Theory of Production

- Product and Production

- Production Function

- Short-Run and Long-Run

- Variable and Fixed Factors

- Total Product (TP), Average Product (AP) and Marginal Product (MP)

- Law of Variable Proportions/ Law of Diminishing Returns

- Relationship between TP, AP and MP

What is a Product?

- A product can be defined as an item that can be offered to the market which has the ability to satisfy the market need or want and which is produced through some processes.

- It may be a good, service, idea, person or place.

- A product is a set of tangible and intangible attributes that allow the need satisfaction to occur.

What is Production?

- Production is the process to convert the inputs into desired output.

- It adds some level of utility to the product.

- Therefore, it is the process by which the resources (inputs) are transformed into a different and more useful commodity.

- Various inputs are combined in different quantities to produce various levels of output.

- Producer is a person who is using the process of production to create a useful product.

FOUR FACTORS OF PRODUCTION

In economics, the four factors of production (also called inputs of production) are the resources used to create goods and services (Samuelson & Nordhaus, 2009).

LAND

Land refers to all natural resources, such as minerals, forests, and water.

LABOR

Labor refers to the effort and skills of people who work to produce goods and services.
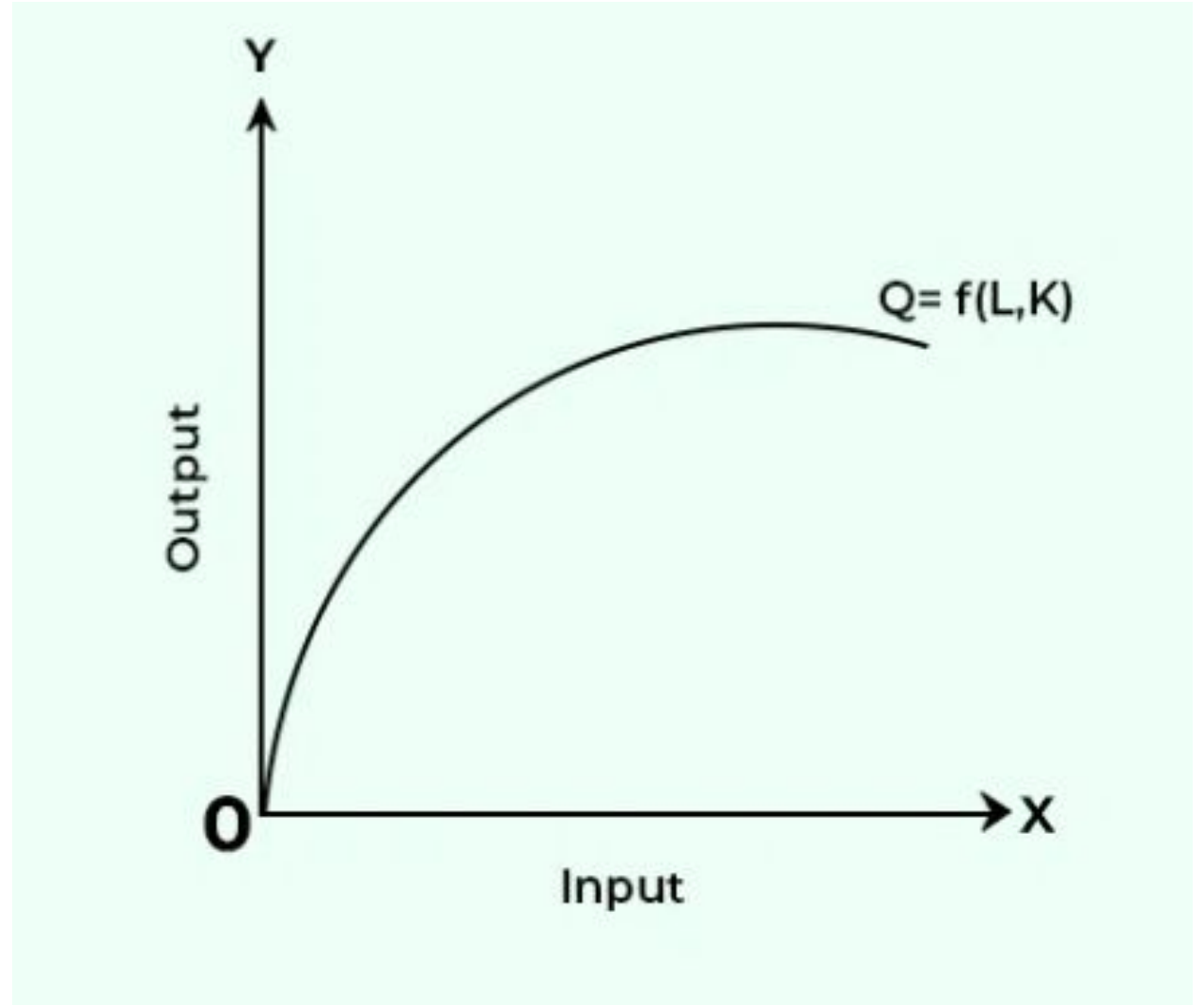
CAPITAL

