

UNIT 3

PRODUCTION BEHAVIOUR AND SUPPLY

POINTS TO REMEMBER

- ❑ Total production refers to the sum total of production done by using all units of variable factors over a given period of time.
- ❑ Average production is the per unit output of variable factor (labour) employed.

AP =

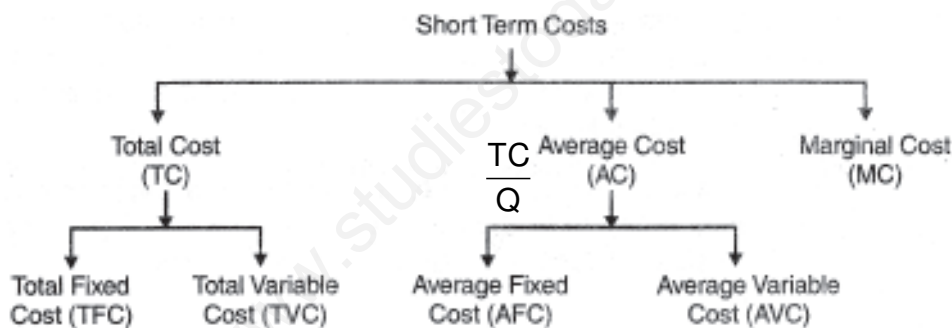
- ❑ Marginal product is addition to total product resulting from employing one additional unit of variable input. $\frac{TP}{\text{variable input}}$
- ❑ Returns to a factor : In a short period when additional units of variable factors are employed with given fixed factors, then returns to a factor operates. Returns to a factor shows the changes in total products, marginal product which arises due to change in ratio between fixed and variable factor. They are as follows :
 - (A) **Increasing returns to a factor** : In the initial stage as more and more units of variable factor are employed with fixed factor total physical production increases at increasing rate.
 - (B) **Diminishing returns to a factor** : As more and more units of variable factors are employed with fixed factors, then total product increases at diminishing rate.
 - (C) **Negative returns to a factor** : This is the last stage of returns to a factor. As more and more units of variable factors are employed with given fixed factors, total production starts decreasing and marginal product becomes negative.

Relation between Total, Average and Marginal Product

1. So long as marginal product rises, total product increases at increasing rate.

2. Marginal product starts falling but remains positive, total product rises at diminishing rate in this stage.
3. When marginal product becomes negative, then total product starts falling in this stage.
4. So long as average production is less than marginal product, average production increases. Marginal product intersects average product at the point where average product is maximum. After this average product starts falling and is more than marginal product in this stage.

- ❑ **Cost** : Cost is the sum of direct (explicit cost) and indirect cost (implicit cost).
- ❑ Those monetary payments, which are incurred by producers for payment those of factor and non-factor inputs which are not owned by producers are called Direct Cost.
- ❑ Implicit cost is the cost of self owned resources of the production used in production process.



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

$$TC = TFC + TVC \quad \text{or} \quad TC = AC \times Q$$
- ❑ Total fixed cost remains constant at all levels of output. It is not zero even at zero output level. Therefore, TFC curve is parallel to OX-axis.

$$TFC = TC - TVC \quad \text{or} \quad TFC = AFC \times Q$$
- ❑ Total variable cost is the cost which vary with the quantity of output produced. It is zero at zero level of output. TVC curve is parallel to TC curve.

$$TVC = TC - TFC \quad \text{or} \quad TVC = AVC \times Q$$
- ❑ Average cost is per unit of total cost. It is the sum of average fixed cost and average variable cost.

- Average fixed cost is per unit of total fixed cost.

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

- Per unit of total variable cost is called average variable cost.

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

- Net increase in cost for producing one additional unit is called marginal cost.

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

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 AFC 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.
- Marginal cost curve intersects average cost curve and average variable cost curve at their minimum point. After the point of intersection with increase in output, AC curve and AVC curve starts rising.
- MC curve remains under the AC and AVC curve before intersection point but after intersection point AC and AVC curve remains under the MC curve.
- Average cost and average variable cost falls till they are more than marginal cost. When these two costs are less than marginal cost, in that situation both (AC and AVC) rise.
- Money received from the sale of product is called revenue.
- Total revenue is the amount received from the sale of given units of a commodity over a particular period of time.

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

- ❑ Per unit revenue received from the sale of given units of a commodity is called average revenue. Average revenue is equal to price.

