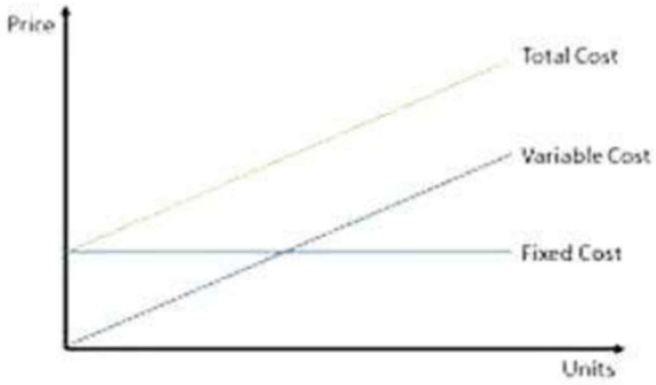
Total cost is the sum of total fixed cost and total variable cost.

TC = TFC + TVC or TC = AC × Q

Total fixed cost: - It is also called supplementary cost. It is the total expenditure incurred by the producer for employing fixed inputs. Ex- Rent of land and building, interest on capital, license fee etc.

TFC = TC – TVC or TFC = AFC × Q

Features of total fixed cost: (a) It remains constant at all levels of output. **It is not zero. even at zero output level.** Therefore, **TFC curve is parallel to X-axis**. (b) **Total cost at zero level of output is equal to total fixed cost.**



Total variable cost is the costs which vary with the quantity of output produce. It is Zero at zero level of output. TVC curve is parallel to TC curve. Ex-cost of raw material, expenses on power etc.

TVC = TC – TFC or TVC = AVC × Q

Features of Total variable cost: (a) It is zero when output is zero. (b) It increases with increase in output. (c) Initially TVC increases at diminishing rate due to increasing returns and later it increases at an increasing rate due to diminishing return.

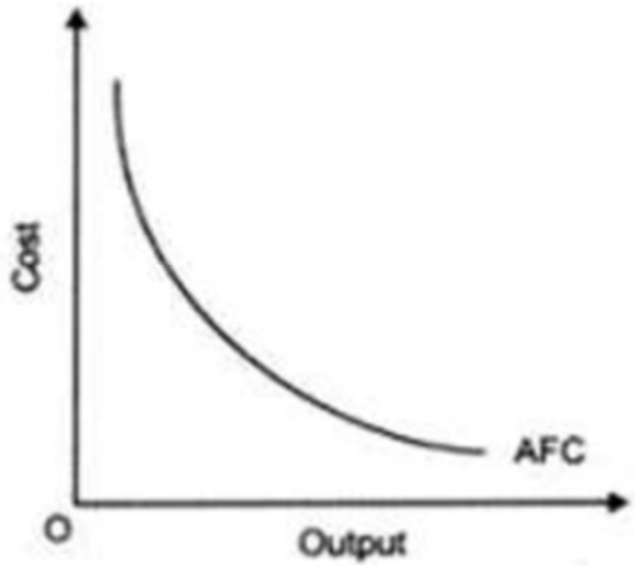
Average cost is per unit cost of production of a commodity. It is the sum of average fixed cost and average variable cost.

Average fixed cost is per unit fixed cost of production of a commodity.

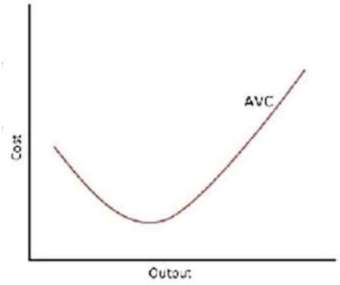
$$AC = \frac{TC}{Q} \text{ or } AC = AFC + AVC$$

$$AFC = \frac{TFC}{Q} \text{ or } AFC = AC - AVC$$

Features of AFC: (a) AFC diminishes with increase in output. (b) AFC curve is a rectangular hyperbola. (c) It cannot intersect X-axis or Y-axis.



Average variable cost is per unit variable cost of production of a commodity. AVC is U-shaped due to law of variable proportion.



$$AVC = \frac{TVC}{Q} \quad \text{or} \quad AVC = AC - AFC$$

Marginal Cost: It refers to change in TC, due to addition unit of a commodity is produced.