Capital refers to the tools, machinery, and other physical assets used to produce goods and services.

ENTREPRENEURSHIP

Entrepreneurs combine the other factors of production, land, labor, and capital to make a profit. They identify opportunities, organize resources and bring new products or services to the market.

What is a Production Function?

☐ The production function of an enterprise is an association between inputs utilized and output manufactured by an enterprise.

☐ For various quantities of inputs utilized, it gives the utmost quantity of output that can be manufactured.

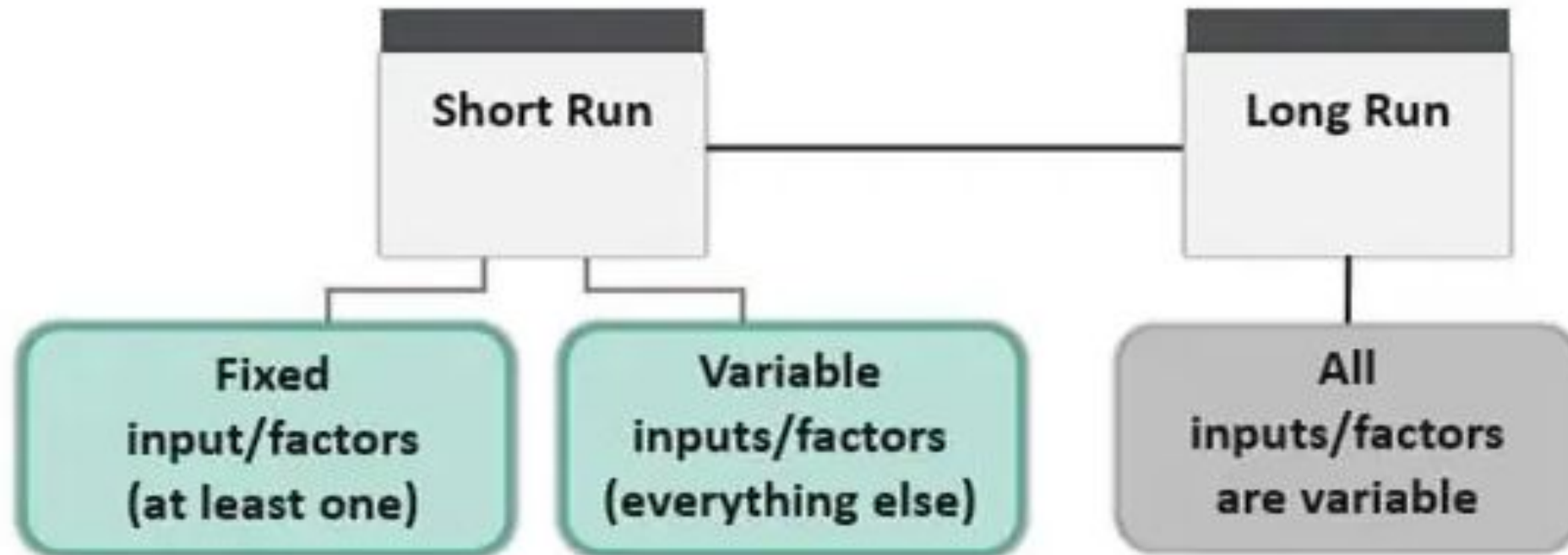# Factors Affecting Production Function

1. Technology

2. Inputs – Land, Labour, Capital, Entrepreneur
   Inputs are divided into fixed and variable.

   3. Time period of production – Short run and long run

Variable Factors and Fixed Factors

❏ A fixed factor of production is one whose quantity cannot readily be changed. Examples include major pieces of equipment, suitable factory space, and key managerial personnel.

