# Unit -II

# Production Function
# &
# Law of Variable proportion

# Production

Production refers to the creation of Utility.

The creation of utility is of different types

1. Form utility (By changing the form like we produce goods from raw materials)
2. Service utility (By providing service)
3. Knowledge utility (by creating knowledge or awareness)
4. Time utility (utilisation time)

# Factors of production

1.Land: Free gift of nature.contribution ofland is Rent. Its material factors of production

2.Labour: Human factors of production. Wage is the contribution given to labour.

3. Capital: Man-made physical factor of production used for furtheproduction.Examples machine,tools money etc. contribution is Interest.

4. Organisation: Group of people working together. Human factors of production. Profit is earned by organisation.

5.Enterprise: Higher specialised human factors of Production.Alone takes the risks of production.

# Production Function

- Refers to the functional relationship between inputs and output.
- It shows the maximum output that can be produced from given inputs.
- $Q = f(Ld, L, K, E)$
- Land, Labour, Capital and Entrepreneurship are the four basic factors of production.
- Fixed Factors: Land, Capital etc.
- Variable Factors: Labour, Raw materials etc.

# Types of Production Function Based on Time

- Short Run: The time period in which some inputs (fixed factors) of production cannot be varied and the production is increased by varying other factors (variable factors) only.

$$Q = f(L)$$

- Long Run: Defined as a period of time over which all factors become variable.

$$Q = f(L, K)$$

# Laws of Production

***Short run Laws of Production***

- The study of short run production function with one variable input is called as Law of Variable Proportions or Law of Diminishing Returns.

***Long run Laws of Production***

- The study of long run production function with all variable inputs is known as Laws of Returns to Scale.

# Concepts of Product

- Total Product (TP): The total output produced by a given quantity of the variable factor, keeping the quantity of other factors constant.
- Average product (AP): Refers to total product per unit of a given variable factor. AP = TP/QVF
- Marginal Product (MP): It is the addition to the total product by employing an extra unit of variable factor.
  - $MP = TP_N - TP_{N-1}$ or $\Delta TP / \Delta QVF$

# Law of Variable Proportions

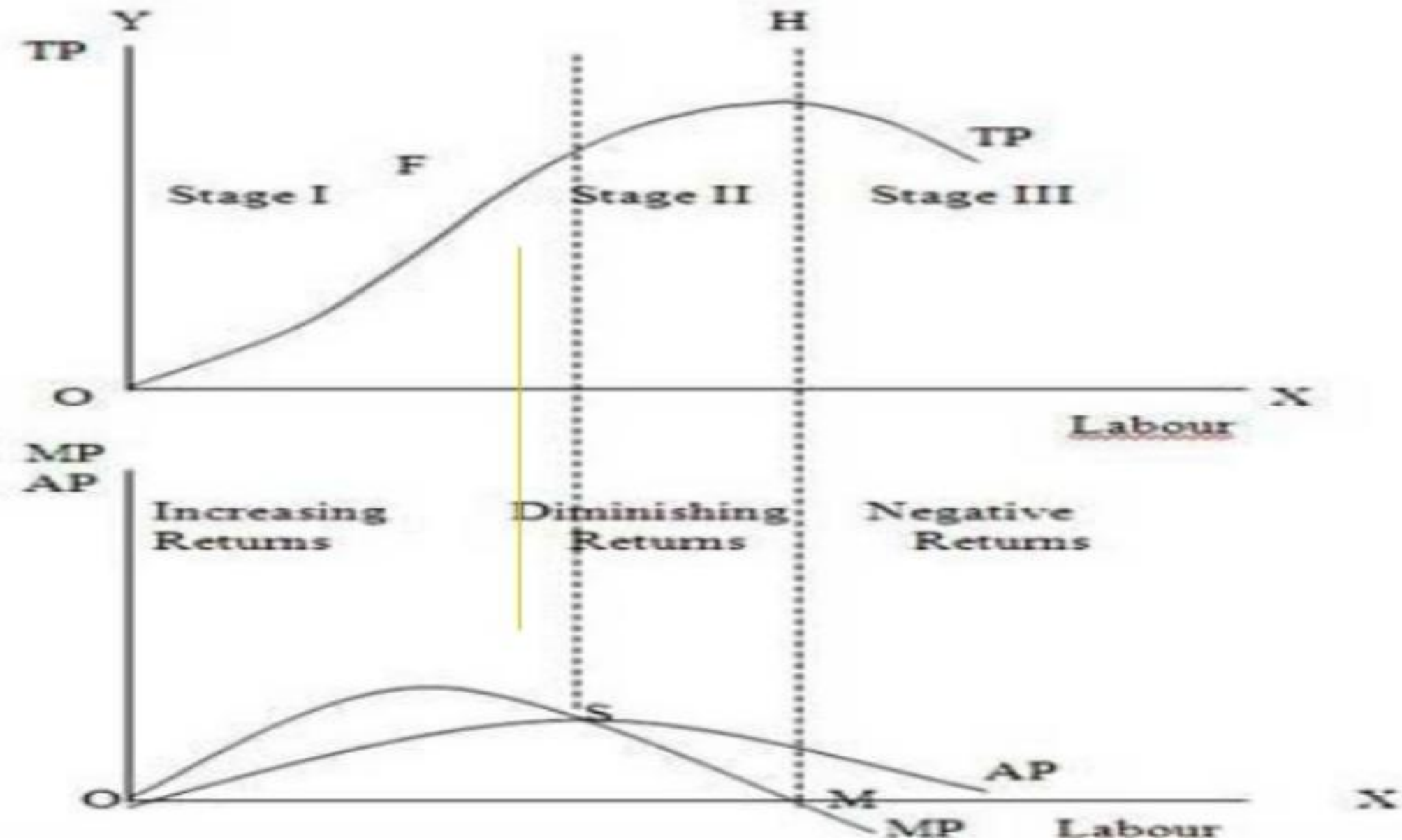
- It was propounded by Marshall and other classical economists.
- How total & marginal product is affected by change in one factor, keeping other factors constant.
- "As proportion of one factor in a combination of factors is increased, keeping other factors fixed, initially marginal & average products will increase then after a point, first marginal and then average product will diminish".

