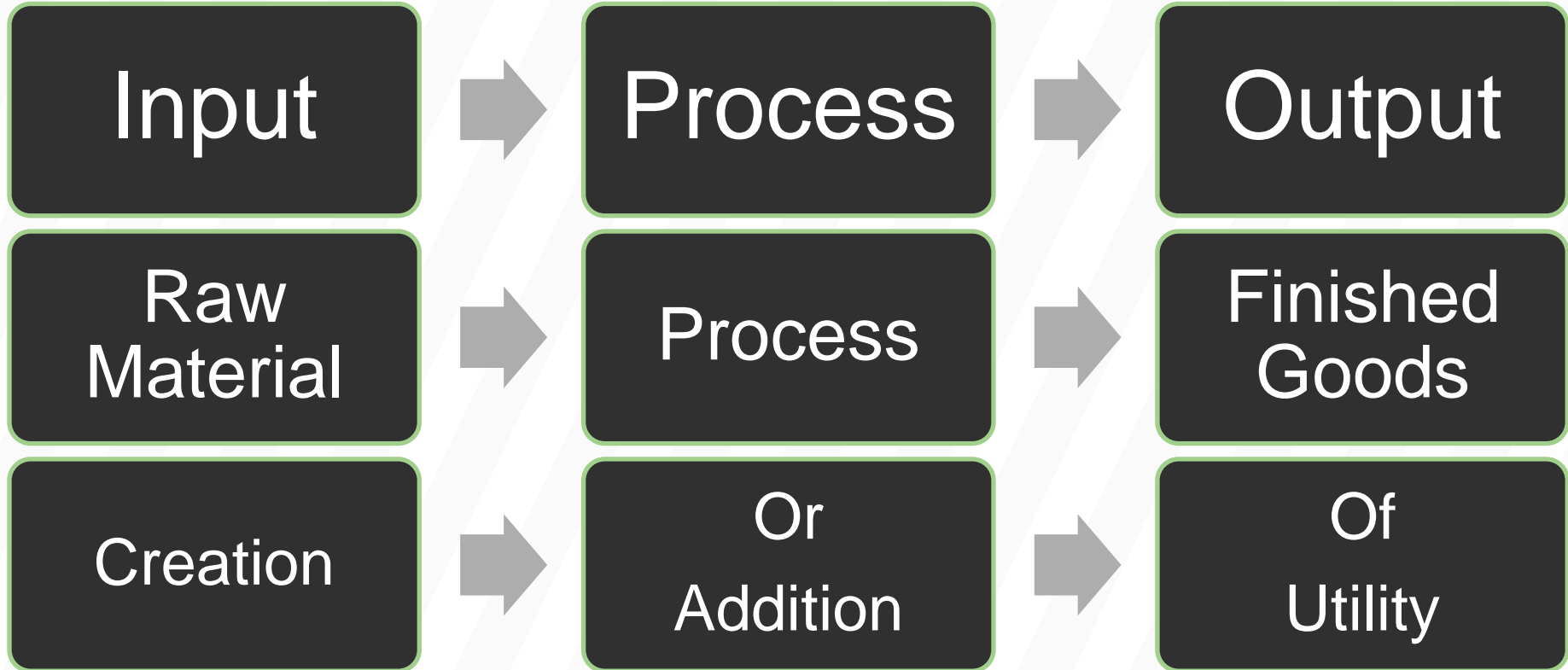


# Chapter - 3

## Theory of Production and Cost

Unit – 1 Theory of Production

# Meaning of Production



# Meaning of Production

- Man cannot create or destroy matter.
- **Professor J. R. Hicks** has defined production “as any activity whether physical or mental, which is directed to the satisfaction of other people’s wants through exchange.”

# Types of Utility

- **Form Utility**
- **Place Utility-  
Extraction from Earth,  
Transfer of Goods**
- **Time Utility**
- **Service Utility**

# Form Utility

- Changing the form of Natural Resource.
- It is created by changing the form of raw materials into finished goods for man's use.
- E.g. converting raw cotton into cotton fabric.
- Form utility is created by manufacturing industries.



**LOG OF WOOD**



# Place Utility

- It is created by **transporting goods** from one place to another.
- E.g. when goods are taken from factory to marketplace, place utility is created.
- **Transport services** are involved in creation of place utility.
- **Extraction from Earth** also creates place utility.

# Time Utility

- It is created by **making things available when they are required.**
- E.g. Banks create time utility by granting overdraft facilities.

# Service Utility

- Service Utility is created by some special skills or knowledge.
- It is created by **providing personal services to the customers** by professionals like lawyers, doctors, bankers, teachers, etc.



# Factors of Production

- **Land**
- **Labor**
- **Capital**
- **Entrepreneurship**

# Land

- Generally, land means earth's surface.
- However, in economics land refers to **all the free gifts of nature** i.e. natural resources.
- Land includes natural resources:
- **On the surface of earth**; E.g. Soil, forest, plots of land, etc.;
- **Below the surface of earth**, E.g. mineral deposits, etc., and
- **Above the surface of earth**, E.g. climate, sunshine, rain, etc.

# Land

- **Primary Factor**
- **Free Gift of Nature**
- **Inelastic Supply**
- **Lacks Geographical Mobility**
- **Passive Factor**
- **Heterogeneous**
- **Permanent**
- **Diminishing Returns**

# Labour

- Labour, in economics, means any **physical or mental** work done in exchange for some monetary reward.
- Anything done out of love and affection is not labour in economic sense.

# Labour

- **Labour is inseparable from labourer**
- **Human Factor**
- **Highly perishable**
- **The labourer sells his services and not himself**
- **Heterogeneous**
- **Restricted Mobility**
- **Active Factor**
- **Labour has sociological characteristics**
- **Supply curve of labour is backward sloping**
- **The supply of labour is inelastic in short run**

# Capital

- In ordinary language, capital is used in the sense of money.
- But in economics the term ‘Capital’ means **man made stock of goods** like factories, machines, tools, equipment, etc. which are used in production.
- Capital has therefore, been rightly defined as **“produced means of production”** and as **“man made instrument of production”**.

# Capital

- **Land and labour are primary or original factors of production. But capital is produced by man working with nature to help in the production of further goods.**

# Capital

- **Capital is man-made**
- **Capital is productive**
- **Supply of capital is elastic**
- **All capital is wealth**
- **Capital is a passive factor**
- **Capital is the most mobile factor**
- **Capital is durable**
- **Capital involves social cost - Sacrifice of present consumption**



# Types of Capital

- **From the View Point of Convertibility:-**
- Fixed capital
- Circulating or Working Capital
- **From the View Point of Purpose of Use:-**
- Sunk Capital
- Floating Capital
- **From the View Point of Thing or Human:-**
- Real capital
- Human capital

# Types of Capital

- **From the View Point of Tangibility:-**
- Tangible capital
- Intangible capital
- **From the View Point of Expected Return:-**
- Money capital
- **From the View Point of Ownership:-**
- Individual capital
- Social capital

# Capital Formation

- Capital formation means a **sustained increase** in the stock of real capital in a country.
- Capital formation is also known as **investment**.
- There are mainly three stages of capital formation which are as follows:
  - a) Savings ( $S = Y - C$ ) (Willingness to Save & Ability to Save)
  - b) Mobilization of savings (Done by Banking & Financial Institutions)
  - c) Investments (In Productive Avenues)

# Entrepreneurship

- The entrepreneur owns entrepreneurship.
- He is that man of production who takes decisions and bears risk.
- He has also been called the **organizer, the manager** or **risk taker**.
- **Functions of an entrepreneur:**
- **Initiating a business enterprise and coordination:**
- **Risk bearing and uncertainty:**
- **Innovation:**

# Enterprise's Objectives

- **Organic objectives: to survive or to stay alive**
- **Economic objectives:**
- **Social objectives:**
- **Human objective:**
- **National objectives:**

# Enterprise's Problems

- **Objectives:**
- **Location and size of the plant:**
- **Selecting and organising physical facilities:**
- **Finance:**
- **Organisation structure:**
- **Marketing:**
- **Legal formalities:**
- **Industrial relations:**

# Production Function

- Production function states the **relationship between inputs and outputs**, i.e., the amount of output that can be produced with given quantities of inputs under a given state of technical knowledge.