❏ A variable factor of production is one whose usage rate can be changed easily. Examples include electrical power consumption, transportation services, and most raw material inputs.

Time Period of Production

Short Run vs. Long Run

Short Run	Long Run

| Fixed input/factors (at least one)	Variable inputs/factors (everything else)	All inputs/factors are variable

Concept of Product/Output

1. Total Product (TP)

A total product curve shows the quantities of output that can be obtained from different amounts of a variable factor of production, assuming other factors of production are fixed.

Point on graph	A	B	C	D	E	F	G	H	I
Units of labor per day	0	1	2	3	4	5	6	7	8
Jackets per day	0.0	1.0	3.0	7.0	9.0	10.0	10.7	11.0	10.5
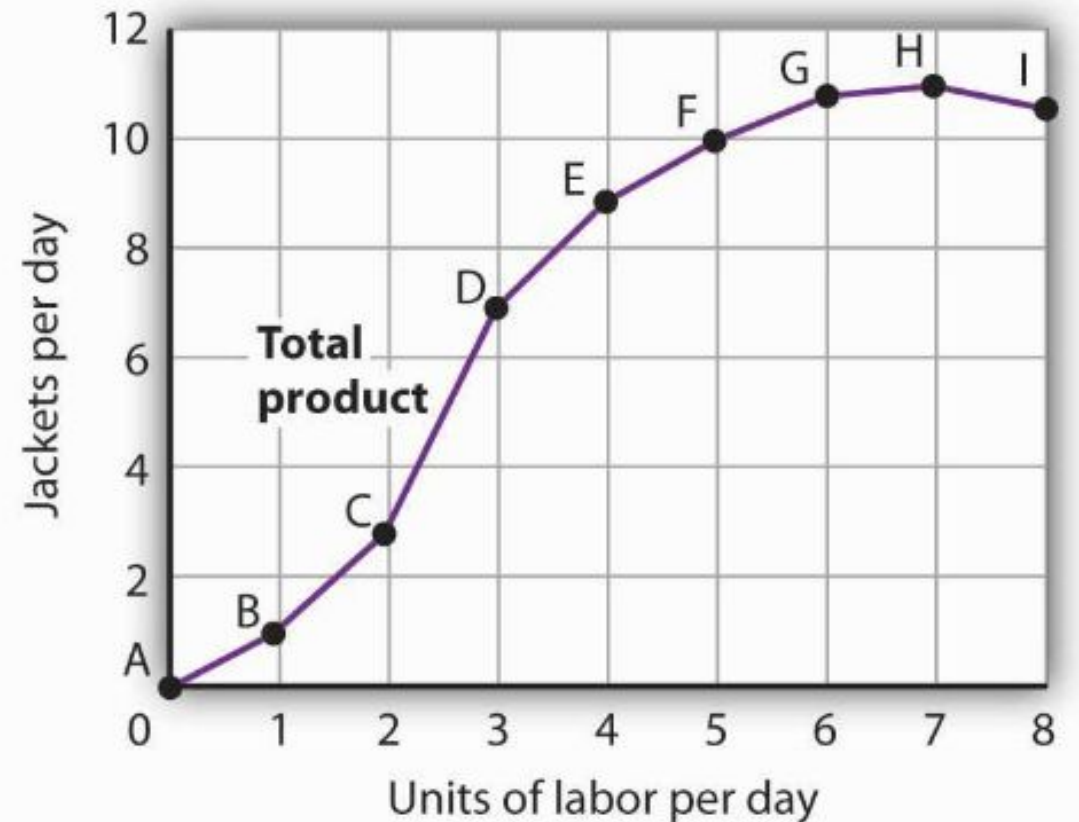
2. Marginal Product (MP)

It is the increase in total product, resulting from one-unit increase in the amount of the variable factor (labor) employed.

$$MP_n = TP_n - TP_{n-1}$$

3. Average Product (AP)

It is the total product per unit of the variable factor (labor) employed.

$$AP = TP/\text{Units of variable factor (n)}$$

Law of Diminishing Returns

- This law states that as a firm uses more of a variable input without changing the quantity of fixed input, the marginal product of the variable input will eventually decline.