# Assumptions of the Law

- There are only two factors of production- Labour (L) and Capital (K)
- State of technology is constant
- Capital must be kept fixed
- The proportion among the factors is subject to vary
- Labour is homogenous

# Production Schedule

| Units of Labour | TP | AP | MP | Stages of Returns |
|---|---|---|---|---|
| 1 | 20 | 20 | 20 | |
| 2 | 50 | 25 | 30 | Stage I Increasing Returns |
| 3 | 90 | 30 | 40 | |
| 4 | 120 | 30 | 30 | |
| 5 | 135 | 27 | 15 | |
| 6 | 144 | 24 | 9 | |
| 7 | 147 | 21 | 3 | Stage II Diminishing Returns |
| 8 | 148 | 18.5 | 1 | |
| 9 | 148 | 16.4 | 0 | |
| 10 | 141 | 14.1 | -7 | Stage III Negative Returns |
| 11 | 118 | 10.7 | -23 | |


Y
TP
H
TP
F
Stage I
Stage II
Stage III
O
X
Labour
MP
AP
Increasing Returns
Diminishing Returns
Negative Returns
S
AP
O
M
X
MP
Labour

# Stage- I, Increasing Return

- TP increases at an increasing rate up to point F, after point F, TP increases but at a decreasing rate. This point is called as *point of inflection.*
- MP initially increases, reaches its maximum corresponding to the point F, then falls but remains positive throughout the stage.
- MP >AP, When AP is maximum, MP=AP
- Stage-I ends where MP cuts the maximum point of AP.
- Reasons-
    a) Indivisibility of fixed factor
    b) Specialisation or Division of labour

# Stage-II, Diminishing Return

- TP increases at a diminishing rate until it reaches its maximum.
- Both AP and MP continuously decreases.
- AP > MP
- When MP=0, TP is maximum
- Stage-II ends when TP reaches its maximum point H.
- Reasons-

a) Scarcity of the fixed factor
b) Indivisibility of the fixed factor
c) Imperfect substitutability of the factors

# Stage-III, Negative Return

- AP falls but remains positive
- AP > MP
- When TP begins to decline, MP becomes negative.
- Reasons-
  - Imperfect substitutability between K and L
  - Mismanagement or lack of supervision
  - Excessiveness of variable factor relative to the fixed factor- "***too many cooks spoil the broth***".

# Observations

- In Stage-I capital is presumably under-utilised. Here the labour-capital ratio is very low.
- And in Stage-III there is a very high labour-capital ratio, as a result additional workers not only prove unproductive but also cause a decline in TP.
- So a firm operating in Stage-I has to increase labour and that in Stage-III has to decrease labour.

# Stage of Operation

- Stage-I is the Stage of Increasing Return, where MP of fixed factors is negative, all fixed factors are not fully utilised and there is a possibility of increase in output and profit further. Hence it is not a rational stage of operation.
- Stage-III is the Stage of Negative Return, where TP falls and MP of the variable factor is negative. As there is loss to the producer. Thus it is also an irrational stage of operation.
- In Stage-II/Stage of Diminishing Return, both AP and MP falls but the TP reaches its maximum. So the total revenue will be the highest and the profit will be maximised here. Thus the stage of diminishing return will be the most preferable stage of operation for the producer.