# Assumptions of Production Function

- **Particular unit of time**
- **Technical knowledge remain constant**
- **Factors are divisible**
- **Producer is using best technique**



# Production Function

## Short run Analysis

**Law of Variable Proportion**

**Law of Increasing Return**  
**Law of Decreasing Return**  
**Law of Negative Return**


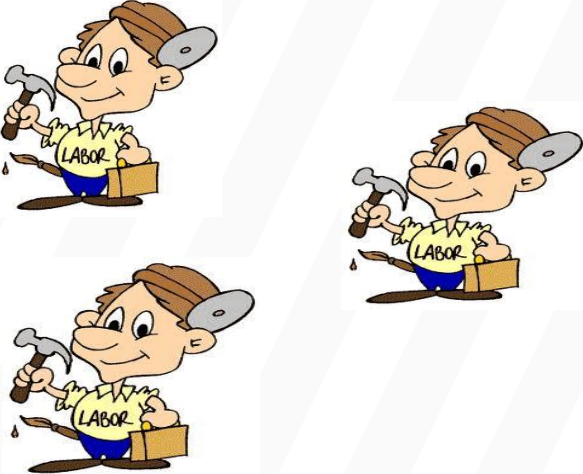
## Long run Analysis

**Return to Scale**

**Increasing Return to Scale**  
**Constant Return to Scale**  
**Decreasing Return to Scale**


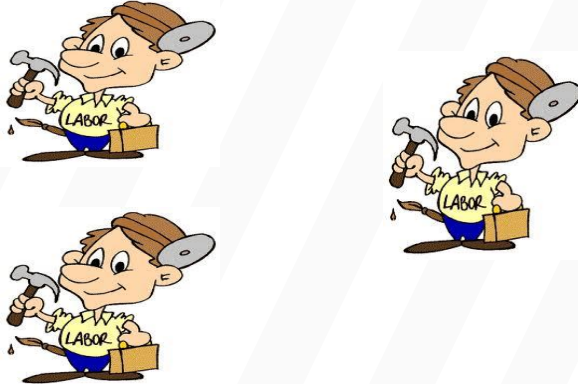
# Short Run

- It is the time period in which out put can be changed by changing only the variable factors of production.
- Fixed factors remain fixed.

Fixed Factors	Variable Factors
	

# Long Run

- It is the time period in which the out put can be changed by changing all the factors of production i.e. fixed & variable in same proportion.
- No factor remains fixed.

Fixed Factors	Variable Factors
	

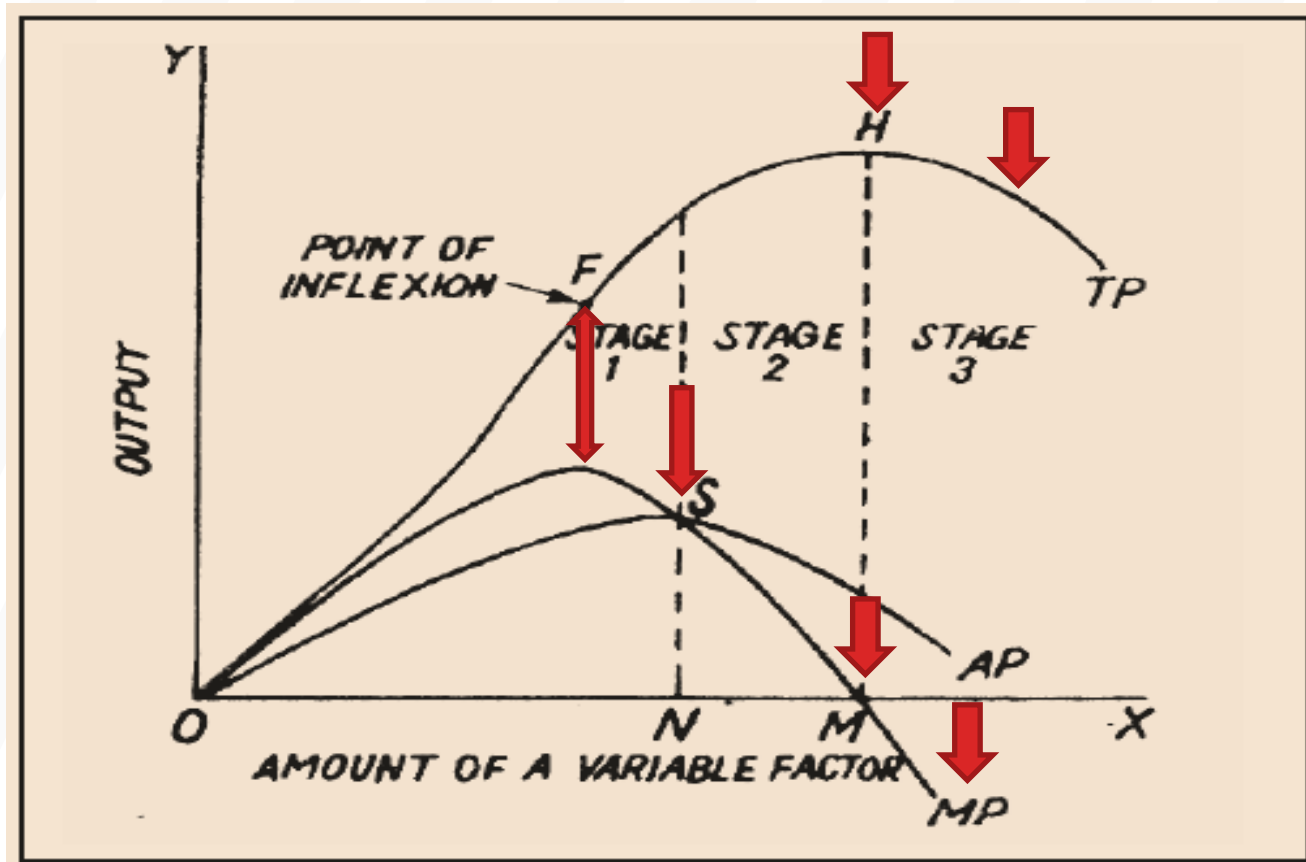
# Assumptions of Law of Variable Proportion

- The **technology** remains **unchanged**.
- There must be **some inputs** whose quantity is kept **fixed**.
- Law **does not apply** where factors are used **in fixed proportions**.
- **Only physical** input and output are considered.
- All the units of variable factors are **homogeneous**.