- Why?? Because the productivity of additional units of the variable input (labour) is limited by the lack of the fixed inputs (machines).

Can law of diminishing returns occur in long-run?

Assumptions:

❑ The law is applicable only if at least one factor of production is kept constant or fixed.

❑ The technique of production remains same or constant.

Assumptions of Law of Diminishing Returns

1. Constant state of Technology: It is assumed that the state of technology will be constant and with improvements in the technology, the production will improve.

2. Variable Factor Proportions: The law of diminishing returns assumes that at least one input factor is fixed while the other input factors are variable.

3. Homogeneous factor units: This assumes that all the units produced are identical in quality, quantity and price. In other words, the units are homogeneous in nature.

4. Short Run: This assumes that this law is applicable for those systems that are operating for a short term, where it is not possible to alter all factor inputs.

Example: Law of Diminishing Returns

Fixed Factor (Land)	Variable Factor (Labour)	TP (units)	MP (units)	Phase
1	1	5	5	Phase I: Increasing Returns to a Factor
1	2	20	15	
1	3	32	12	Phase II: Decreasing Returns to a Factor
1	4	40	8	
1	5	40	0	
1	6	35	-5	Phase III: Negative Returns to a Factor

Different Phases of Production

1. **Phase I: Increasing return to a factor**
   - Total Product increases at increasing rate
   - Marginal Product is increasing and reaches its maximum point

2. **Phase II: Decreasing return to a factor**
   - Total Product increases at a decreasing rate
   - Marginal Product starts declining and reaches zero

3. **Phase III: Negative return to a factor**
   - Total Product starts declining
   - Marginal Product becomes Negative
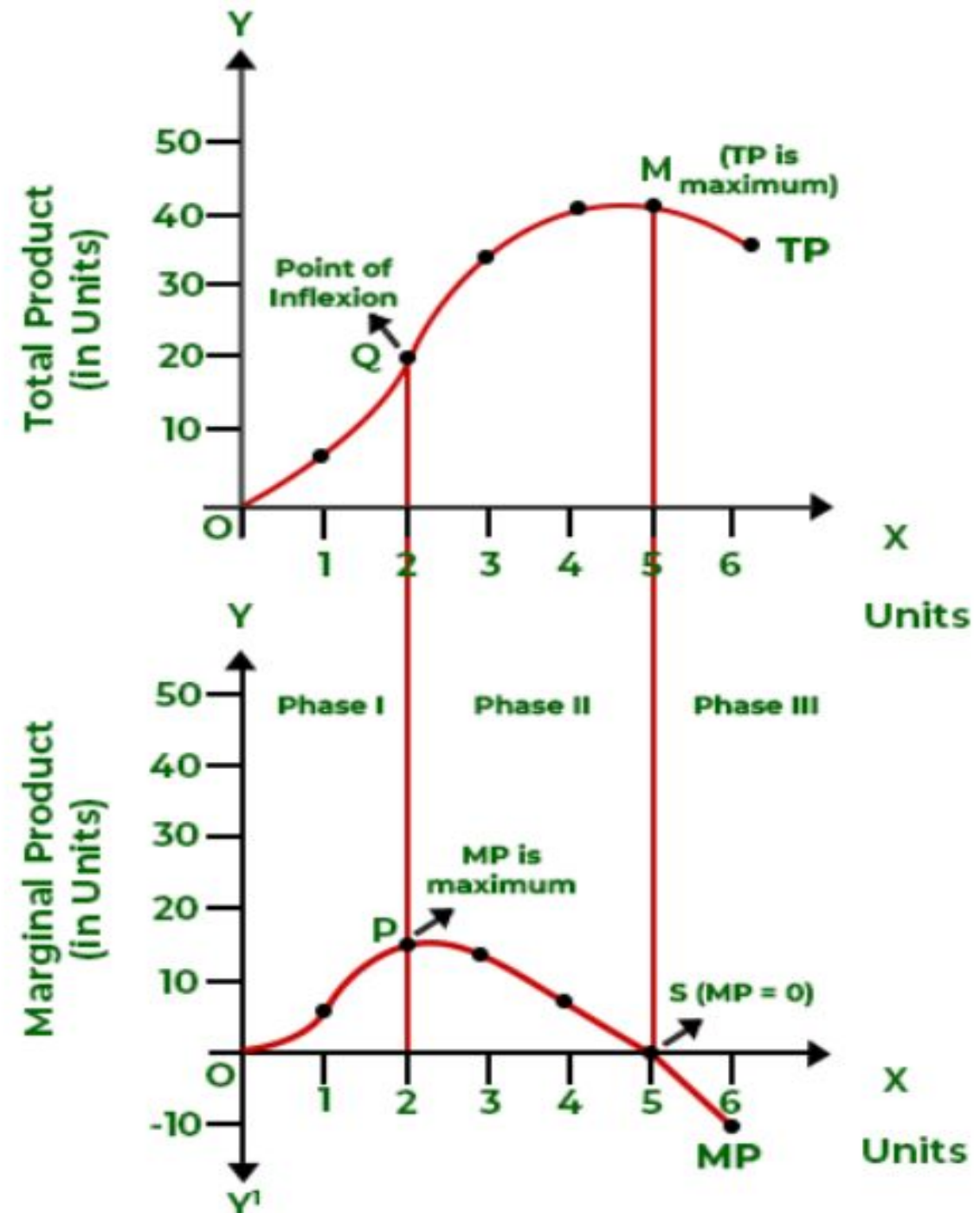
Causes of Diminishing Returns

