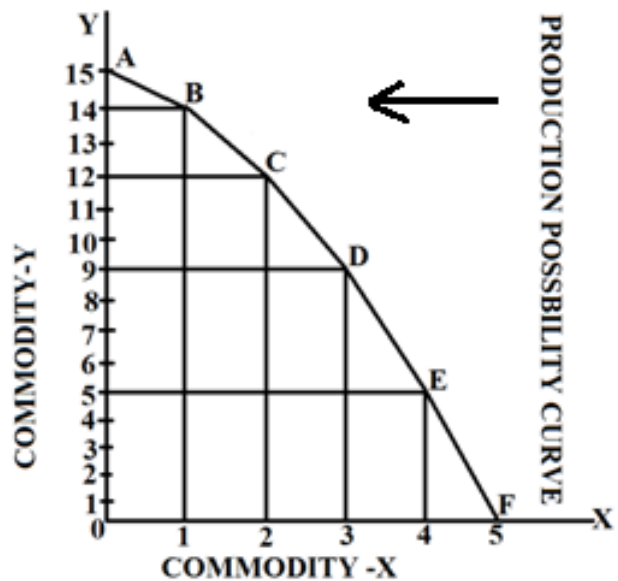


Chapter :-TRADITIONAL THEROY OF COST

1. **Real cost** :-the concept of real cost was advocated by the classical economists and later on supported by the noted economist Dr.Marshall. in the words of Dr.Marshall;”The exertion of all the different kinds of labour that are directly or indirectly involed in making it together with the abstinences or rather the waiting required for saving the capital used in making it, all these efforts and sacrifices together will be called the real cost of production of the commodity .”

2. **Money Cost:** money cost relate to out lays of a firm in the form of money for the production of a commodity. In the present day monetary economic, costs are generally expressed in terms of money. According to J.L.Hanson,”The money cost of preducing a certain output of a commodity is the sum of all the payments to the factors of production engaged in the production of that commodity and for non factor resources.



3. **Opportunity cost or alternative cost:** The concept of opportunity cost has been extensively used by the modern economists. The credit for popularizing the concept goes to an American economist knight. The opportunity cost of anything is the next best alternative that could be produced instead by the same factors or an equivalent group of factors costing the same amount of money .For example, a farmer who is producing of rice can also produce cotton with the same factor. Thus the opportunity cost of a quintal of rice is the amount of the output of cotton **sacrificed**. According to

Ferguson,”The alternative or opportunity cost of producing one unit of x-commodity, is the amount of commodity Y that must be sacrificed in order to use resources to produce X rather than Y.”

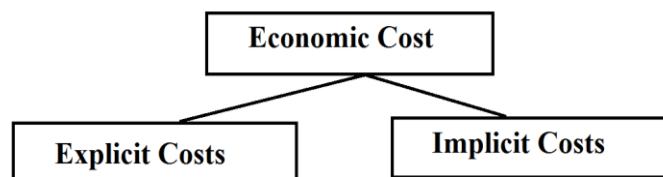
The concept of opportunity cost can be explained with the help of production possibility curves.

In Fig. I AF is a production possibility curve. If we produce 15 units of commodity-Y, its opportunity cost is the sacrifice of 5 units of commodity-X. At point B, 14 units of commodity Y and one unit of commodity-X is produced. The opportunity cost of 14 units of commodity Y is 4 units of X-commodity foregone. Similarly the opportunity cost of 4 units of X is 10 units of Y sacrificed. Points C, D, E and F also indicate opportunity cost on the same pattern as discussed above

4. Accounting cost: Accounting costs refer to outlay cost or expenditure that is incurred by a firm to undertake production of a commodity. In other words, all those expenses incurred by a firm that enter the account of the accountant in course of production are known as accounting cost.

5. Sunk cost: Sunk costs are retrospective (past) costs that have already been incurred and cannot be recovered. These costs are sometimes contrasted with prospective costs which are cannot be recovered. These costs are sometimes contrasted with prospective costs, which are future costs which may be incurred if some productive activity is undertaken.

6. Economic cost: Economic costs refer to the accounting costs of the firm and costs arising out of self-owned and self employed factors or resources of the firm



- (i) **Explicit cost:** Explicit cost refers to the payments made by the firm to the hired factor of production. These costs are explicitly paid by the firm to those outsiders, who supply labour services, land capital, raw material, fuel and power, transportation etc. Explicit cost is also called accounting cost or 'paid out cost' or is absolute cost, In the words of

Leftwich “Explicit cost are those cash payment which firms make to outsiders for their services and good”.

- (ii) **Implicit cost:** In addition to the hired factors, a firm may use certain resource which the firm itself owns or the self-owned resources. The cost of self-owned and self employed resources are implicit cost from the point of a firm costs are the money payment which the self-owend resource could have eared in their best alternative employments. These costs include interest on the capital invested by the entrepreneur, salary for managerial services of the owner manager etc. The implicit cost must be imputed. In the words of Leftwich, Implicit costs are costs of self-owned and self-employed resources. Implicit costs are also known as imputed cost since the values of the owned inputs are imputed or estimated from what they could earn in their best alternative use,”

7. Direct cost: Direct costs are these which have direct relationship with production of the commodity. These costs are directly and definitely identifiable. Direct costs vary with the variation in output. These costs are also known as ‘traceable costs’ e.g. the cost of raw material in the production of cloth is a part of direct cost.

8. Indirect cost:- Indirect costs are those which cannot be easily and definitely identifiable in relation to production of a product. These costs may or may not vary with change in output and hence are both the fixed and variable type. Indirect costs are also called also called as ‘non-traceable costs’.

9. Private and social cost:- Private costs are those explicit and implicit costs of producing a product which are some by the producer himself. Social costs consist of private costs plus whatever other costs may be imposed on other people producers or firms, a part of these costs are imposed upon society.

e.g. pollution caused by emission of smoke and other residue by a firm represents a social cost because it causes health problems and adds to their medical expenses. These expenses are not borne by that particular firm which is causing, pollution. These are the result ‘externalities’ or by-

product effects. Social costs are inclusive of both private costs and by-product costs or external costs.

Social costs = Private costs + External Costs

Cost Function: Cost function means dependences of cost on factors affecting cost. Cost function of a firm is determined by following factors:

- (i) Prices of factors of production to be employed by the firm
- (ii) Productive capacity or output of the firm
- (iii) Technique of production
- (iv) Time period

Assuming perfect competition in the factor market and given factor prices, with given technique of production costs of a firm are affected by level of output and time period concerned as the production pertains to two time periods i.e. short period and long period.