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

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

$$MR = \frac{\Delta TR}{\Delta Q} \quad \frac{P \times Q}{Q}$$

- ❑ Behaviour of TR, AR and MR when per unit price remains constant or firm can sell additional quantity of a good at same price
 - (a) Average revenue and marginal revenue remains constant at all levels of output and AR and MR curves are parallel to ox-axis.
 - (b) Total revenue increases at constant rate and TR curve is positively sloped straight line passing through the origin.
- ❑ Behaviour of TR, AR and MR when price falls with additional unit of output sold 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.
 - (b) Marginal revenue falls, twice the rate of average revenue.
 - (c) So long as marginal revenue is positive, total revenue increases. When marginal revenue is zero, total revenue is maximum and when marginal revenue becomes negative, TR starts falling.
- ❑ **Concept of Producer's Equilibrium** : It refers to the stage where producer gets maximum profit.
- (A) **MR and MC Approach** : Conditions of producer's equilibrium according to this approach are :
 - (a) Equality between MR and MC
 - (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.

- ❑ **Supply** : Refers to the amount of the commodity that a firm or seller is willing to offer or to sell in a given period of time at various prices.

- ❑ **Individual Supply** : Refers to quantity of a commodity that an individual firm is willing and able to offer for sale at each possible price during a given period of time.
- ❑ **Stock** : Refers to the total quantity of a particular commodity available with the firm at a particular point of time.
- ❑ **Supply Schedule** : Refers to a tabular presentation which shows various quantities of a commodity that a producer is willing to supply at different prices, during a given period of time.

Supply curve : Refers to the graphical representation of supply schedule which represents various quantities of a commodity that a producer is willing to supply at different prices during given period of time.

- ❑ **Law of Supply** : States the direct relationship between price and quantity supplied, keeping other factors constant.

Exceptions to Law of Supply

1. Future Expectation
 2. Agricultural goods
 3. Perishable goods
 4. Rare goods
 5. Backward countries.
- ❑ **Price Elasticity of Supply** : Refer to the degree of responsiveness of supply of a commodity with reference to a change in price of such commodity. It is always positive due to direct relationship between price and quantity supplied.

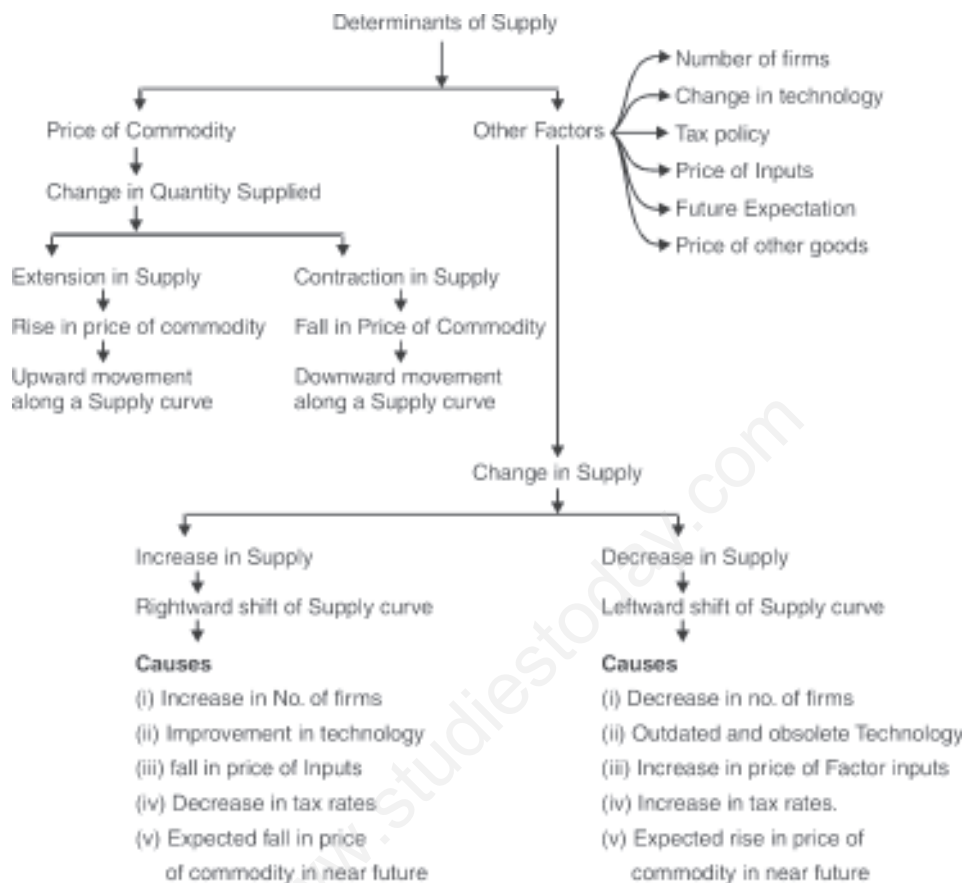
$$\text{Price Elasticity of Supply (Es)} = \frac{\text{Percentage change in quantity supplied}}{\text{Percentage change in price}}$$