1. **Scarcity of Factors**
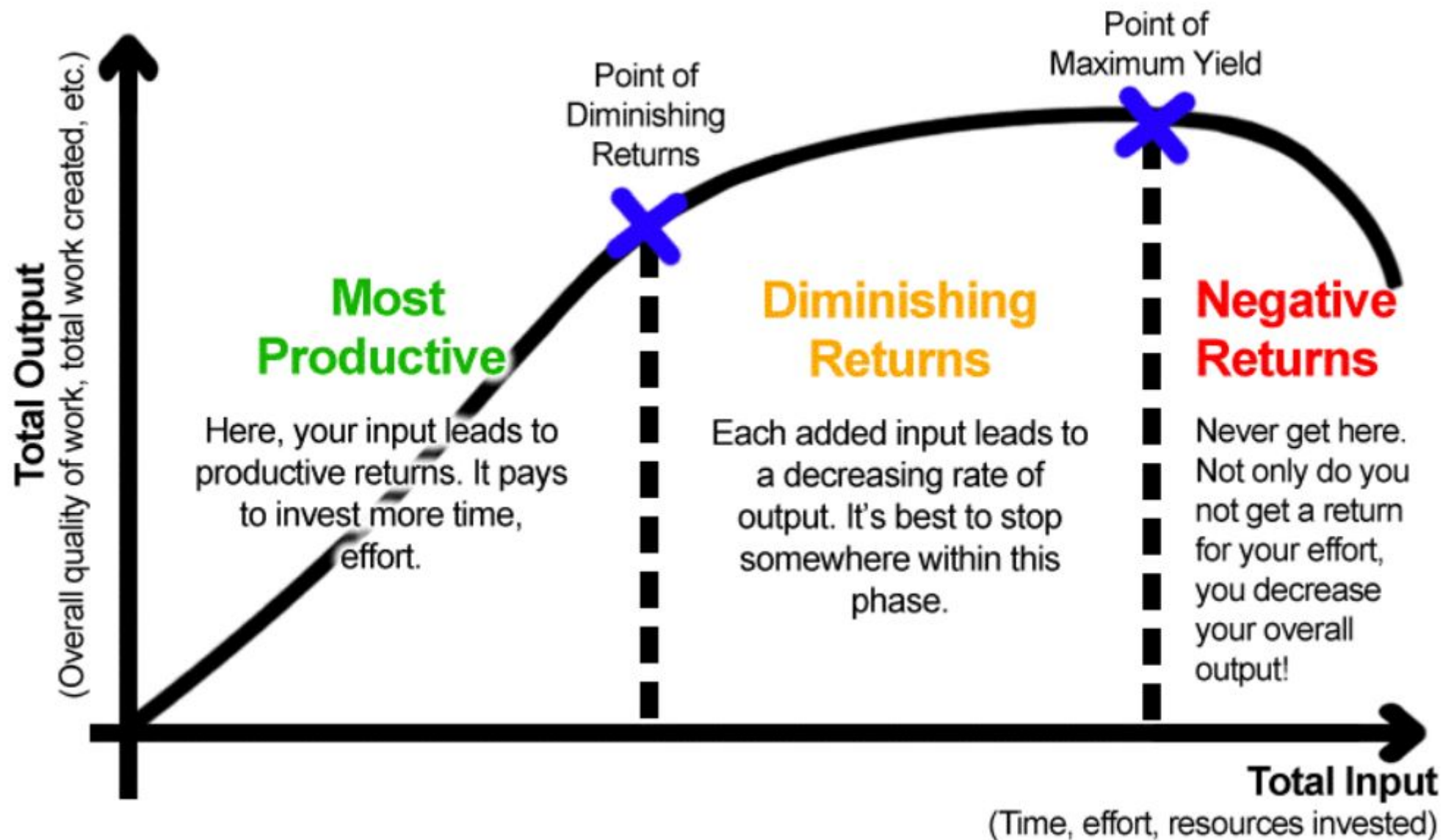
   The factors of production are scarce in supply.