The short period is that period during which some factors remains fixed while others are variable. The long run is that period over which all factors are variable. It may, however be noted that the short run and the long run are not definite periods of calendar time. Infact they are sets of conditions and not time periods. In the short run, some factors like. Infact they are sets of conditions and not time periods. In the short run, some factors like capital and entrepreneurship are fixed a firm can expand output to a limited enters only by increasing the use of other factors. In the long run, all inputs are variable and output cannot be expanded to indefinitely large quantity. Thus, the short period is any span of time in which fixed factors cannot be varied and variable factors/resources can be increased or decreased.

Symbolically, we may write the short period and long period cost function in the following manner:

Time period	Cost Function
-------------	---------------

Long period

$$C = f(X, T, P_{fk})$$

Short period

$$C = f(X, T, T_f, K)$$

Where

C = Total Cost

X = Output

T = Technology

P_f = Price of factors

K = Fixed factors

Theories of Costs

There are primarily, two theories of costs

I. Traditional theory of costs

II. Modern theory of costs

1. Traditional Theory of Costs: The traditional makes a distinction between short period and long period. According, there are short run costs and long run costs.

(a) Short Run Costs: Closely related to fixed and variable factors in the short run, there are fixed and variable costs. On the basis of these costs, traditional economists have defined various types of costs as explained below:

Short-Run Costs

Total Fixed Cost
(TFC)

Average Fixed Cost
(AFC)

$$AFC = \frac{TFC}{\text{Output}}$$

Marginal Cost
(MC)

$$\text{Or } MC = TC_n - TC_{n-1}$$

$$MC = \frac{\text{Change in TC}}{\text{Change in output}}$$

$$\text{Or } MC = \frac{\Delta TC}{\Delta Q}$$

$$\text{Or } MC = \frac{\Delta(TFC+TVC)}{\Delta Q}$$

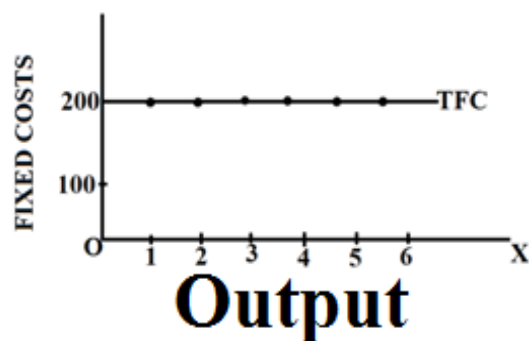
		$\text{Or } MC = \frac{\Delta TVC}{\Delta Q}$ $\therefore \Delta TFC = 0$
Total Variable Cost (TVC)	Average Variable Cost (AVC)	$AVC = \frac{TVC}{\text{Output}}$
Total Cost (TC)	Average Cost (AC)	$AC = \frac{TC}{\text{Output}}$ $= \frac{TFC}{\text{Output}} + \frac{TVC}{\text{Output}}$ <p>Or $AC = AFC + AVC$</p>

Total cost. Total cost signifies nothing but the money cost including both explicit and implicit costs total cost goes on increasing with the increase in the volume of output. In other words, fixed costs and variable costs taken together constitute the total cost of the firm.

- (i) Fixed cost or supplementary costs. We know that in the short run the short run firm uses both fixed as well as variable factors of production. The cost incurred on the fixed factors is known as fixed cost. Fixed costs are these costs which have nothing to do with the volume of output i.e., at every level of output, it remains the same. In other words fixed costs do not rise with the rise in production and vice-versa. Even if output falls to

zero, the firm has to incur fixed costs. Fixed costs are also known as overhead costs and include charge such as contractual rent, maintenance costs, manager's salary, interest on the capital invested etc. the concept of fixed cost may be explained with the help of the following table and graph:

Quantity	Fixed costs (In Rs.)
0	200
1	200
2	200
3	200
4	200
5	200
6	200



Obviously, fixed cost does not change with the change in output. Even when the level of output is zero, fixed costs amount to Rs. 200. And when output curve rises to six units, fixed costs remain the same i.e. Rs. 200.

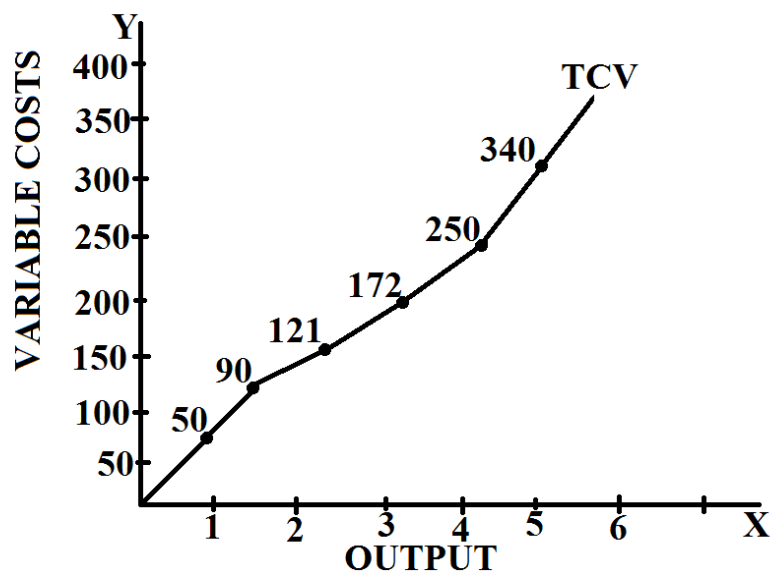
Similarly in the given figure, TFC curve, total fixed cost curve runs parallel to X-axis illustrating that at every output level, fixed costs are the same.

- (ii) **Variable cost or prime costs:-** In the short-run some factors of production are variable and the firm can make changes in these factors if necessary. Variable costs are those

costs which are incurred on the variable factors. These costs vary with the level of output with the increase in output, variable costs rise and vice-versa. And if output falls to zero, variable costs also fall to zero. These costs include payments such as wages of labour employed, the price of the raw material fuel and power used etc. In the words of D.S. Watson, ‘The variable costs are those which vary with volume of output. These costs include wages payments for raw material and other goods bought by the firm, payments for the fuel taxes (if any) interest on short-term loans etc.’”

Since the volume of output of a firm depends upon variable costs, Marshall calls these costs as prime costs. The concept of variable or prime costs can be appreciated with the help of the following table and graph.

Quantity (units)	Variable cost (in Rs)
0	0
1	50
2	90
3	121
4	172
5	250
6	340



The above table and graph clearly demonstrate that variable costs go on rising with the increase in the volume of output. In the figure, TVC is the variable cost curve which slopes upward from left to right indicating that with the increase in output, total variable costs also rise. However, TVC is a curve and not a straight line and this amounts to saying that the rate of increase of variable costs undergoes a change with the increase in volume of output.