# Law of Variable Proportion

Labour	TP	AP	MP
1	2	2	2
2	5	2.5	3
3	9	3	4
4	12	3	3
5	14	2.8	2
6	15	2.5	1
7	15	2.1	0
8	14	1.7	-1
9	12	1.3	-2

# Law of Variable Proportion



# Law of Variable Proportion

- According to law of variable proportions, **as more and more units of a variable factors** are combined with same quantity of fixed factors, **total product first increases at an increasing rate, then at diminishing rate and finally starts diminishing.**
- It implies that marginal product first rises and then **diminishes eventually.**
- Law of variable proportions is also known as law of **returns to a factor.**

# Relationship Between AP & MP

- Both **AP** and **MP** can be calculated by **TP**.
- When **AP rises**, the **MP also rises** but **MP > AP**
- When **AP is maximum**, the **MP = AP** or say MP curve cuts the AP curve at its maximum point.
- When **AP falls**, then **MP also falls**, but **MP < AP**
- There may be a situation when **MP decreases** and **AP increases**, but opposite never happens.



# Stage Wise Relationship Between TP, AP & MP

Stage	TP	AP	MP
Stage 1	Increases at an increasing rate	Increases and reaches at maximum Point	Increases and reaches its maximum point
Stage 2	Increases at diminishing rate and reaches its maximum point	After reaching its maximum point, begins to decrease	Decreases and Becomes zero
Stage 3	Begins to fall	Continues to diminish	Becomes negative

# Explanation of Stage - 1

- **Indivisibility of fixed-factors:**
- The law of increasing returns operates because of
- indivisibility of fixed factors.
- It means, in order to produce goods up to a given limit, at least one unit of the fixed factor is a fixed.
- **Division of labour and specialization:**
- The second reason why we get increasing returns in the initial stages is that with sufficient quantity of variable factor, introduction of division of labour and specialization becomes possible, which results in higher productivity.
- **Note:** *Point of inflexion is that point on TP at which MP is maximum.*

# Explanation of Stage - 2

- **Inadequate relative of fixed factors:**
- Once the point is reached at which the amount of variable factor is sufficient to ensure the efficient utilization of the fixed factor, then further increases in the variable factor will cause marginal and average product to decline because the fixed factor then becomes inadequate relative to the quantity of variable factors.

# Explanation of Stage - 2

- **Imperfect substitutability:**
- Another reason offered for the operation of the diminishing returns is the imperfect substitutability of factors for one another.
- **Note:** Saturation point is the point at which TP is maximum and MP is zero.

# Explanation of Stage - 3

- **Too excessive quantity of variable factor:**
- In this stage, the quantity of variable factor becomes too excessive relative to the fixed factor so that they get in each other's way with a result that the total output falls instead of rising.
- In such a situation, a reduction in the units of the variable factor will increase the total output.

# Stage of Operation

- Since the second stage is the most important, **stage II** will be stage of operation.
- Because of that, in practice, we normally refer to the law of variable proportion as the **law of diminishing returns**.

# Law of Returns to Scale

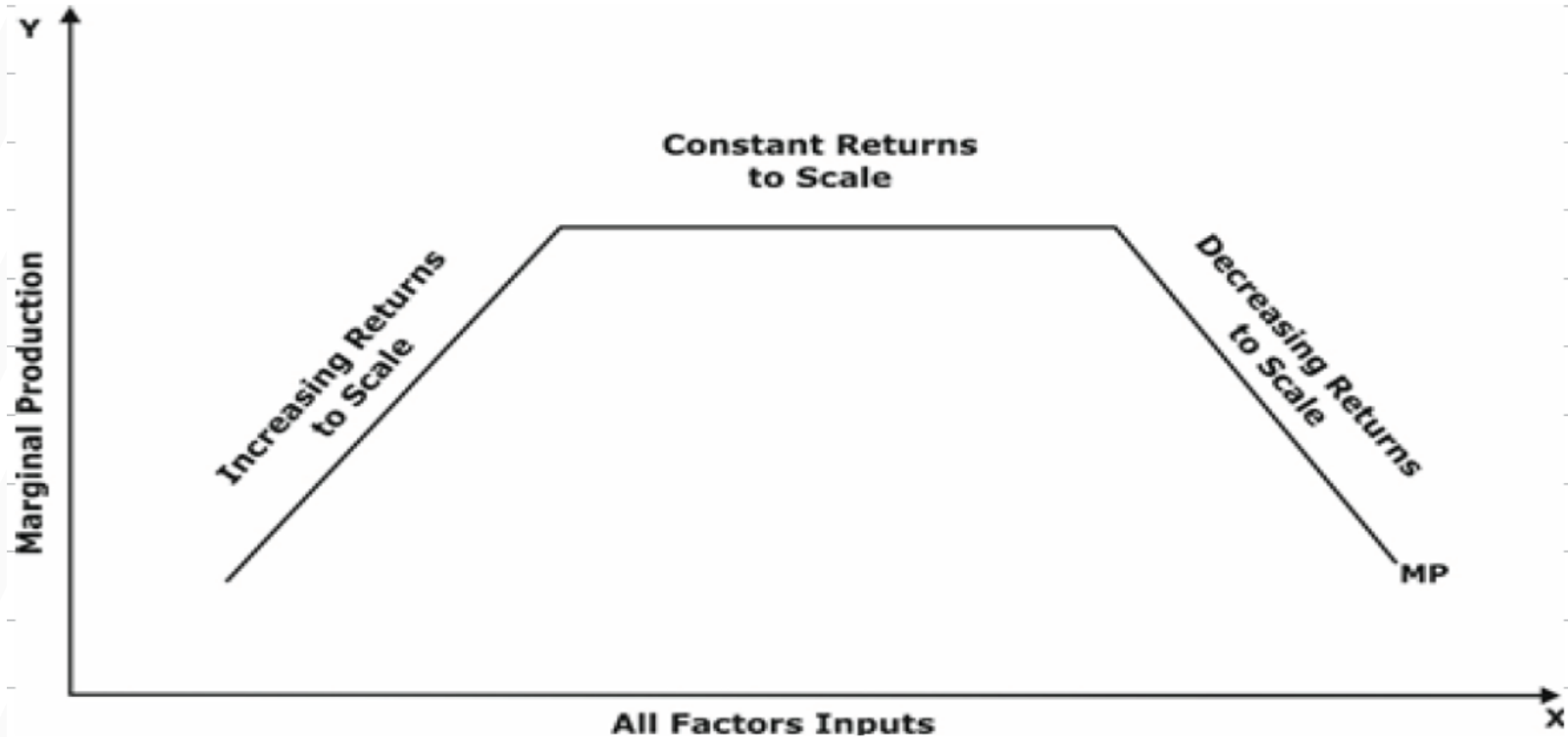
**Change in Scale  
(Variable + Fixed)**



**Change in Output**

- **Increasing Return to Scale:**
- It refers to output increase in greater proportion than increase in input.
- **Constant Return to Scale:**
- It means output increase in the same proportion as input increases
- **Decreasing Return to Scale:**
- It refers to output increase in smaller proportion than increase in input.