2. **Imperfect Substitutability**

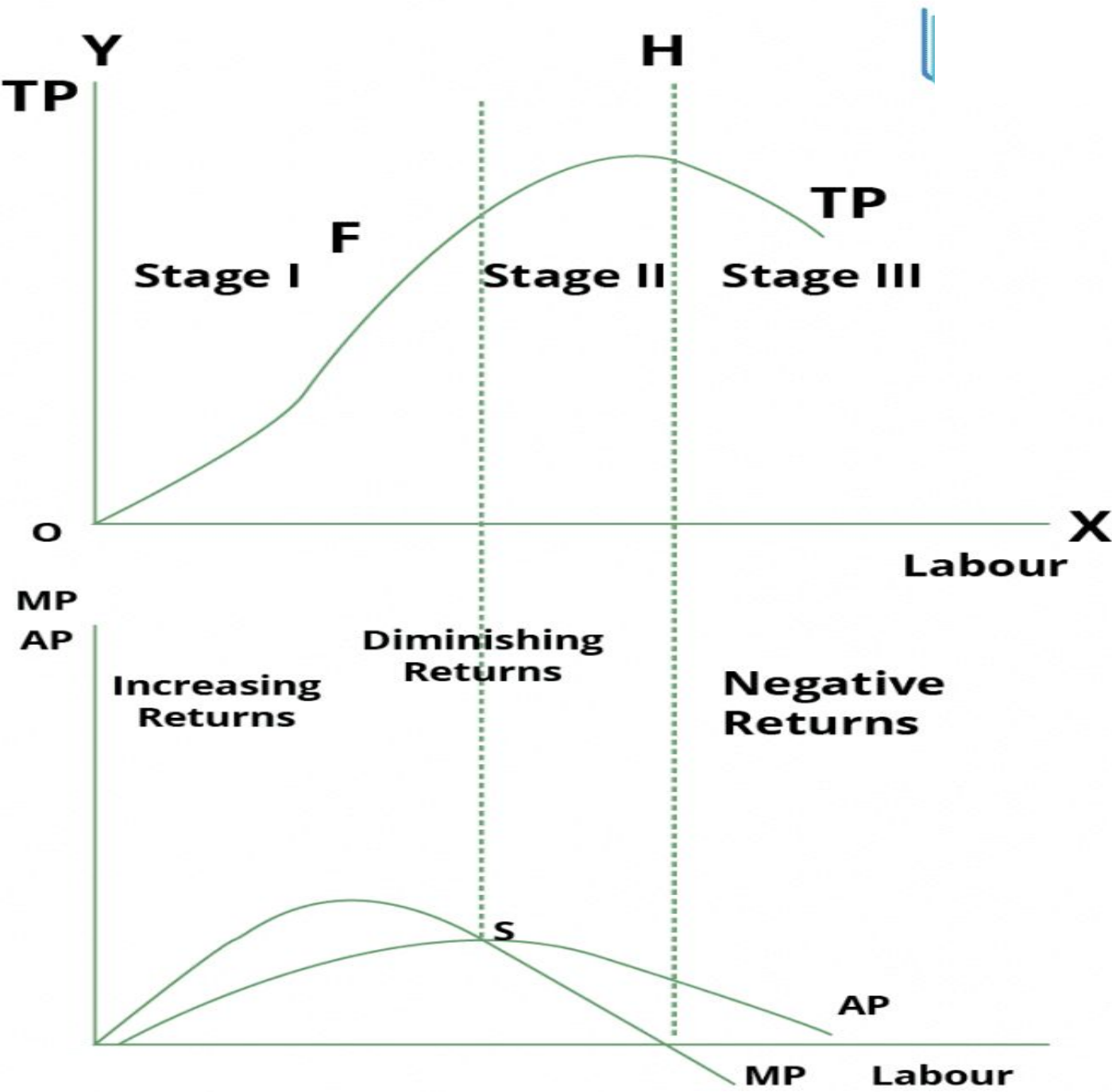   It is not possible to perfectly substitute one factor in place of another.