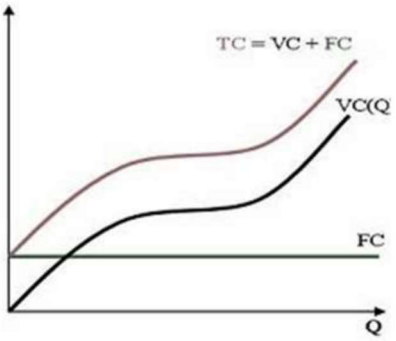
MC = ΔTC/ΔQ or MCn = TCn – TCn–1. But under short run, it is calculated from TVC.

$$MC_n = TVC_n - TC_{n-1} \text{ or } MC = \frac{\Delta TVC}{\Delta Q}$$

Relation between Short-Term Costs

Total cost curve and total variable cost curve remains parallel to each other. The vertical distance between these two curves is equal to total fixed cost.

TFC curve remains parallel to X-axis and TVC curve remains parallel to TC curve.



With increase in level of output, the vertical distance between ACF curve and AC curve goes on increasing. On contrary the vertical distance between AC curve and AVC curve goes on decreasing but these two curves never intersect because average fixed cost is never zero.

Relation between MC and AVC.

When MC < AVC, AVC falls.

When MC = AVC, AVC is minimum and constant

When MC > AVC, AVC rises. MC curve cuts AVC curve at its lowest point. Both curves are U-shaped and start from same point.

Relation between MC and AC:

(i) When AC falls, MC < AC

(ii) When AC rises, MC > AC.

(iii) When AC is constant and minimum, MC = AC.

Money received from the sale of product is called revenue.

Total revenue is the total amount of money received by a firm from the sale of given units of a commodity.

$$TR = AR \times Q \text{ Or } TR = \sum MR$$

TR = Price × Quantity Sold.

Price. = AR

Per unit revenue received from the sale of given units of a commodity is called **average revenue.** Average revenue is equal to price. Per unit price of a commodity it also called AR.

$$AR = \frac{TR}{Q} \text{ or } \frac{P \times Q}{Q} = P = \text{Price.}$$

Marginal revenue is net addition to total revenue when one additional unit is output is sold.

$$MR = \frac{\Delta TR}{\Delta Q} \text{ Or } MR_n = TR_n - TR_{n-1}$$

Relation between TR, AR, and MR When more quantity sold at the same price: under perfect condition.

(a) Average revenue and marginal revenue remains constant at all levels of output and AR and MR curves are parallel to ox-axis.

AR= MR.

(b) Total revenue increases at constant rate MR is constant and TR curve is positively sloped straight line passing through the origin.

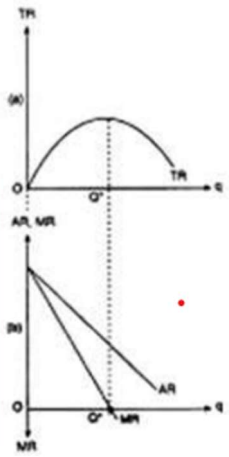
Relation between TR, AR, and MR When more quantity by sold at the lower price or there is monopoly or monopolistic competition in the market.

(a) Average revenue and marginal revenue curves have negative slope. MR curve lies below AR curve. AR > MR

(b) Marginal revenue falls, twice the rate of average revenue.

$$\text{MR} = \frac{1}{2}\text{AR}$$

(c) So long as marginal revenue decreases and positive, total revenue increases at diminishing rate. When marginal revenue is zero, total revenue is maximum and when marginal revenue becomes negative, TR starts falling.



Relation between AR and MR (General relationship)

When MR= AR, AR is maximum and constant. MR can be negative but not AR.

When MR < AR, AR falls. When TR increases at an increasing rate, MR and AR also increases.

Concept of Producer's Equilibrium: If refers the stage where producer is getting maximum profit with given cost and he has no incentive to increase or decrease the level of output.

(A) MR and MC Approach: Conditions of producers equilibrium according to this approach are:

(a) MC = MR and also AR = MR, hence AR = MR = MC. MC should be rising.

(b) MC curve should cut the MR curve from below at the point of equilibrium.

Or

MC should be more than MR after the equilibrium point, with increase in output.

Normal Profit: It is a no profit no loss situation, it is achieved when P = AC. It is the minimum return that a producer expects from his capital invested in the business.

Break-even Point: It occurs when AR=AC or (TR=TC). At this point, firm is earning zero economic profit or normal profit. OR we can say it is just covering all its costs.

Shut-down Point: - It occurs when a firm is covering its variable costs only, here, the firm is incurring loss of fixed cost. (TR < TVC OR AR < AVC)

Supply: Refers to the amount of the commodity that a firm or seller is willing to sell at different prices during a given period of time.