

## CH - 7

1. what is production.

- Production refers to transformation of inputs into outputs.

Eg: to manufacture shoes (output) we need various inputs like leather, nails, land, labour, capital, services of entrepreneur, etc.

2. what is production function.

- Production function refers to functional relationship between inputs and outputs.

Production function is expressed as

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

O = output

f = functional relationship

L = labour (inputs)

K = capital (inputs)

$$250 = (7L, 2K)$$

It means 7 units of labour and 2 units of capital can produce maximum 250 units.

Thus, production function

- Establish functional or technical relation b/w inputs & outputs.
- specifies the maximum output that can be produced with the given input.
- is determined by given period of time.

Explain various types of production function. Short run and long run.

Short Run :-

It refers to a period in which output can be changed by changing only variable factors.

In short run, fixed inputs like plant, machinery, building etc cannot be changed.

It means, production can be increased by increasing only variable factors, but till the extent of capacity of fixed factors.

So, in the short run, some factors are fixed and some are variable and fixed factors cannot be changed.

Long Run :-

It refers to a period in which output can be changed by changing all factors of production.

Long run is a period, for the firm to adjust all its inputs according to change in the conditions.

In the long run, firm can change its factory size, switch to new techniques of production, purchase new machinery, etc.

Explain difference between Short Run and Long Run.

### Short Run

### Long Run

It refers to a period in which output can be changed by changing only variable factors.

It refers to a period in which output can be changed by changing all factors of production.

Factors are classified as variable and fixed factors in the short run.

All factors are variable in the long run.

In the short run, demand is more active in price determination as supply cannot be increased immediately with increase in demand.

In the long run, both demand & supply play equal role in price determination as both can be increased.

Explain variable factors and fixed factors.

Variable factors:-

It refers to those factors, which can be changed in the short run.

Eg :- raw materials, power, fuel etc.

Variable factors vary directly with the level of output. As output increases, requirement for variable factors also increases and vice-versa.

## Fixed factors :-

It refers to those factors, which cannot be changed in the short run. Eg:- plant and machinery, land, building etc.

The quantity of fixed factors remain same in the short run irrespective of level of output. i.e. they don't change, whether the level of output rises, falls or becomes zero.

Explain difference between variable factors and fixed factors.

### Variable factors

1. It refers to those factors, which can be changed in the short run.

They vary directly with output

Eg:- Raw material, power, fuel etc.

### Fixed factors

It refers to those factors which cannot be changed in the short run.

They don't vary directly with output

Building, plant & machinery, etc.

Explain types of production functions

Short run production function :-

It refers to a situation when output increases by changing only one input keeping other inputs unchanged.

This relationship is explained by 'Law of Variable Proportions'.

## 2. Long Run Production Function:-

It refers to a situation when output is increased by increasing all the inputs simultaneously and in the same proportion.

This relationship is explained by 'Law of Returns to Scale'.

## 3. What is Total Product / Total Physical product?

Total OUTPUT

- Total product refers to total quantity of goods produced by a firm during a given period of time with given number of inputs.

Eg: If 10 labours produce 60 kg of rice then total product is 60 kg.

## 4. What is Average product / Average physical product / Average return?

- Average product refers to output per unit of variable input.

Eg: If total product is 60 kg of rice produced by 10 labourers, then Average product will be  $60 \div 10 = 6 \text{ kg}$ .

AP is obtained by dividing TP by units of variable factor.

$$AP = \frac{TP}{N}$$

\* AP refers to the per unit of total product.

Q What is Marginal Product / Marginal Physical Product / Marginal Return?

Marginal Product refers to addition to total product when 1 more unit of variable factor is employed.

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

I. Explain law of Variable Proportion?

Statement:

law of variable proportion (LVP) states that as we increase quantity of only one input keeping other input fixed, total product initially increases at increasing rate, then at a decreasing rate and finally at a negative rate.

Assumptions:

- 1) It operates in a short run as factors are classified as fixed & variable.
- 2) This law applies in field of production only.
- 3) Factors of production are imperfect substitutes of each other.
  - a) the state of technology is constant.
  - b) it is assumed that all variable factors are equally efficient.