# Law of Returns to Scale





# Cobb-Douglas Production Function

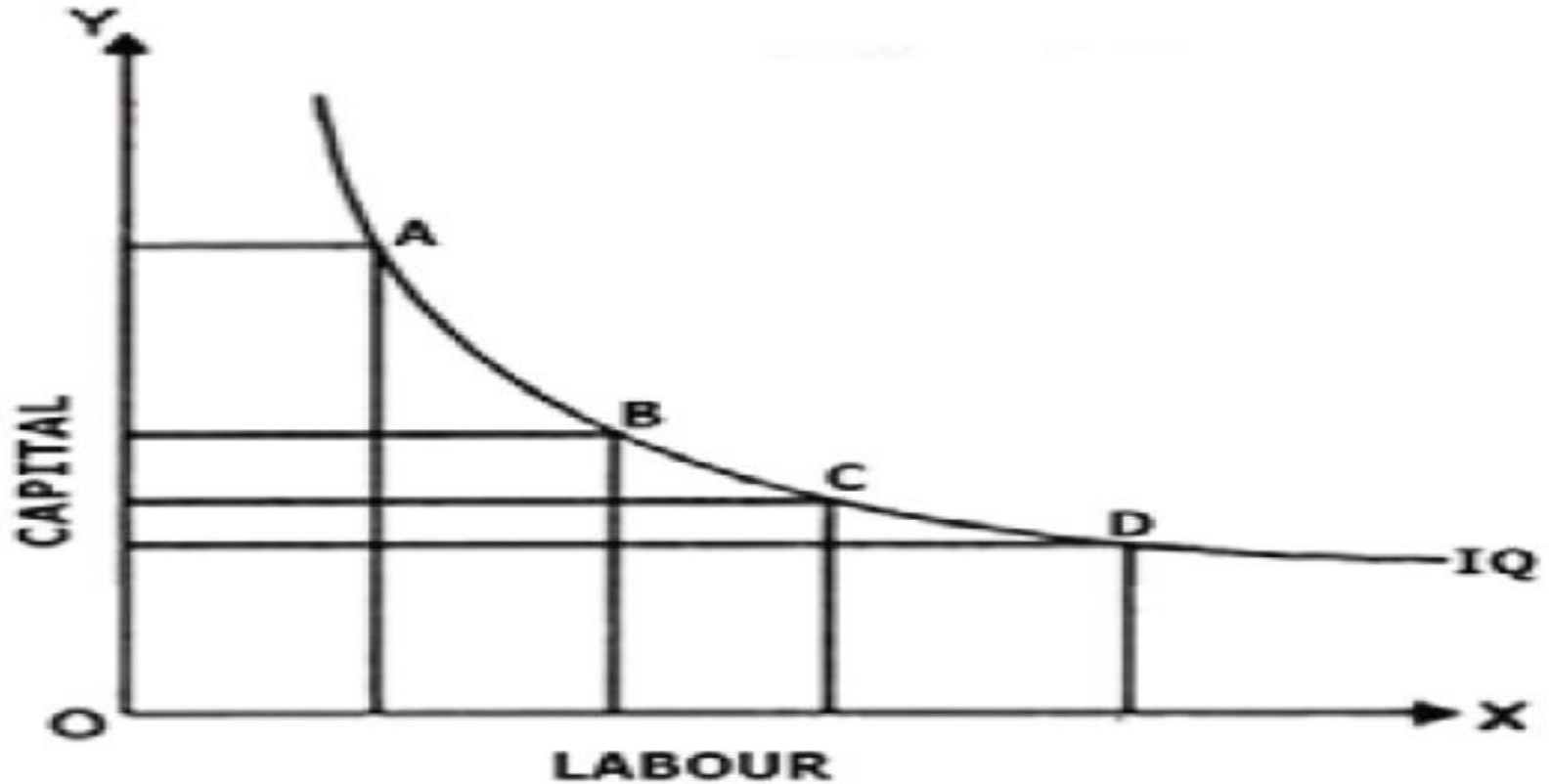
- $Q = K L^a C^{(1-a)}$
- Where 'Q' is output, 'L' the quantity of labour and 'C' the quantity of capital.
- 'K' and 'a' are positive constants.
- In this equation, **labour** contributed **3/4th** and **capital** contributed **1/4th** of production.
- The function is linear and homogeneous.
- It shows constant returns to scale, so it is called "**Linear Homogeneous Production Function**".

# ISO Quant

- Equal product curve
- Iso product curve
- Production Indifference curve
- Iso quant shows various combinations of two inputs (capital / Labour) that gives same level of output

Combinations	Labour	Capital	DMRTS(Lk)
A	1	12	
B	2	6	6
C	3	4	2
D	4	3	1

# ISO Quant

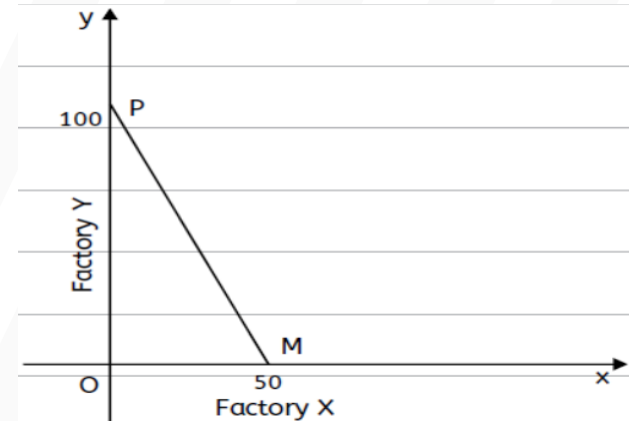


# ISO Cost

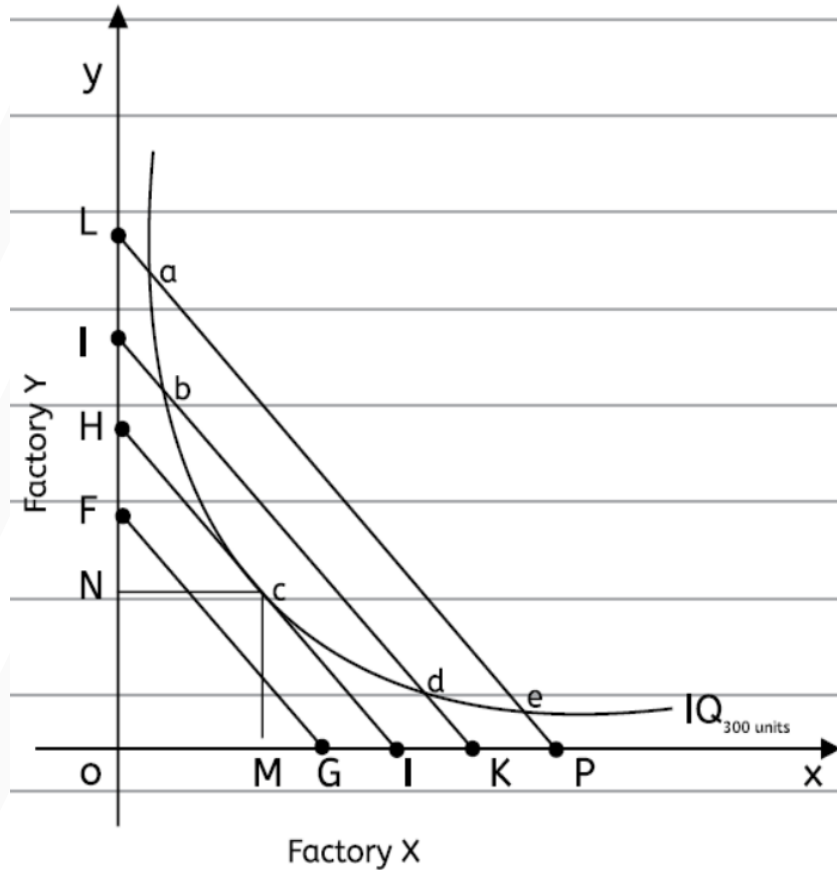
- ISO -cost line also known **Equal Cost Line; Price Line; Outlay Line; Factory Line**
- It shows the various combinations of two factor inputs which the firm can purchase with a given outlay (i.e. budget) and a given prices of two inputs.
- Example. A firm has with itself Rs. 1000 which it would like to spend on factor 'X' and factor 'Y'.