(iii) **Total costs:-** Total costs of production is the sum of its total variable costs and total fixed costs. In other words.

$$\text{Total Costs} = \text{Total Fixed Costs} + \text{Total Variable Costs}$$

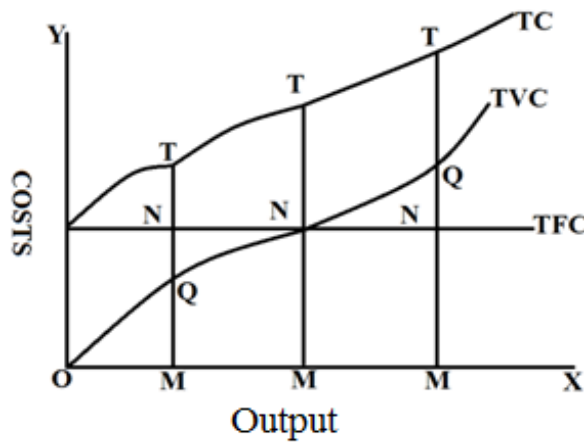
$$\text{Or } \text{TC} = \text{TFC} + \text{TVC}$$

Costs in the short Run: Fixed and variable costs

Quantity (units)	Fixed (In Rs.)	Variable cost (In Rs.)	Total cost (In Rs.)
0	200	0	200
1	200	50	250
2	200	90	290
3	200	121	321
4	200	172	372
5	200	250	450
6	200	340	540
7	200	470	670
8	200	696	896

The table given above clearly illustrates that the fixed costs remain constant Rs. 200 independent of the level of output. On the other hand total variable costs and total costs go on increasing with the increase in output and both rise at the same rate. At all level of output the difference between total costs and total variable cost amounts to total fixed cost.

Since total cost is the sum of firm's total variable cost and total fixed cost, thus firm's total cost curve is obtained from the vertical summation of total fixed cost curve and total variable cost curve. Total fixed costs remain constant throughout. But the total variable costs and hence the total costs respond to change in the level of output and the rate of change in the total variable costs and the total costs is the same because the distance between the TVC and TC represents the amount of TFC. Similarly the difference between TC and TFC shows the amount of TVC. The following graph will clarify the nature of relationship between TC, TVC and TFC.



In the above figure, TFC is the total fixed costs curve which runs parallel to X-axis which suggests that total fixed cost does not change with the change in output. TVC and TC signify total variable costs and total cost which slope upwards from left to right indicating that both increase with the increase in output. And the difference between TVC and TC is suggestive of total fixed costs which remains the same at all levels of output.

In the above figure no. 4, TC is the total cost curve and it derived from the summation of TFC and TVC. At OM amount of output:

$$\text{TFC} = \text{MN}$$

$$\text{TVC} = \text{NT or MQ}$$

$$\text{TC} = \text{MN} + \text{NT}$$

At OM_1 level of output the total fixed cost remains the same i.e. $M_1N_1 = MN$ but total variable cost is N_1T_1 . Thus total cost $M_1T_1 = M_1N_1(TFC) + N_1T_1$ (Total variable cost) in the same manner, at OM_2 level of output

Total cost $M_2T_2 = M_2N_2(TFC) + N_2T_2$ or M_2Q_1 .

Short Run Average costs

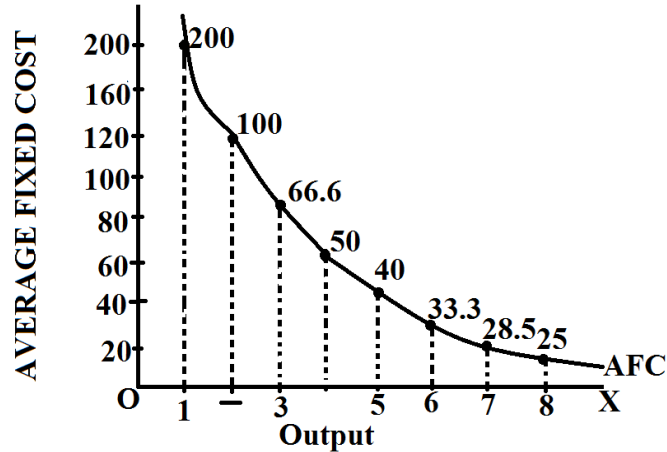
From the stand point of price determination the concept of average is more important as compared to that of the concept of total cost. Average cost are of the following types:

1. **Average Fixed Cost:** Average fixed cost can be calculated dividing the T.F.C. with total output. Total fixed cost remains fixed and does not change with the output. When output increases the total fixed cost gets distributed over a large number of output or average fixed cost goes on decreasing with the increase in output as is clear from the table given ahead. What the firm produces one unit of output then average fixed cost is RS. 200 and if the output increases to six units, average fixed cost goes down to Rs. 33.3 but it is to be taken into account that average fixed cost can never be zero. Average fixed cost goes down fast in the initial stages but with the increase in output it no doubt goes down but slowly. $AFC = TFC/output$.

Average Fixed Cost

Unit of Output	Fixed Cost (Rs.)	Average Fixed Cost (Rs.)
1	200	200.0
2	200	100.0
3	200	66.6
4	200	50.0
5	200	40.0
6	200	33.3
7	200	28.5

8	200	25.0
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It is clear from the above diagram that average fixed cost goes on diminishing with the increase in output. It is because of the fact that total fixed cost is divided by the increasing units of output. When the firm produces one unit of output, then AFC is RS. 200 and if the output increases to two units, it falls to Rs. 100 $\left(\frac{200}{2} = 100\right)$. When output increases to three units, AFC fall to Rs. 66.6 $\left(\frac{200}{3} = 66.6\right)$ and so on. It is clear that AFC goes on falling with the increase in output.