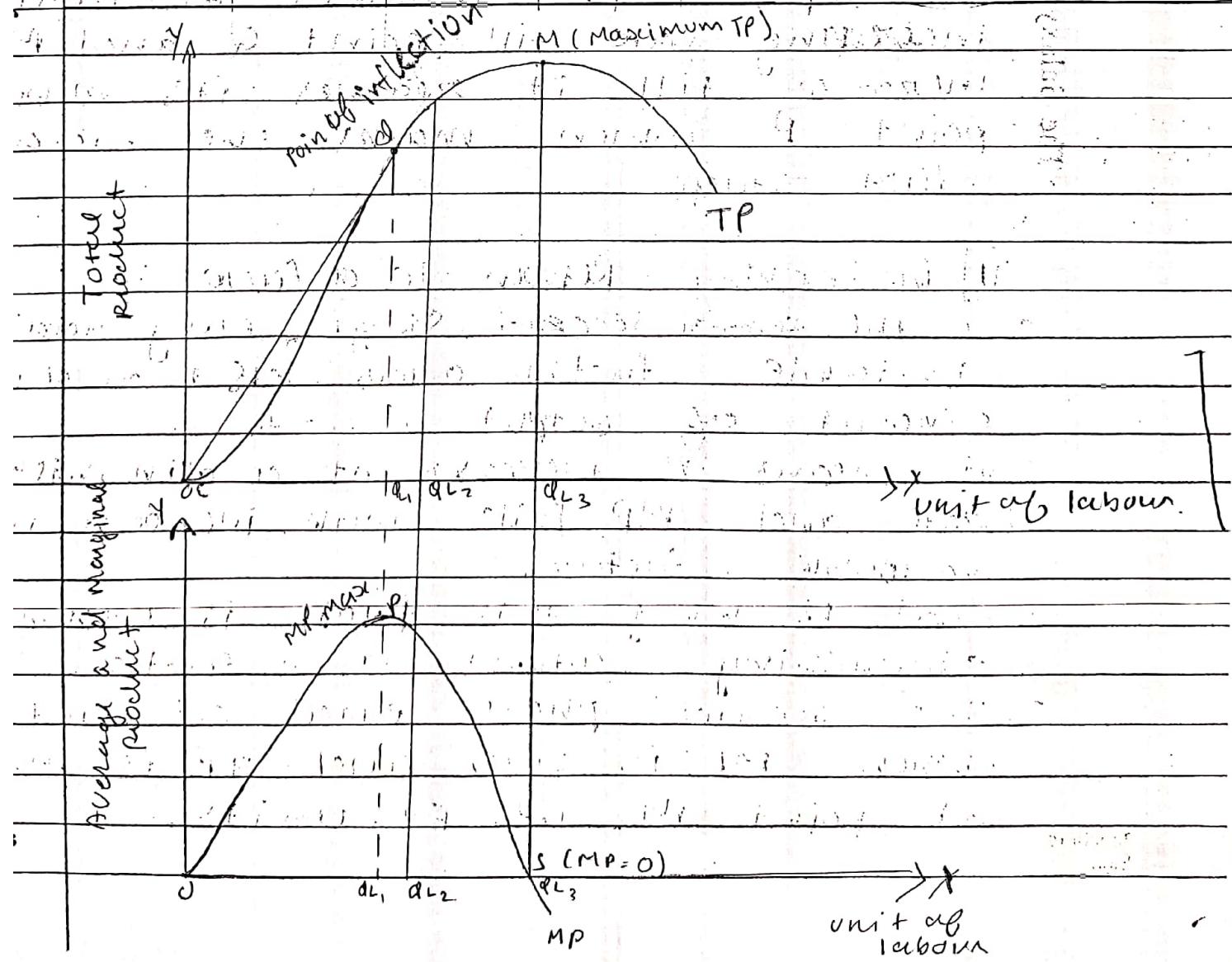
Example:

Suppose a farmer has 1 acre of land (fixed factor) on which he wants to increase product of wheat with help

of labour (variable factor).

When he employed more & more units of labour initially output increased at an increasing rate then at a decreasing rate and finally at a negative rate. This is explained with below schedule.

Fixed Factor Land	Variable Labour	TP	MP	Phase
1	1	10	10	Phase - 1
1	2	30	20	Increasing return
1	3	45	15	Phase - 2
1	4	52	7	Diminishing return
1	5	52	0	Point of inflection
1	6	48	-4	Phase - 3
				Negative return



As seen in the above schedule and diagram when farmer increases the labour on the same piece of land then, initially TP increases at an increasing rate, then at a decreasing rate and finally it falls.