# ISO Cost

- Price of factor 'X' is Rs. 20 per unit.
- Price of factor 'Y' is Rs. 10 per unit.
- Therefore, if the firm spends the whole amount on factor X, it can buy 50 units of X and if the whole amount is spent on factor Y, it can buy 100 units of Y.
- However, in between these two extreme limits, it can have many combinations of X and Y for the outlay of Rs. 1000.



# Producer's Equilibrium



A graphic featuring a central blue ribbon with the text "Thank You" in white. The ribbon is set against a background of light gray diagonal stripes. The entire graphic is framed by a solid orange border.

**Thank You**

# Chapter - 3

## Theory of Production and Cost

Unit – 2 Theory of Cost



# Cost

- Cost is best described as a **sacrifice made in order to get something.**
- In business, cost is usually a **monetary valuation** of all efforts, materials, resources, time and utilities consumed, risk incurred and opportunities foregone in production and delivery of goods and services.

# Types of Cost

<b>Accounting Cost/ Explicit Cost</b>	<b>Implicit Cost</b>
Accounting cost / explicit cost are that cost which is incurred on those factors that are not owned by entrepreneur. He has to purchase from outside.	Implicit cost is that cost which is incurred by an entrepreneur on those factor which are owned by him
Recorded in books of account	Not recorded in books of account
Out of the pocket expenditure	They are not out of the pocket expenditure. Also known as opportunity cost.
Raw material, Rent paid, Printing & Stationary cost.	Owned property, Owned capital

## **Economic Cost**

**Explicit Cost + Implicit Cost = Economic cost**

# Types of Cost

## Outlay Cost

It involves actual outlay of funds on wages material, rent known as “Financial expenditure”

## Opportunity Cost

Opportunity cost is a sacrifice or loss of alternative.  
Value of next best alternative.  
Known as Trade off, Forgone cost, Implicit cost.

# Types of Cost

## Direct Cost

Direct cost is also known as “Traceable cost”.

Cost which can be easily identified called as direct cost.

In production of shoes cost of leather is a direct cost.

## Indirect Cost

Indirect cost is also known as “non-traceable cost”.

Cost which cannot be easily identified called non-traceable / indirect cost.

Electricity, Power charges

# Types of Cost

## Incremental Cost

Incremental cost is related to concept of marginal cost. It refers to the total additional cost incurred by the business.

Purchase of new equipment, expansion of production capacity

## Sunk Cost

Sunk cost refers to that cost which has been already incurred for one purpose in the past & cannot be recovered.

Expense on advertisement.

# Types of Cost

## Historical Cost

Historical cost are those cost which are incurred on the purchase of an asset in the past, may or may not be recovered.

Machinery, Tools

## Replacement Cost

Replacement cost refers to expenditure to be made for replacing an old asset.

Replacement of an old Machine

# Types of Cost

## Private Cost

Private cost are those cost which are incurred or provided by the firm or organization.

Cost of manufacturing a product

## Social Cost

Social cost refers to the total cost to the society due to business activities it includes both private & external cost.

Pollution of all types

# Types of Cost

## Fixed Cost

Fixed cost do not change with change in output

It is independent of output

It cannot become zero also known as supplementary cost or overhead cost.

Rent, Property tax, Interest on Capital, Depreciation

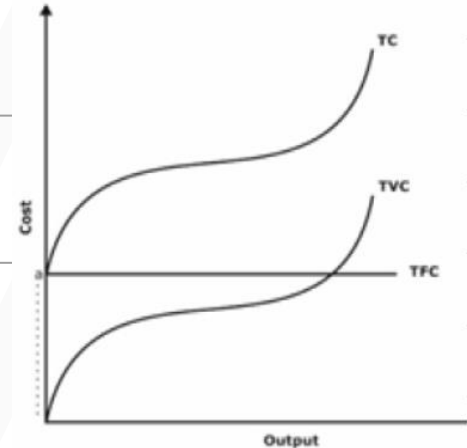
## Variable Cost

Variable cost changes with change in output

Dependent on output

It can become zero also known as prime cost.

Wages, Raw Material etc.





# Types of Cost

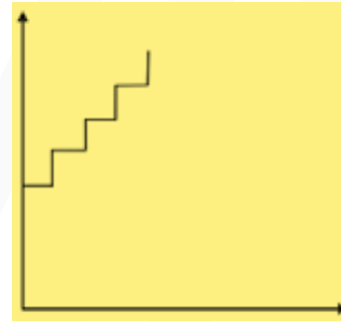
## Semi-Variable Cost

It is a mixture of fixed cost & variable cost.

Electricity charges , Post paid  
Mobile connection

## Stair-step Variable Cost

A salary or Remuneration give to a foreman or extra helper represent stair step cost.



# Economies

## Internal Economies

Internal economies are the benefits which accrue to a firm when it expands the scale of production.

- a.** Internal economies are called 'internal' because these arise due to the internal efforts of the firm.
- b.** These economies are specific to the individual firm and are different for different firms depending upon the size of the firm.

## External Economies

External economies are those benefits which accrue to all the firms operating in a given industry from the growth and expansion of that industry.

External economies are called 'external' because they accrue to a firm as a result of factors that are entirely outside the firm i.e. from the expansion of the industry.

# Economies

## Internal Economies

- a.** Internal economies are the result of the firm's OWN EFFORTS INDEPENDENT OF THE ACTIONS OF OTHER FIRMS.
- b.** These economies are peculiar to each firm.
- c.** It reflects the working pattern of the firm.

## External Economies

- a.** External economies are independent of firm's own efforts and output.
- b.** They are dependent on the general development of the industry.
- c.** They are not restricted to a single firm but are shared by a number for firms.

# Economies

## Internal Economies

If every thing is effectively managed, internal economies can be of long term in nature.

Internal economies are in the form of technical economies like superior techniques, use of by – products, etc., managerial economies; commercial economies; financial economies and risk-bearing economies.

## External Economies

External economies depend upon the conditions of the entire industry and economy. Thus, it can be of short term in nature.

External economies are in the form of cheaper inputs; discovery of new technical knowledge; development of skilled labour; economies of information; growth of ancillary units; better transport and marketing facilities.