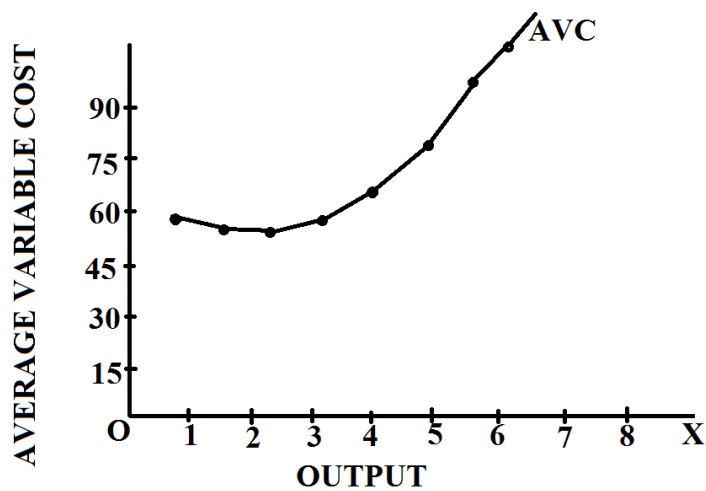
2. **Average variable Cost:-** Average variable cost can be calculated by dividing the total average cost with the output. It goes down with the increase in production in the beginning but after a limit it starts increasing and continues with the increase in output.

$$AVC = \frac{TVC}{Q} \left\{ \begin{array}{l} AVC = \text{Average variable cost} \\ Q = \text{Output} \\ TVC = \text{Total variable cost} \end{array} \right.$$

It is clear from the table given below that with the increase in output average variable cost goes down initially and then it starts increasing and thus the average variable cost curve is 'U' shaped. The reason of this curve being 'U' shaped is the application of law of variable proportions. In the beginning for the increase in output, the variable factor is increased the proportion between

variable factor and fixed factor improves in other words the fixed factor is utilized in a better way and average variable costs start diminishing. But after the ideal combination of the factors of production, with the increase in variable factors average variable cost starts rising. In this way we can state, in brief that if the output is less than the full productive capacity of the firm the average variable cost decrease but after a point when these are at minimum level these start increasing. Thus average variable costs are ‘U’ shaped. In the table given below up to the third unit, average variable cost falls, it is minimum at the third unit and starts increasing later on.

Output	V.C.	AVC
0	0	0
1	50	50.0
2	90	45.0
3	121	40.3
4	172	43.0
5	250	50.0
6	340	56.7
7	470	67.1
8	696	87.0



In this above diagram, it is clear that as the output increase up to the 3rd unit, AVC decreases but after that it goes on increasing. When the 3rd unit is produced AVC is at its minimum point. Average variable cost curve initially comes down and then it starts rising. It is because of application of the law of variable proportions. According to this law, the costs fall initially when output is expanded up to the optimum point is crossed the costs start increasing. At the optimum level, the average cost is at its minimum.

Averages Cost:- Per unit cost of output is known as average cost. According to Prof .Ferguson, ‘Average cost si total cost is total cost divided by output’ .Prof. Dooley opines, “ The average cost of production is the total cost per unit of output:

$$AC = TC \div Q \text{ (Here, } AC = \text{Average Cost, } TC = \text{Total Cost, } Q = \text{Output)}$$

According to McConnel “Average total cost can be found by dividing total costs by total output or simply by adding AFC and AVC”.

$$AC = AFC + AVC \left\{ \begin{array}{l} AC = \text{Average Cost} \\ AFC = \text{Average Fixed Cost} \\ AVC = \text{Average Variable Cost} \end{array} \right.$$

It is clear from the table given above that average cost can be found out by adding average fixed cost and average variable cost, up to the fifth unit, it falls, at sixth unit it is minimum and constant and after this it starts rising.

Why is the average cost curve U-shaped?

The following are the causes why the average cost curve is U-shaped. In other words average cost falls in the beginning and after a limit it starts rising. The main reasons for this behavior of the cost are given below:

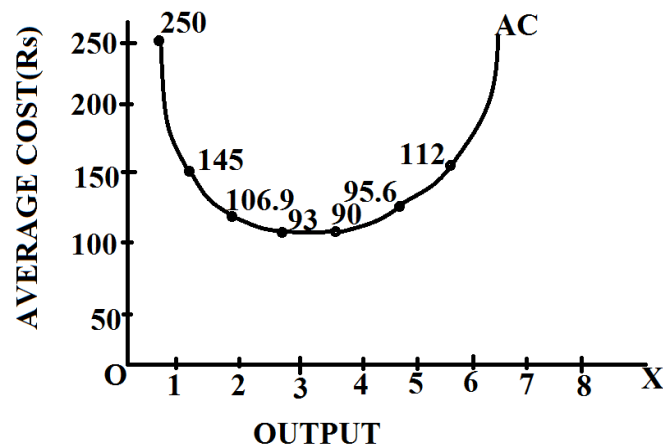
- (1) Average cost is the summation of average fixed cost and average variable cost. When a firm starts, it is not able to utilise its full capacity and when it increases its production, the average fixed cost and average variable cost start falling consequently average cost curve which is the summation of average fixed cost and average variable cost curves starts falling

but when a firm utilises its fullest capacity, the average cost is at its minimum. But beyond this optimum level AFC continues to go down but average variable cost starts rising. As the rate of fall in average fixed cost (AFC) is very slow and rate of rise in AVC is high, consequently AC starts rising and with the increase in output the AC goes on increasing. It is clear thus, that AC curve first falls to a limit and then it starts rising. Therefore AC curve is U-shaped.

(2) Secondly AC curve is U-shaped because of the application of law of variable proportions. Initially when the variable factors are increased to increase production, the fixed factors are more efficiently utilised. Consequently the firm derives internal economies and the cost of production falls. When the variable factors are increased to the extent that fixed factors are utilised fully, the average cost is at its minimum. Beyond this limit, variable factors increase to increase the production and internal diseconomies start accruing. In other words law of diminishing returns operates consequently, AC curve rises and continues to rise with the increase in production.

AVERAGE COST

Units of Output	Average Fixed Cost (Rs.)	Average Variable Cost	AC = AFC + AVC (Rs.)
1	200	50.0	250.0
2	100	45.0	145.0
3	66.6	40.3	106.0
4	50.0	43.0	93.0
5	40.0	50.0	90.0
6	33.3	56.7	90.0
7	28.5	67.1	95.0
8	25.0	87.0	112.0



The average cost can be explained with the help of a table and a figure. As is clear from the table and figure given above average Cost = Average Fixed Cost + Average Variable cost. It falls up to a point and then starts increasing. The shape of this curve is like the English word ‘U’. It is again according to the law of variable proportion. As we increasing the output, the average cost falls because of increasing returns or diminishing cost. After a limit, the average cost starts rising because of the increasing cost or diminishing returns. When the output is optimum the average cost is at its minimum. It means at this level of output the factors are being fully utilised and as a result of it the average cost is at its minimum .

Marginal cost. Marginal cost is very important from the equilibrium point of view. Marginal cost is the net addition to total cost when one more unit is added to the total production. According to Reynolds, “The cost of producing one additional unit of product is known as marginal cost of that unit,” Prof. P.C. Dooley opines that due to change in total production, whatever change comes in total cost, it is known as marginal cost.”

In the words of Ferguson, “Marginal cost is the addition to total cost attributable to the addition of one unit of output.” It can be calculated by subtracting the total cost of producing N – 1 units from the total cost of production ‘N’ units.