- ❑ **Methods for measuring price elasticity of supply** :

1. Percentage Method
2. Geometric Method

- ❑ **Degrees of Elasticity of Supply** :

- (a) If the tangent to the supply curve passes through the point of origin, Es at that point is equal to unity.
- (b) If the tangent intersects the x-axis, Es at that point is less than unity
- (c) if tangent intersects the y-axis Es at that point will be greater than unity.



Very Short Answer Type Questions (1 Mark)

1. Define production function.
2. Define marginal product.
3. What will be the behavior of total product when marginal product of variable input is falling but is positive?
4. What is the relation between average and marginal product when average product is falling?
5. Define average production.
6. What do you mean by fixed factors of production? Give example.
7. By which behaviour of marginal product will total product be maximum

8. How does fall in total product affects marginal product?
9. What do you mean by cost?
10. Define explicit costs.
11. Which cost curve is parallel to ox-axis? Why?
12. What do you mean by implicit costs?
13. Define marginal cost.
14. Why does the difference between average total cost and average variable cost falls with increase in output?
15. Define Revenue.
16. At what rate average and marginal revenue falls, with fall in per unit price of a good?
17. What will be the behaviour of Average revenue when total revenue increases at constant rate?
18. What do you mean by marginal revenue?
19. What will be the behaviour of total revenue when marginal revenue is zero?
20. Why does average cost curve and averages variable cost curve never intersect each other?
21. What do you mean by producer's equilibrium?
22. State any two conditions of producers equilibrium according to marginal revenue and marginal cost approach.
23. Define supply.
24. What do you mean by individual supply schedule?
25. Define Market Supply
26. Name two determinants of supply.
27. What is meant by change in supply?
28. What type of change in price is the cause of upward movement along a supply curve?
29. What effect does an increase in tax rates have on supply of a commodity?
30. What causes a downward movement along a supply curve?
31. What is meant by leftward shift of supply curve?
32. How does a decrease in price of input effect supply curve of the commodity?

33. Why does a supply curve have a positive slope?
34. What is meant by elasticity of supply?
35. What is the price elasticity of supply, if supply curve is parallel to y-axis.
36. When does the elasticity of supply of commodity called equal to unity?
37. When does the producer increase the supply of a good at given price, give two reasons.
38. What causes an extension in supply?
39. If the price of a commodity falls by 10% and, consequently, the quantity supplied decreases by 20%. What will be its price elasticity of supply?

H.O.T.S.

40. Why is total variable cost curve parallel to total cost curve?
41. Why does average fixed cost fall with increase in output?
42. Why is total fixed cost curve parallel to ox-axis.
43. Under which situation will MR fall when an additional quantity of a good is sold?
44. What behaviour of per unit price will cause the equality of average and marginal revenue.
45. Give one differences between law of supply and price elasticity of supply.
46. What is the price elasticity of supply associated when the supply curve passing through to intersect to x-axis?
47. Why does a producer moves downward along a supply curve due to decrease in price of commodity?
48. What is the price elasticity of supply associated with when a supply curve passes through the origin at 40° angle?
49. When does the supply curve shift rightward while price remains constant.
50. What effect does an increase in price of competitive good have on the supply of a commodity?
51. How does the imposition of a tax affect the supply curve of a firm?