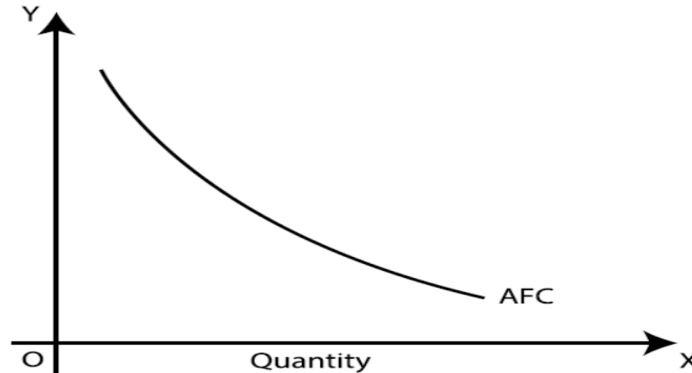
# Short Run Average Cost

- For the purpose of making decision about operations, **unit cost functions or average costs** are more useful than the total cost functions.
- We examine here three of these unit cost functions namely...
  - a. Average Fixed Cost (AFC)
  - b. Average Variable Cost (AVC)
  - c. Average Total Cost (ATC)

# Average Fixed Cost

- Average Fixed Cost is the fixed cost per unit of output.  
Thus,
- $\text{Average Fixed Cost} = \text{Total Fixed Cost} / \text{Total Input}$
- **OR**  $\text{AFC} = \text{TFC} / Q$

Output (units)	T F C (Rs.)	A F C (Rs.)
0	60	-
1	60	60
2	60	30
3	60	20
4	60	15
5	60	12
6	60	10



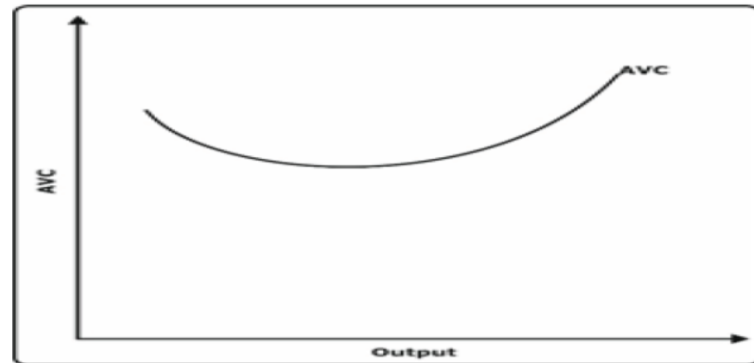
# Average Fixed Cost

- The above table shows that as the output increases, **AFC goes on falling.**
- The reason being TFC is spread over larger quantities of output.
- The AFC curve slopes downwards from left to right throughout its length.
- The AFC curve comes closer and closer to the X-axis but not touch the X-axis as TFC can never be zero.
- AFC curve will not touch Y-axis also because at zero level of output, TFC is a **POSITIVE VALUE**. Any positive value divided by zero will provide infinite value.
- The AFC curve is a **RECTANGULAR HYPERBOLA**

# Average Variable Cost

- Average Variable Cost is the variable cost per unit of output. Thus,
- Average Variable Cost = Total Variable Cost / Total Output OR  $AVC = TVC / Q$

Output (units)	TVC (Rs.)	AVC (Rs.)
0	0	-
1	40	60
2	76	38
3	102	34
4	132	33
5	170	34
6	22	37





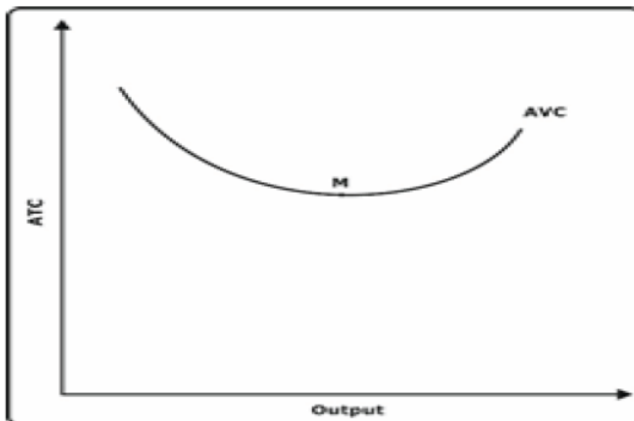
# Average Variable Cost

- The above table shows that as the output expands, average variable cost falls initially due to increasing returns to the variable factor.
- It is minimum at the optimum capacity output.
- Beyond optimum capacity average variable cost rises very sharply due to diminishing returns to variable factor.
- Thus, AVC and AVERAGE PRODUCT of variable factor are inversely related.
- Thus, AVC curve is U-shaped indicating three phases decreasing phase, constant phase and increasing phase.

# Average Total Cost

- Average Total Cost is the cost per unit of output. Thus,
- Average total cost or Average cost = Total Cost / Total Output
- $ATC \text{ OR } AC = TC / Q$                        $ATC \text{ OR } AC = TFC / Q + TVC / Q$
- $ATC \text{ or } AC = AFC + AVC$

Output (units)	TC (Rs.)	ATC (Rs.)
0	60	-
1	100	100
2	136	68
3	162	54
4	192	48
5	230	46
6	282	47



# Marginal Cost

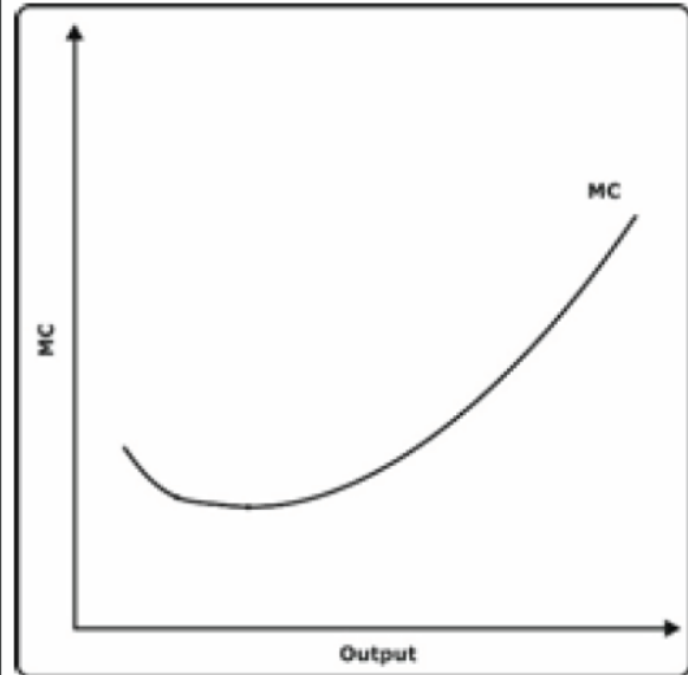
- Marginal cost is addition to the total cost caused by producing one more unit of output.
- Thus, marginal cost is the cost of the additional unit of output.
- It is measured by the change in total cost resulting from a unit increase in output.
- $MC_n = TC_n - TC_{n-1}$  Or  $MC = \Delta TC / \Delta Q$

# Marginal Cost

- **The Marginal Cost is INDEPENDENT OF FIXED COST**
- **In the short period, total fixed cost are constant for all levels of output.**
- **The only change in total cost when output changes is CHANGE IN VARIABLE COST.**
- **Hence, marginal cost is affected only by the variable cost.**
- **Therefore marginal cost can also be defined as a change in TVC as a result of a unit change in output.**