MC = Total cost of producing ‘N’ units Total cost of producing N – 1 units.

$$MC = TC_N - TC_{N-1}$$

It is clear from the definitions of marginal cost that if additional unit of output is added, the increase due to that in total cost is known as marginal cost. For example, if a firm produces 10 units of a commodity, its total cost is Rs. 200. Now if that firm produces 11 units (one more unit as compared to previous units), its total cost increases to Rs. 209. The difference between the previous total cost Rs. 200 and total cost of 11 units Rs. 209, is the marginal cost, it can thus be Rs. 209 - Rs. 200 = Rs.9

Prof Leftwich has tried to make clear the concept of marginal cost through variable costs. According to him, the marginal cost is the change in total variable cost due to an additional unit of production. It is because of the reason that when an additional unit of output is produced in the short run the fixed costs do not change and due to increase in variable costs, total cost increase just equal to the increase in variable costs. In other words the increase in the total cost equals the increase in variable costs. In the above example suppose the total cost of 10 units of output is Rs. 200. Fixed cost = (Rs.100) + variable costs (Rs. 100). By producing an extra unit of output. Total cost = fixed cost (Rs. 100) + Variable cost (Rs. 109) = Rs. 100+ Rs. 109 = Rs. 209. Marginal cost Rs. 209 -Rs. 200 =Rs.9. Thus, it is clear, that marginal cost is an additional cost to variable cost due to an additional unit of output: the same increase takes place in total cost and it is known as marginal cost. It can be expressed through the following the following formula:

$$MC = \frac{\Delta TC}{\Delta Q} \text{ or } MC = \frac{\Delta VC}{\Delta Q}$$

Here

MC = Marginal cost

ΔTC = Change in total cost

ΔVC = Change in Variable cost

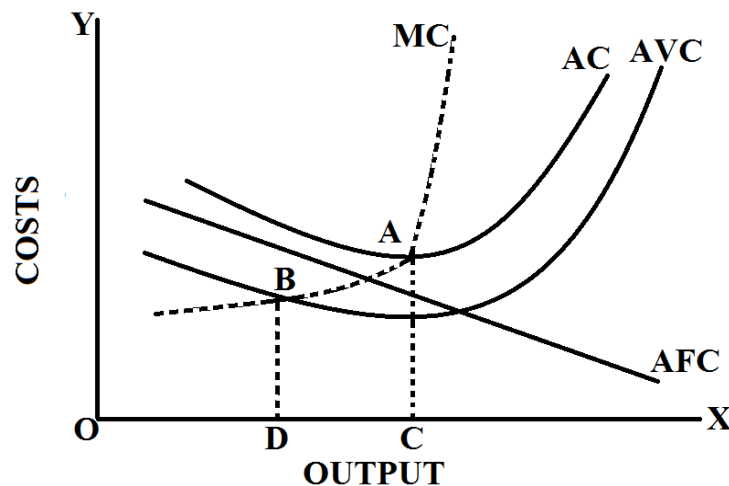
ΔQ = Change in output

Δ = change

It is clear from the table given ahead that Marginal cost falls in the beginning with increase in output and after a point, it starts rising.

Output	F.C	V.C.	T.C	A.F.C	AVC	AC	MC
0	200	0	200	—	—	—	—
1	200	50	250	200	50.0	250	50
2	200	90	290	100	45.0	145	40
3	200	121	321	66.7	40.3	107	31
4	200	172	372	50.0	43.0	93	51
5	200	250	450	40.0	50.0	90	78
6	200	340	540	33.3	56.7	90	90
7	200	470	670	28.5	67.0	95.5	130
8	200	696	896	25.0	87.0	112.0	226

As is clear from the table, MC decrease up to the three units of output and it is 31 (minimum) and after that, it starts increasing. Marginal cost can also be calculated from variable cost. By changing one unit o output the change which takes place in variable cost, is marginal cost.



Thus, it is obvious that marginal cost curve is U- shaped. The curve first goes down up to a limit and then it starts rising.

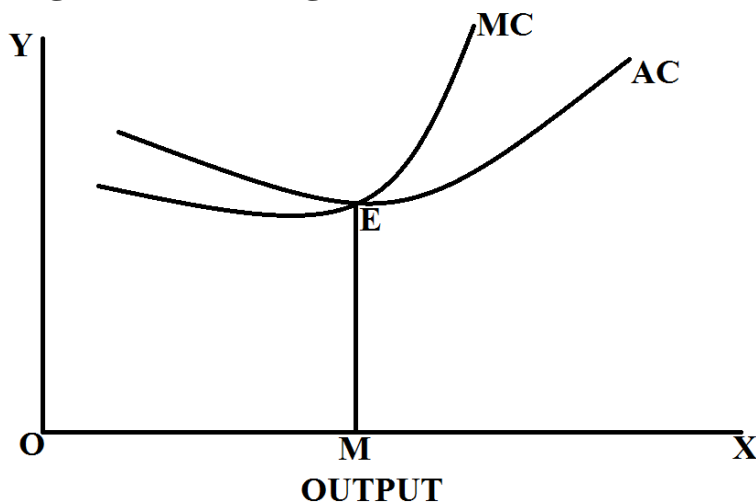
Why is MC curve U-shaped? Marginal cost is an addition to total cost or variable cost by producing an additional unit. In the beginning when production is increased, the total cost increases at diminishing rate, which means the cost of an additional unit is less than that of the

previous unit. In other words, marginal cost diminishes and MC curve slope downwards. But after a limit the total cost increases with increasing rate and marginal cost goes on increasing and MC curve rises upwards. Thus MC curve is U- shaped.

Relationship between short period costs: We have already studied total cost, fixed cost, variable average fixed cost, average variable cost, average cost and marginal cost. The relationship among all these concepts can be explained with the help of table and diagram given above. The main points of relationship are given below:

- (i) It is clear from the table and diagram given above that average fixed cost (AFC) goes on diminishing with the increase in output. It is because of this, AFC curve goes on diminishing. It slopes down steeply in the beginning but later on its slope is less. In other words it falls slowly
- (ii) AC curve goes down initially but after a limit it starts rising. Its minimum point is 'A' which means before point 'A' AC curve is falling and after this point, it is rising. Thus AC curve is U-shaped
- (iii) In the diagram, AVC is average variable cost curve which is U-shaped. It slopes down with the increase in output and after a limit, it starts rising. Its minimum point is B.
- (iv) MC is marginal cost curve and it is U-shaped. It also slope down with the increase in output and after a limit, it starts increasing MC curve cuts AVC curve at its minimum point (B) and AC curve at its minimum point (A). The minimum point B of AVC is on the left hand side of minimum point A of AC curve. It means AVC reaches its minimum point earlier than that of AC and it starts rising earlier than AC.