### Phases:

I] Increasing Returns to a Factor:  
In the first phase, every additional variable factor adds more and more to the total output.  
It means, TP increases at an increasing rate and MP also increases.  
It implies TP increases at first increasing rate till point Q and MP increases till it reaches its maximum point P which marks the end of first stage.

II] Diminishing Returns to a factor:  
In the second stage, every additional variable factor adds lesser and lesser amount of output.  
It means TP increases at a diminishing rate and MP falls with increase in variable factor.  
That is why this phase is known as diminishing return to a factor.  
The second phase ends at point S, when MP is zero and TP is maximum at point M. i.e. 52 units.

### III Negative returns to a factor:

- In the third phase starting from 6 units of labour, the employment of additional variable factor causes TP to decline.
- MP now becomes negative.
- therefore this phase is known as negative returns to a factor.
- The third phase starts after point O on MP curve and point M on TP curve.
- MP of each variable factor is negative in this stage so no firm will choose to operate in this stage.

q) In which phase a rational producer will operate?

- A rational producer will always operate in phase I of all of variable proportion.

In phase I, employment of every additional unit of variable factor gives more and more output i.e. MP increases. It means there is scope for more profit, if production is increased with more units of variable factors.

In the phase III, MP of each variable factor is negative so, this phase is ruled out on the ground of technical inefficiency and the a rational producer will never produce in the III stage phase.

This brings us to the conclusion that producer will aim to operate in phase II as TP is maximum and MP of each variable factor is positive.

Q) Explain the reasons for the law of variable factors proportion.

→ Reasons for Increasing Returns to a factor:

- i) Better utilisation of fixed factors:  
- In the I stage, the supply of fixed factor is too large, whereas variable factors are too few. So, the fixed factor is not fully utilised.  
- When variable factors are increased and combined with fixed factor, the fixed factor is better utilised and output increases at an increasing rate.

- ii) Increase efficiency of variable factors:  
- When variable factors are increased and combined with the fixed factor, then variable factor is utilized in a more efficient manner.  
- At the same time, there is a greater co-operation and high degree of specialization between different units of variable factors.

- iii) Invisibility of fixed factors:  
Generally, the fixed factors which are combined with variable factors

are indivisible such factors cannot be divided into smaller units. Once an investment is made in an indivisible fixed factor then addition of more and more units of variable factor improves the utilization of fixed factors.

The increasing returns apply as long as optimum level of combination between variable and fixed factor is achieved.

### B] Reasons for diminishing returns to a factor

#### i) Optimum combination of factors:

- among the different combination between fixed and variable factors there is one optimum combination, at which total product is maximum.
- After making the optimum use of fixed factor, the marginal return of variable factor begins to diminish.

#### ii) Imperfect substitute.

Diminishing returns to a factor occurs because fixed and variable factors are imperfect substitutes of one another. There is a limit to the extent of which one factor of production can be substituted for another.

### C] Reasons for negative returns to a factor

#### i) Limitation of fixed factor:

- The negative returns to a factor applies

because some factors of production are of fixed nature, which cannot be increased with increase in variable factor in the short run.

i) Poor coordination between variable and fixed factors

When variable factor becomes too excessive in relation to fixed factor, then they obstruct each other. It leads to poor coordination between variable & fixed factor.

As a result, total output falls instead of rising and marginal product becomes negative.