SHORT ANSWER TYPE QUESTIONS (3-4 MARKS)

1. Why does the law of diminishing returns apply?
2. How does total product behave with change in marginal product?
3. Briefly explain the causes of increasing returns to a factor with the help of marginal product.
4. Explain the likely behaviour of total product. When only the unit of a variable factor is increased to increase the output. Use numeric example.
5. Distinguish between total fixed cost and total variable cost.
6. Explain with the help of a diagram the relationship between Average cost, Average variable cost and Marginal cost.
7. Why is short run average cost curve 'U' shaped?
8. Explain diagrammatically the relationship between Average cost, Average variable cost and Average fixed cost.
9. What changes will take place in total revenue when
 - (a) Marginal revenue is falling but remains positive.
 - (b) Marginal revenue is zero.
 - (c) Marginal revenue is negative.
10. Define marginal revenue. Explain the relationship between average and marginal revenue when price is constant at all levels of output.
11. How does marginal revenue effect total revenue when price decreases to increase sale. Use Schedule.
12. What do you mean by producers equilibrium? State the conditions of producer's equilibrium with Marginal Revenue and Marginal Cost Curves.
13. Explain producer's equilibrium with the help of a numerical example using marginal revenue and marginal cost approach.
14. Draw in a single diagram the average revenue and marginal revenue curves of a firm which can sell any quantity of the good at a given price. Explain.
15. Complete the following table :

Output (Units)	Total Cost (Rs.)	Average Variable Cost (Rs.)	Marginal Cost (Rs.)
1	90	—	30
2	—	27	27
3	—	—	—
4	180	30	—

16. Given below is the cost schedule of a firm. Its average fixed cost is Rs. 20 when it produces 3 units.

Output (units)	1	2	3
Average variable cost (Rs.)	30	28	32

Calculate its marginal cost and average total cost at each given level of output.

17. Complete the following table :

Output (Units)	Average Variable Cost (Rs.)	Total Cost (Rs.)	Marginal Cost (Rs.)
1	—	60	20
2	18	—	—
3	—	—	18
4	20	120	—
5	22	—	—

18. Define market supply. Explain its two determinants.
19. Distinguish between 'Change in Supply' and change in quantity supplied.
20. Explain briefly two causes of a rightward shift of supply curve.
21. Differentiate between contraction in supply and decrease in supply.
22. How does change in price of inputs affect the supply of a good.
23. What is meant by elasticity of supply? What will be the price elasticity under following conditions :
- Percentage change in quantity is greater than percentage change in price.
 - Supply remain constant due to increase or decrease in price of the good.
24. A seller of potatoes sells 80 quintals a day when the price of potatoes is Rs. 4 per kg. The price elasticity of supply of potatoes is known to be 2. How much quantity of potatoes will the seller supply when the price rises to Rs. 5 per kg.
25. The coefficient of elasticity of supply of a commodity is 3. A seller supplies 20 units of the commodity. How much quantity of this commodity will the seller supply. When price rises by Rs. 2 per unit?
26. The ratio of elasticity of supply of commodities A and B is 1 : 1.5. 20 percent fall in price of A results in a 40 percent fall in its supply. Calculate

the percentage increase in supply of B if its price rises from Rs. 10 per unit to Rs. 11 per unit.

27. How does change in price of related goods affect the supply of given good.

H.O.T.S.

1. State the causes by which marginal product of a variable factor change from increasing return to diminishing return.
2. What would be the shape of average revenue curve when total revenue is positively sloped straight line passing through origin. Explain with the help of schedule and diagram.
3. What is a supply schedule? Explain how does change in technology of producing a good affect the supply of that good.
4. Following statements are true or false. Give reasons :
 - (a) At the stage of producer's equilibrium, marginal cost will be decreasing.
 - (b) AR curve always remain above MR curve.
5. Whether following statements are true or false. Give reasons.
 - (a) Marginal revenue falls twice the rate at which average revenue falls.
 - (b) Average cost starts increasing when rising portion of marginal cost intersects.
6. Following statements are true or false. Give reasons :
 - (a) Diminishing returns to a factor is applicable only when average product starts falling.
 - (b) AC and AVC curves do not intersect each other
7. Distinguish between leftward shift to supply curve and downward movement along a supply curve.
8. "The change in quantity supplied is explanation of law of supply". Explain.
9. Either following statements are true or false. Give reasons.
 - (a) There is inverse impact of change in tax rates on the supply of given good.
 - (b) Future expectation to increase in price increases the market supply of a commodity.
10. Explain the geometric method of measuring price elasticity of supply with the help of diagram.