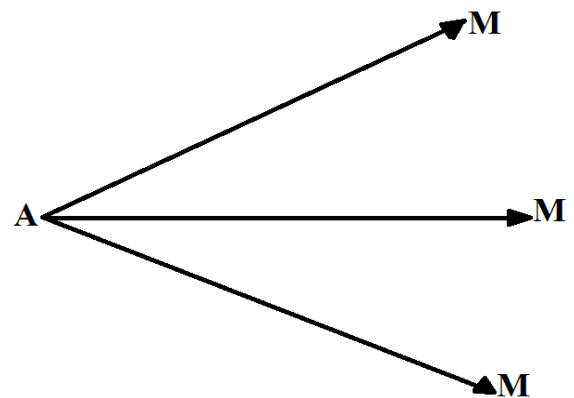
Relationship between Average cost and Marginal cost



From the angle determining the price a commodity, the study of relationship between cost and marginal cost is very important. The relationship is clear from the table given above and the diagram ahead shows it:

In the table given above and the diagram no.9, the average cost and marginal cost are shown. The relationship of AC and MC is clearly shown with the table and the adjacent diagram.

1. **AC and MC are derived from total cost.** Average cost is calculated by dividing total cost with the units of output. MC is an addition to total cost by producing an additional unit. Thus, it is clear that average cost and marginal cost are calculated from total cost.
2. **When both AC and MC fall. MC falls, more than AC.** When AC curve and MC curve are falling. MC curve is below AC curve. In other words, when these are falling at every level of output, MC is less than AC. It is because of the reason that AC is calculated for both fixed cost and variable cost, whereas MC is influenced by average variable cost only.
3. If both AC and MC are rising, due to higher rate of increase is MC as compared to AC, MC curve is higher than AC curve. In the schedule given above after the sixth unit, both are increasing and the rate of increase in MC is more than that of AC.
4. **MC curve cuts AC curve at its minimum point:-** It is obvious from the table given above that AC and MC are equal at sixth unit. AC is minimum at the point. After this average cost increases as the output increases. As MC and AC are equal at sixth point, therefore MC cuts AC at point E (as shown in Fig.9) which is the minimum point of AC. Thus it is clear that MC curve cuts AC curve at its minimum point.



5. The relationship between AC and MC can be shown with the above diagram N. 10. It clearly shows when there is an increase in AC, MC cost does increase and is more than AC. When AC is constant, MC is equal to AC and when AC is falling, MC falls more than AC and Marginal cost is below the average cost.

Long Run Costs

Every firm produces in the short run but the production plans are based on long run. To study the long term production plans, it is necessary to study long costs. But before we discuss the long costs, we try to understand the meaning of long run.

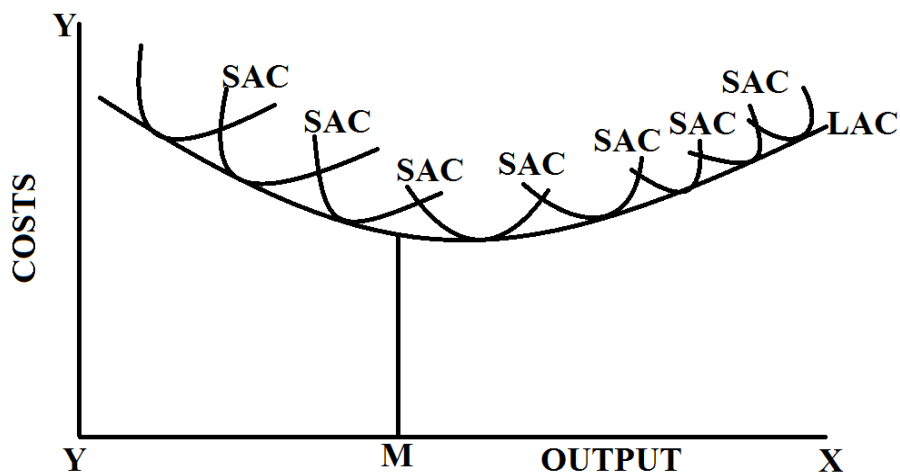
By the long-run we mean a time period which is long enough during which the difference between the fixed and variable factors is no longer there and all the factors of production in this period are variable factors. In other words, a firm can change its productive capacity according to one's requirement in the long-run. According to McConnel, "Long-run is a period of time, long enough to enable the firm to change its output its output by changing not only variable factors, but also the fixed factors like capital equipment."

Long-run is the period of time long enough for the firm to be able to vary the quantities of all input used. Thus, in the long-run there are no fixed factors and no fixed costs. All resource are variable. Therefore, the number of firms is subject to change. It means that new firms may enter the market and some of the existing ones may leave. There is not only the possibility of the expansion of the firm but also of the growth of the industry. An important aspect of the long-run is that it is a planning Horizon. For this period, the firm plans ahead to build the most suitable scale of plant to produce the future level of output. Of course the firm operates in the short period once the firm has built a particular scale of plant, it operates in the short-run. In other words the firm operates in the short-run and plants in the long run. The implementation of these long run plans determine the particular short run situation in which the firm will operate in the future. According to Leftwich, "The long run may be compared with the action sequence of a motion

picture. If we stop the film and look at a single picture we have a short run concept.” What he means to say is that the long run is made up of a series of short periods and the short period is a part of the long-run period

DIFFERENT NAMES OF LAC

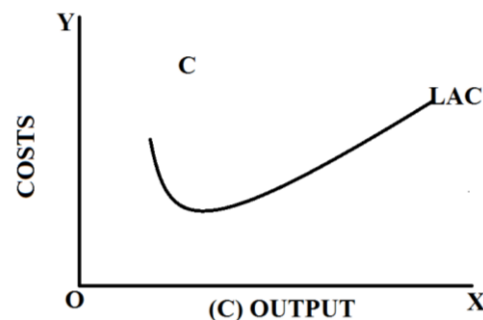
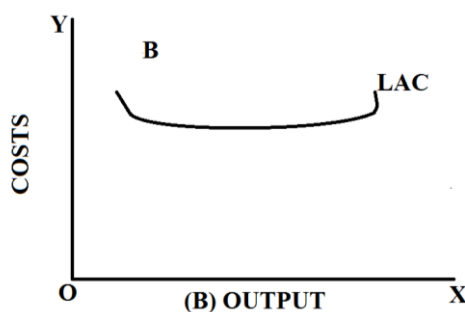
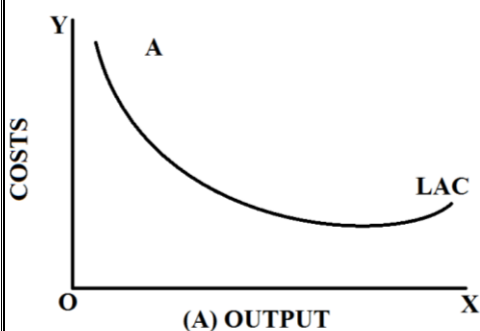
1. **Envelop Curve:** Long-run average cost curve is known as an envelope curve, because it covers all the possible short-run average cost curves. It means that the long-run average cost cannot be higher than the indivisible factors of



production can be fully utilized, which is not possible in the short-run. The long-run average cost curve envelope the short-run average cost curves, it does not intersect these, it only touches these. It is because of this, that the long-run cost curve is called an Envelope curve. It is shown by the following diagram.