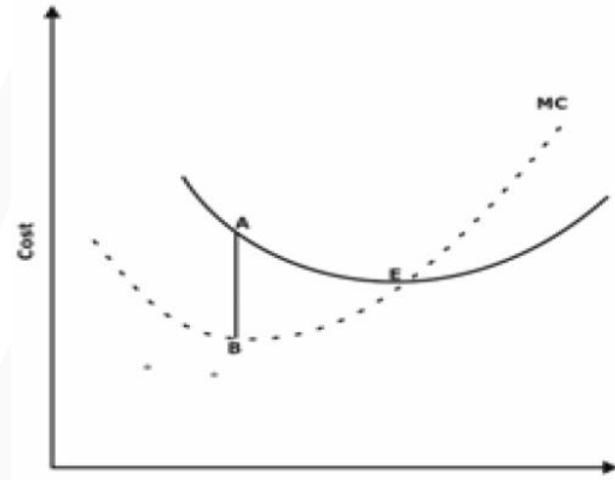
# Marginal Cost

Output (units)	TFC (Rs.)	TVC (Rs.)	TC (Rs.)	MC (Rs.)
1	30	50	80	-
2	30	90	120	40
3	30	120	150	30
4	30	170	200	50
5	30	250	280	80
6	30	360	390	110



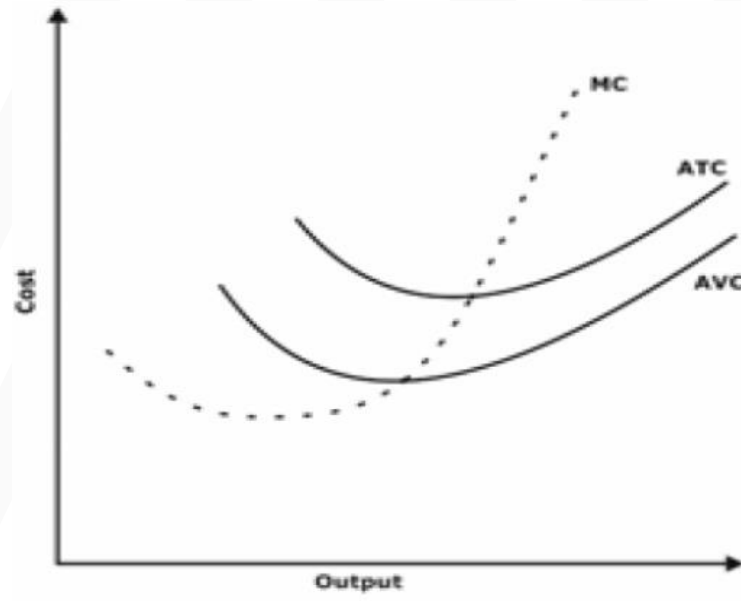
# Relationship between AC & MC

- MC and AC both can be calculated by TC.
- When AC falls, MC also falls, but  $AC > MC$ .
- When AC rises, MC also rises, but now  $MC > AC$ .
- When AC is minimum, then  $MC = AC$ . In other words, MC curve cuts to AC curve at its minimum point (i.e., optimum point).
- There is also abnormal situation when AC falls and MC rises. In the figure given, from 'A' to 'E' AC falls but from 'B' to 'E' MC rises. But, opposite never happened.

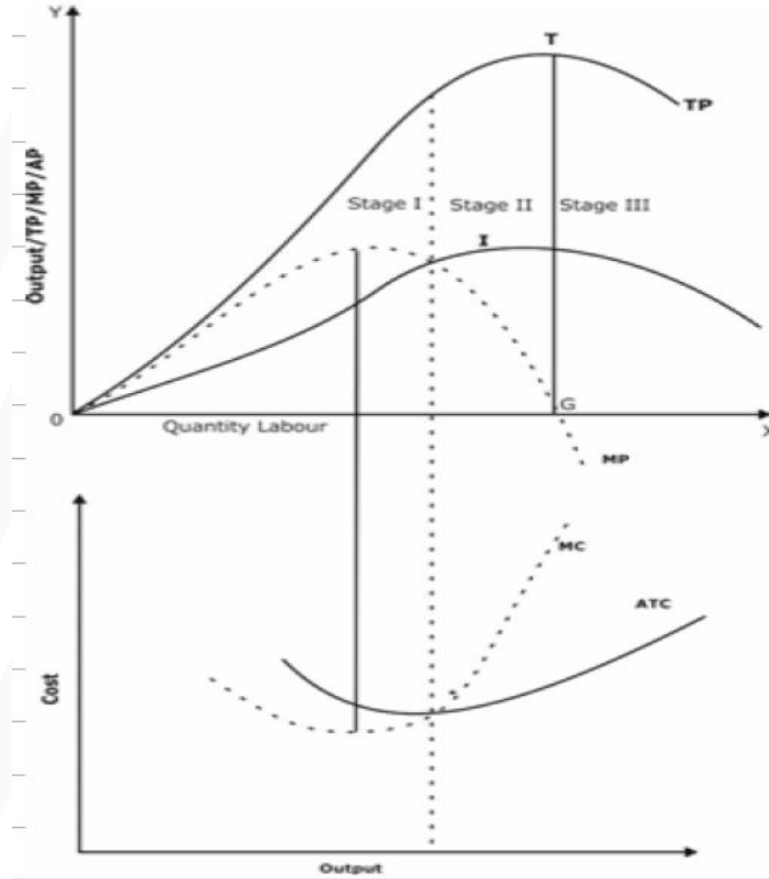


# Relationship between AC, AVC & MC

- $ATC = AVC + AFC$ , but  $ATC \neq AVC$ , so AVC curve can never touch to ATC curve.
- MC cuts to ATC and AVC's minimum points.