LONG ANSWER TYPE QUESTIONS (6 MARKS)

1. Explain diagrammatically the effect on total output when units of one factor is increased and all other inputs are held constant.
2. Complete the following table

Output (Units)	Total Cost (Rs.)	Average Fixed Cost	Average Variable Cost	Marginal Cost
0	36			
1	—	—	—	18
2	—	—	—	14
3	—	—	16	—
4	—	—	—	24

3. What is producer's equilibrium? Explain the conditions of producer's equilibrium through the 'marginal cost and marginal revenue' approach. Use diagram.
4. State whether true or false. Give reasons.
 - (a) Total product is the area under the marginal product curve.
 - (b) When marginal product falls, average product always falls.
 - (c) For the first unit of output $MC = AVC$.
5. State whether True or False. Give reasons.
 - (a) When marginal revenue is constant and not equal to zero, then total revenue will also be constant.
 - (b) As soon as marginal cost rises, average variable cost also starts rising.
 - (c) Total product always increases whether there is increasing returns or Diminishing return to a factor.
6. State whether the following statements are true or false. Give reasons for your answer.
 - (a) When total revenue is constant average revenue will also be constant.
 - (b) Average variable cost can fall even when marginal cost is rising.
 - (c) When marginal product falls, average product will also fall.

ANSWERS

1 MARK QUESTIONS

1. Diminishing return to a factor
2. Marginal product is net addition to total product when one additional unit of variable factor is used.
3. Total product increases at diminishing rate.
4. MP falls but it falls at faster rate than AP
5. AP is a per unit output of a variable factor.
6. These factors of production which cannot be varied in short period e.g. machine, land.
7. When marginal product of a factor is zero, then total product will be maximum.
8. When total product falls, marginal product becomes negative.
9. Cost is the sum of explicit and implicit cost.
10. Those monetary payments by producer on factor and non factor payments is called explicit cost. Which are not owned by himself.
11. Total fixed cost because TFC remain constant at all level of output.
12. Implicit cost is the cost of self owned resources of producer.
13. Marginal cost is the net addition to total cost when one additional unit of output is produced.
14. It is because average fixed cost goes on falling with increase in output.
15. Revenue is the amount received from sale of output.
16. Marginal revenue falls twice the rate of average revenue.
17. Average revenue remains constant.
18. Marginal revenue is net additions to total revenue by sale of one additional unit of output.
19. Total revenue will be maximum.
20. Because AFC can never be zero at any level of output.
21. Producer's equilibrium is a situation where he gets maximum profit.
22. 1. $MR = MC$
2. Rising portion of Marginal cost curve intersects marginal revenue curve.

25. Supply refers to the amount of the commodity that a firm or seller is willing to offer for sale in a given period of time at various prices.
26. Individual supply schedule is a tabular representation showing various quantities of a commodity which a firm is ready to sell at different prices during a given period of time.
27. It refers the sum of total quantity supplied by all the firms in a market.
28.
 1. Number of firms
 2. Change in technology
29. Change in supply refers to increase or decrease in supply of a commodity due to change in factors other than price like technology, price of inputs, Goal of producer, Number of firms etc.
30. Due to increase in price.
31. As a result of increase in tax rates production cost increase, so the profit margin of producer will fall and producer will decrease the supply.
32. Decrease in price.
33. Due to change in other factors the supply of a commodity falls at same price than supply curve shifted to leftward.
34. As a result of decrease in price of input production cost falls then producers profit margin will increase so producer will increase the supply of commodity.
35. Because of positive relation between price and supply.
36. Price Elasticity of Supply (E_s) is a measure of degree of response of supply for a good to change in its price.
37. Perfectly elastic.
38. When percentage change in price is equal to percentage change in supply.
39. Due to change in other factor like improvement in technology, decrease in price of inputs.
40. Increase in price of a commodity.
41.
$$E_s = \frac{\% \text{ change in quantity}}{\% \text{ change in price}} = \frac{20\%}{10\%} = 2$$

H.O.T.S.

42. Total cost is the sum of total fixed cost and total variable cost. TFC remains constant at all levels of output.
42. AFC can be calculated from TFC. Which remains constant at all level of output.
43. TFC remains constant at all levels of output.
44. When per unit price falls by selling an additional unit of a good.
45. Per unit price remains constant.
46. Law of supply reflects the direction of change in supply where as price elasticity of supply measures the magnitude of change in supply.
47. Inelastic.
48. Because profit margin of firm (producer) decreases.
49. Equal to unity elastic.
50. When the supply of commodity increases due to change in other factors.
51. Supply of the commodity will fall.
52. The supply curve will shift to the left side.