3. **Factors of production are not homogeneous.**

4. **Wrong combination of factors**

   Wrong combination of factors arises due to the scarcity of factors of production and their imperfect substitute-ability.

Different Stages of Law of Variable Proportions

Stage I
- Average product Increases
- Average cost falls
- Profit increases

Stage II
- Both Average and Marginal product falls
- Marginal Produce (MP)> 0
- Profit is maximum

Stage III
- Total product declines and Marginal product is negative
- Net profit drops

Can the firm operate at Stage 3?

❏ Stage 3 has very high labour-capital ratio – as a result, additional workers not only prove unproductive but also cause a total decline in total product.

❏ In Stage 1, the capital is presumably underutilized – So, a firm operating in Stage 1 has to increase labour and that in Stage 3 has to decrease labour

Limitations of Law of Diminishing Returns

One of the key limitations is that it is based on certain assumptions that may not always hold true in the real world.

1. Fixed Factors assumption
2. Short-run Focus
3. Homogenous Inputs
4. Assumption of Continuity
5. Assumption of Fixed Technology

Returns to Scale

❏ Returns to scale in microeconomics describe a production situation that occurs in the long run when the scale of production increases when all inputs used are variable, which affects the output level.

❏ Returns to scale explain what happens to total output when all production inputs increase, assuming that technology is constant and the market is perfectly competitive.
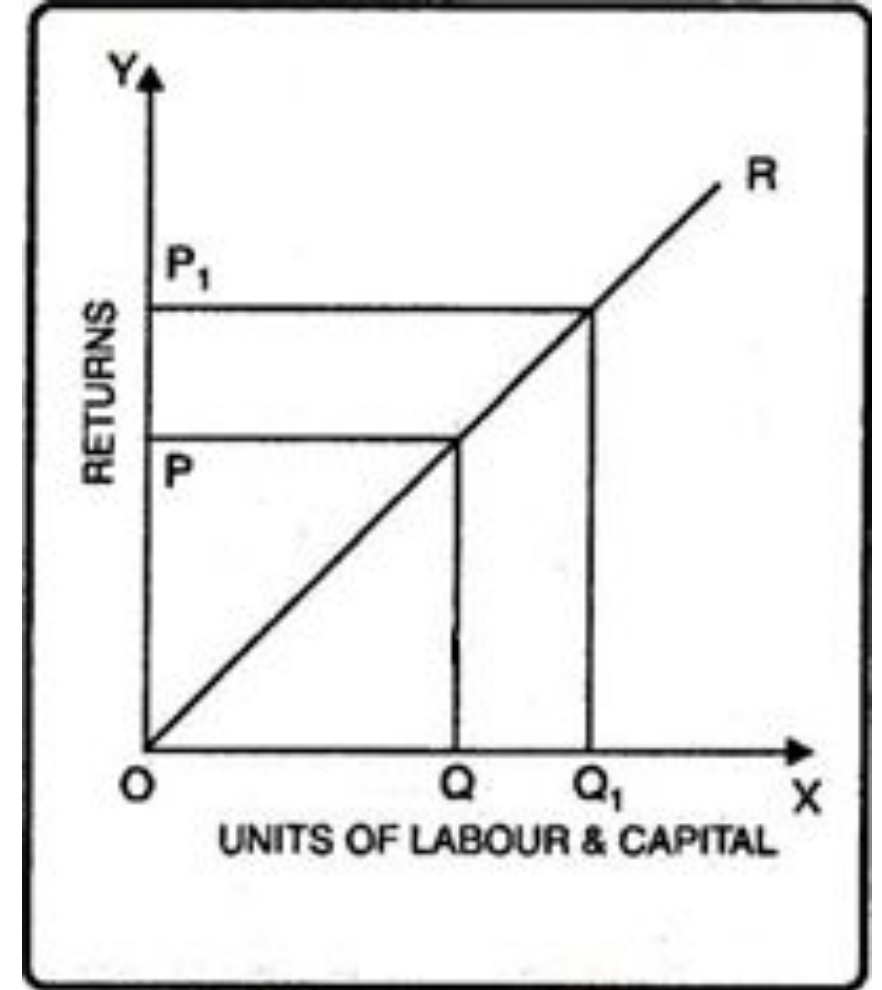
Types of Returns to Scale