# Why are ATC, AVC & MC Curves 'U' Shaped?

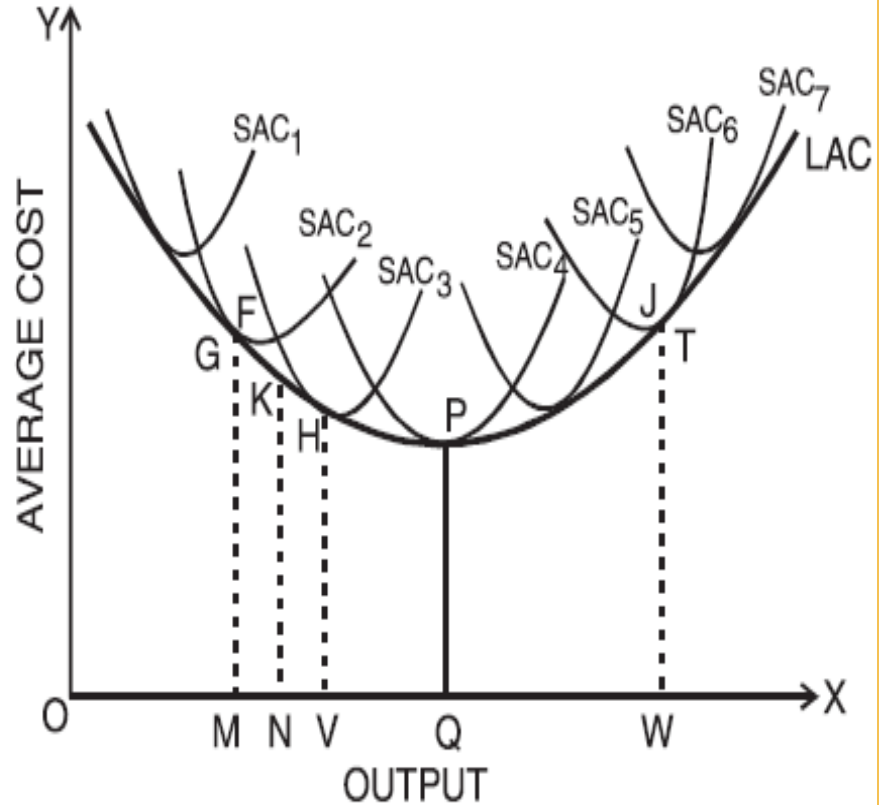
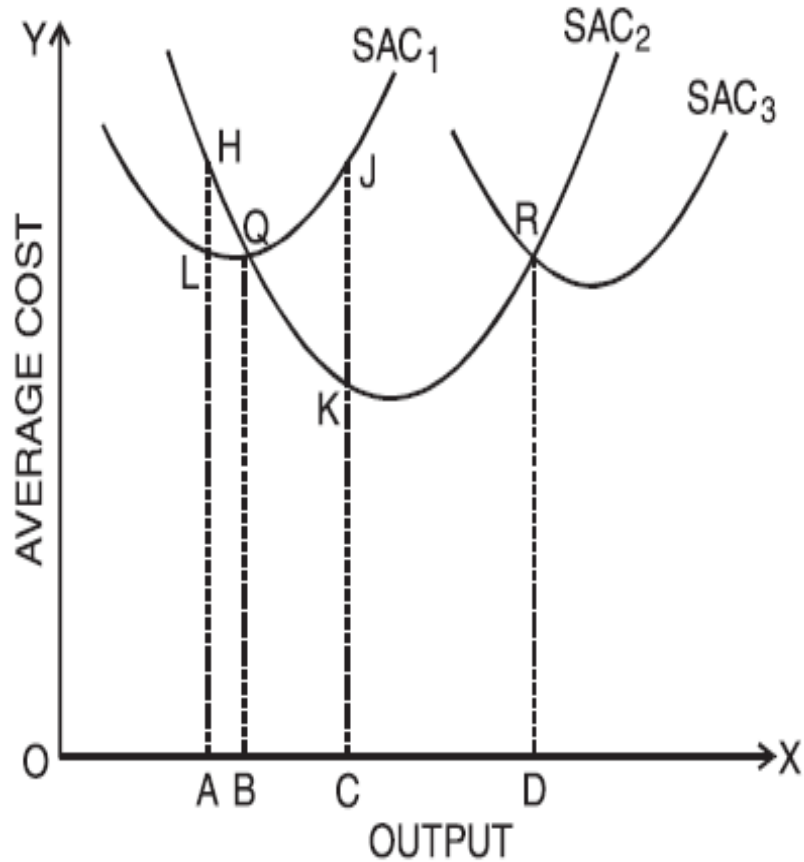




# Long Run Average Cost Curve

- Long run is a period of time during which the firm **can vary all inputs**.
- Thus, in the long run the firm moves from one plant to another. The long run average cost curve shows the minimum possible average cost for producing various levels of output.

# Long Run Average Cost Curve



# Long Run Average Cost Curve

- The LAC curve **envelopes** infinite short run average cost curves each representing a plant. Hence, SACs are also called plant curves.
- The Fig., shows that LAC curve is **not tangent to the minimum points** of the SAC curves.
- When LAC curve is **sloping downwards**, it is tangent to **falling portions** of SACs.
- When LAC curve is **rising upwards**, it is tangent to **rising portions** of SACs.

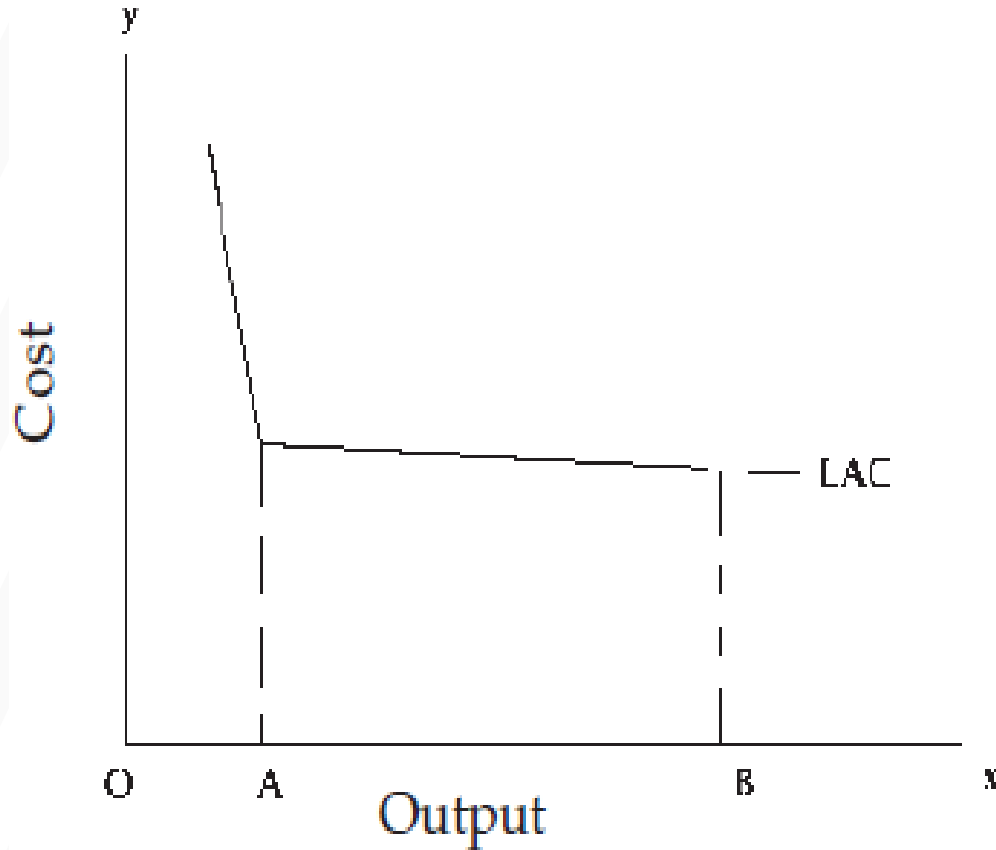
# Long Run Average Cost Curve

- LAC curve is also called **planning curve**.
- This is because firm plans output in the long run but operates in the short run i.e., by choosing a plant on LAC corresponding to the given output.

# Why is Long Run Average Cost Curve 'U' Shaped?

- The shape of LAC curve depends on the **Law of Returns to Scale**.
- As the firm expands, there is increasing returns to scale which means fall in long run average cost due to **economies of scale**.
- When decreasing returns to scale occur it means rise in long run average cost due to **diseconomies of scale**.
- This explain why LAC curve is U-shaped.

# 'L' Shaped Cost Curve



The image features a central blue ribbon with the text "Thank You" written in white, bold, sans-serif font. The ribbon is set against a background of light gray diagonal stripes. The entire composition is framed by a solid orange border.

**Thank You**