2. **Planning Curve:-** Long-run average cost curve is also known as planning curve because with its help, the entrepreneurs can prepare plane to produce a certain amount of output with the suitable size of the plant so that its average cost is minimum.

Different Shapes of LAC Curve:- Normal LAC curve is U-shaped which means it slopes down in the beginning and after a limit, starts increasing. But long-run average cost curve is flatter than the pronounced shape of short run cost curve. LAC can be of different shapes in different conditions as is shown in the diagrams below:



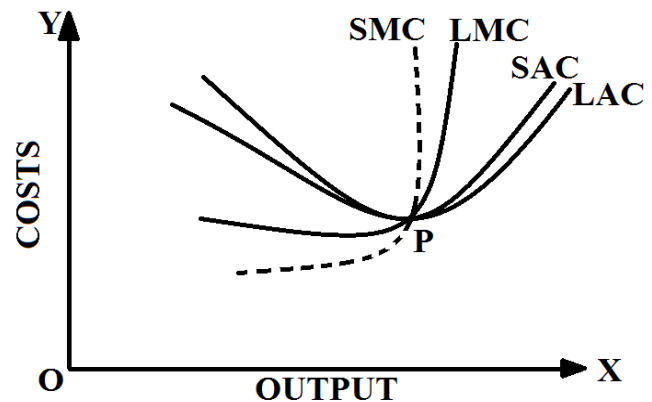
In diagram (A) LAC is the long-run average cost curve which is sloping downwards from left to right. This shape of LAC is possible when the law of increasing returns operates. In other words when scale of production is increased the economies scale accrue in large quantity. In the fig (B), the large part of LAC is parallel to X-axis. It indicates towards the operation of the laws of constant returns. In other words in this case, the average cost of production remains constant. In diagram (C), LAC rises upward from downwards expresses the fact that law of diminishing returns starts operating and soon the diseconomies of scale start accruing and with the increase in production, average cost goes on increasing. Thus the shape of LAC is such when the law of diminishing returns operates.

LONG-RUN MARGINAL COST CURVE

By the long-run marginal cost is meant the addition to total by adding one more unit of production. According to Leftwich, “ **The LMC curve shows the changes in long-run total cost per unit firm’s output, when the firm has ample time to make the output change by changing all resoureces.**”

The long-run marginal cost curve is also U-shaped. The reason behind the shape of LMC is the same which is behind the shape of long-run average cost.

The relationship between the long-run average cost is the same which is there in case of short run average cost curve and short-run marginal cost curve. In other words, when long-run average cost falls, long-run marginal cost is less than the average and when average is constant the marginal is equal to it and when long-run average cost starts increasing marginal cost is



more than the average. It is clear in the following diagram. When a firm decides a suitable plant to produces a certain amount of output then at this level of output, the long-run and short-run cost of

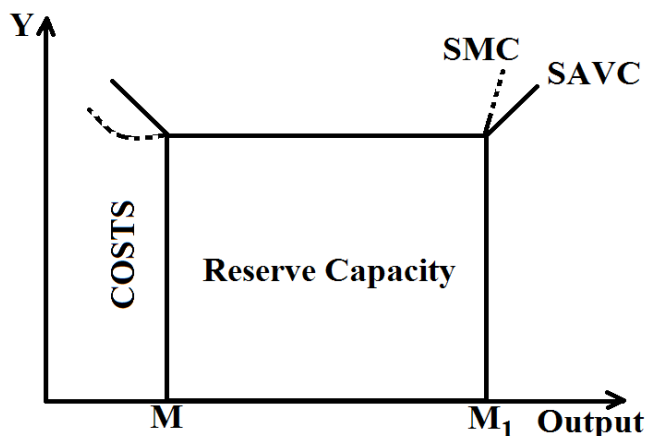
a firm are equal. It is known as optimum output and at this level, $SMC = LMC$, as is clear in the above diagram,

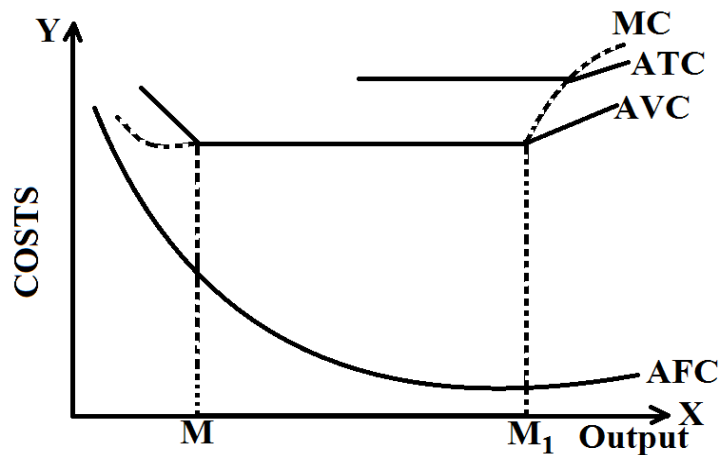
It is clear from diagram that the LAC is falling, then LMC is below that and when LAC is increasing LMC is above the LAC. Point 'P' in the minimum point of LAC, where LMC becomes equal to it.

Modern Theory of Cost

Modern economists including Stigler, Andrews and Friedman have questioned the validity of U-shaped cost curve both on theoretical as well as empirical grounds. Stigler as suggested that short-run average variable cost has a flat stretch over a range of output on account of some flexibility in productive capacity of the firm. The long run cost curve as per modern economists, is not U-shaped but L-shaped. Let us discuss these cost curves in detail.