1. Increasing returns to scale

If the proportional change in the output of an organization is greater than the proportional change in inputs, the production is said to reflect increasing returns to scale.

For example: To produce a particular product, when the quantity of input is doubled, and the resultant increase in output is more than double.
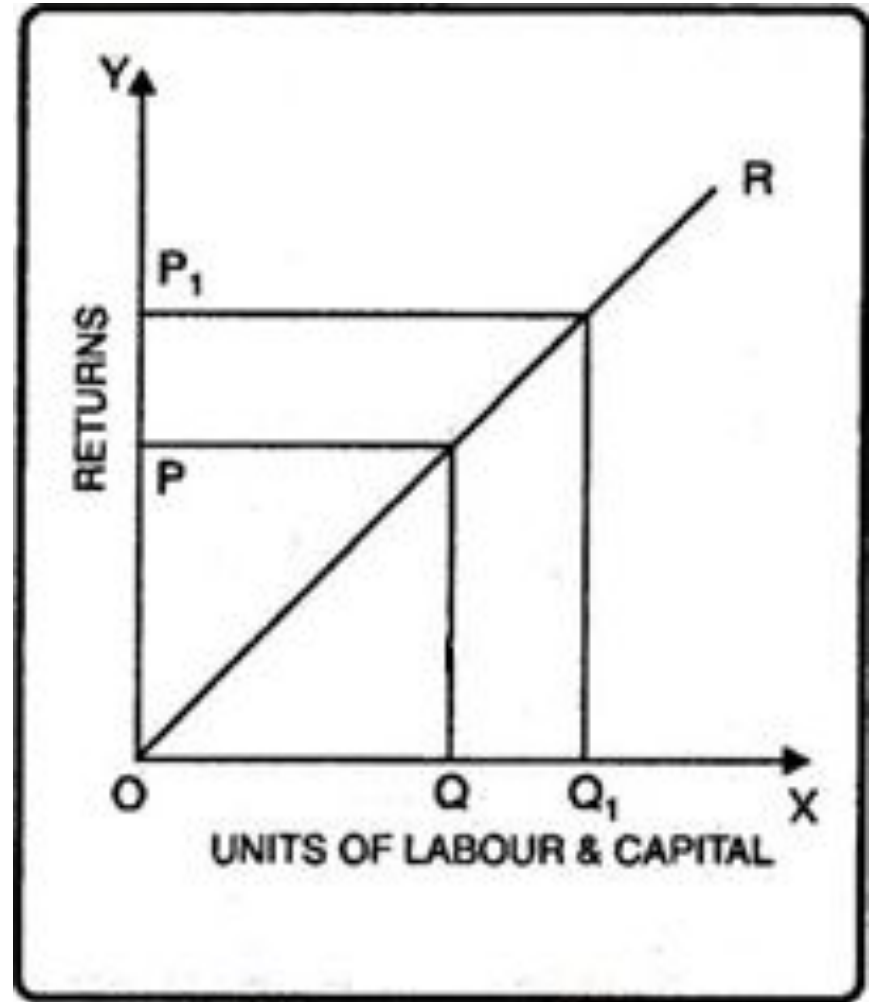
When there is increasing returns to scale, the average cost per unit produced is lower (economies of scale)

2. Constant Returns to Scale

The production is said to generate constant returns to scale when proportionate change in input is equal to the proportionate change in output.

For example: when inputs are doubled, so output also get doubled

3. Decreasing Returns to Scale

Diminishing returns to scale refer to the situation when the proportionate change in the output is less than the proportionate change in input.

For example: When capital and labour is doubled but the output generated is less than doubled.