- (A) **Short-Run Cost:-** Like the traditional theory short-run costs are divided into average variable costs and average fixed costs. Average fixed cost curve is a downward sloping curve as explained by the traditional economists. But short run average variable cost curve (SAVC) is not U shaped, rather it is saucer-shape and has a flat stretch over a range of output. This flat stretch represents the built-in reserve capacity of the firm to meet seasonal and cyclical changes in demand. Over the flat stretch, SAVC and MC are equal and as a result SAVC curve and MC curve coincide with one another. To the left of this flat stretch, SMC lies below SAVC while to the right of the why MC curve lies above SAVC curve as shown in Fig.16



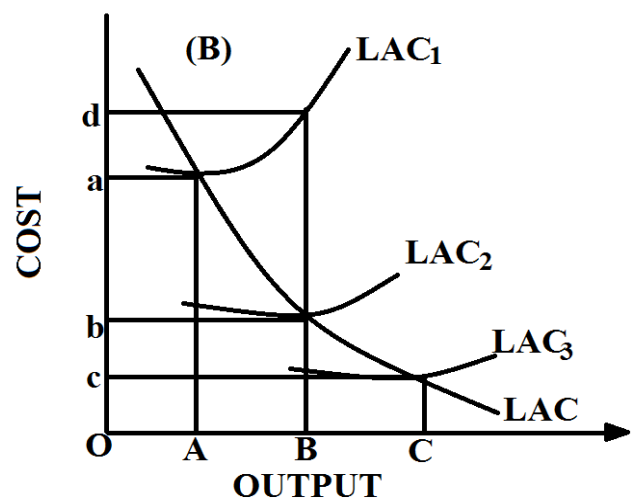
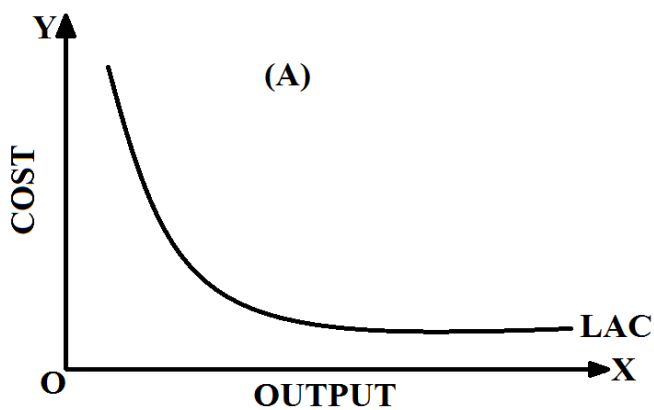


Average total cost (ATC) is obtained by adding together AVC and AFC at each level of output.

ATC curve is shown below in fig.17

ATC curve falls up to the level of output OM_1 at which reserve capacity is exhausted and beyond that it is rising upward.

- (B) **Long-Run Costs:** Modern economists divide long run costs into production costs and managerial costs. In the long run, all costs are variable and they give rise to a long-run average cost (LAC) curve which is roughly L-shaped. This curve rapidly slopes downwards in the beginning but later remains flat or slopes gently downwards at its right-hand end. Thus is shown in fig. 18.



The L-shape of LAC is on account of two factors-

- (i) **Technological Progress:** Fig 18(A) Shows that in the beginning the firm produces OA output at a cost of Oa per unit. If demand increase, the producer may expand to OB at a cost of Od per unit. However, if there is technological progress, OB output can be produced with a new plant size represented by LAC_2 where average cost is Ob.

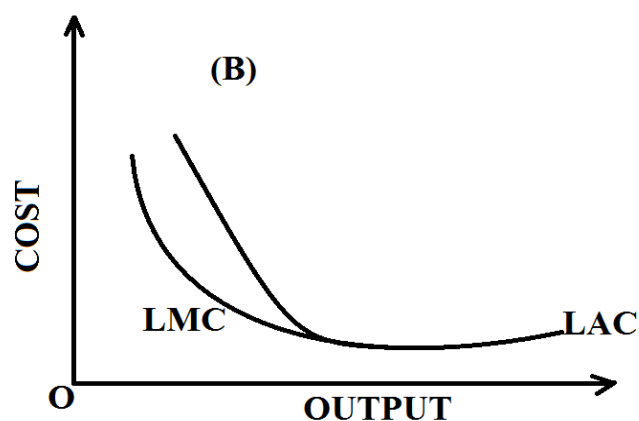
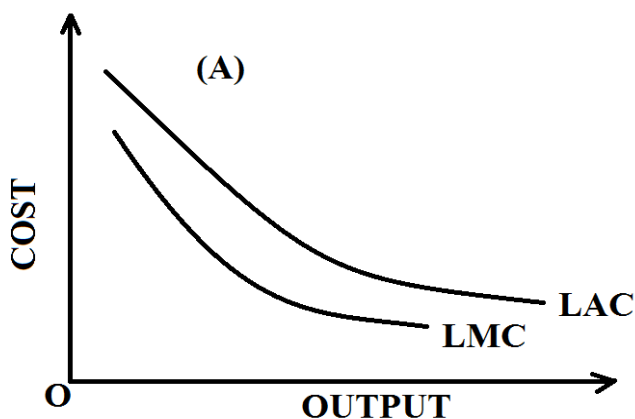
Similarly OC output can be produced at a lower per unit cost of OC on LAC_3 . By joining points like m, n and p we get LAC curve which is downward sloping due to technical progress and economies of scale.

- (ii) **Learning By Doing:** Firm after learn their past experience. As the firm produce move and move of a commodity they learn to produce it better and move efficiently and at a lower cost. This also results in declining slope of LAC curve.

The LAC curve has two main features:-

- (i) It does not rise at every large scale of output
- (ii) It does not envelope the SAC curves but intersects them.

If LAC falls continuously, as some modern economists believe then the LMC lies below the LAC at all levels of output as shown in fig. 19 (A). If however, LAC is L-shaped (i.e. it diminishes to some extent and then becomes constant), Then LMC curve lies below LAC until the minimum optimum is reached and then coincide with LAC curve beyond that level of output as shown in fig.19 (B).



RELEVANCE OR IMPORTANCE O COST CURVES

The importance of cost curves is discussed below-

1. **Price Output Decision:-** The firm take into consideration the cost o production while taking decision about price and output both in the short run and in the long run. The profit maximizing firm follows the marginalistic principle i.e.

Marginal cost = Marginal Revenue

2. **Costs and Growth of firm:-** The future growth of a firm is based as cost considerations. I f LAC curve is U-shaped then the firm can expand only by building up a new plant. One the other hand, if LAC curve is downward sloping then expansion is possible along the same plant size.

3. **Estimation of Profit and Loss:-** Profit and loss estimates of a firm depend upon average cost (AC) and average revenue (AR)

- (i) The firm will earn normal profits if

$$AC = AR$$

- (ii) There will be super normal profits if

$$AC < AR$$

- (iii) The firm will incur losses if

$$AC > AR$$