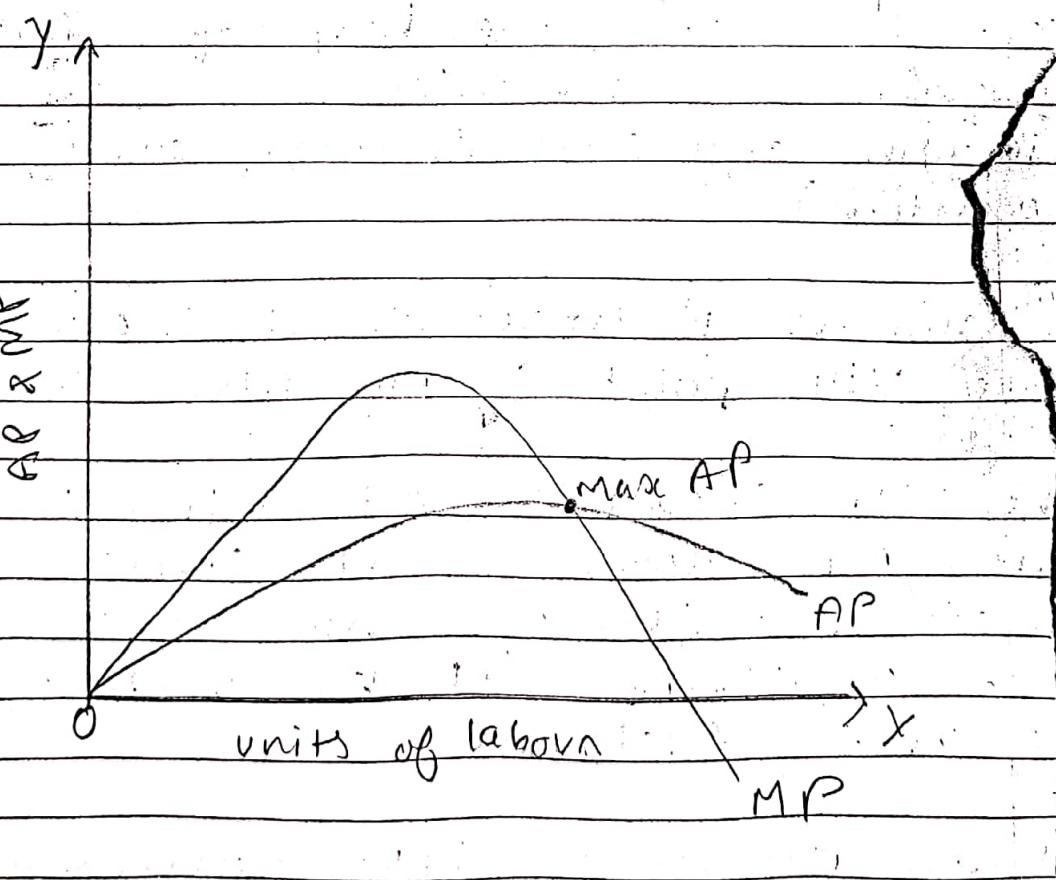
ii) Decrease in efficiency of variable factors with continuous increase in variable factor the advantages of specialization and division of labour starts diminishing. It results in inefficiency of variable factor, which is another reason for the negative returns.

(1) Explain relationship between AP & MP.

- Meaning of AP and MP

- The relationship between AP & MP is discussed with the help of below schedule and diagram.

Fixed Factor Land	Variable Factor Labour	AP	TP	MP
1	0	—	10	—
1	1	10	10	10
1	2	15	30	20
1	3	15	45	15
1	4	13	52	7
1	5	10.40	52	0
1	6	8	48	-4



- As long as MP is more than AP, AP rises; that is upto 2nd unit of variable factor.

- when  $MP = AP$ ,  $AP$  is at its max. i.e. at 3<sup>rd</sup> unit of variable factor.
- when  $MP$  is less than  $AP$ ,  $AP$  falls. (from 4<sup>th</sup> unit of variable factor).
- There after, both  $AP$  and  $MP$  fall, but  $MP$  becomes negative, whereas  $AP$  is positive.  $MP$  falls at faster rate in comparison to fall in  $AP$ .

## 12) Explain relationship between TP and MP

- Meaning of  $TP$  and  $MP$ .
- The relationship between  $TP$  and  $MP$  is discussed with the help of following diagram and schedule (Diagram and schedule refer law of variable proportion)
- As long as  $TP$  increases at increasing rate, till point Q,  $MP$  also increases.
- When  $TP$  increases at diminishing rate,  $MP$  decreases. It starts happening when 3 units of labour are employed and continues till 5 units of variable factor.
- When  $TP$  reaches its maximum point M,  $MP$  becomes zero at point 5, i.e. at 5 unit of variable factor.

→) when TP starts decreasing, MP becomes negative i.e. from 6<sup>th</sup> unit of variable factor.

Q) Explain difference between returns to factor and returns to scale.

### Returns to Factor

### Returns to Scale

- |  |  |
|--|--|
| <ul style="list-style-type: none"><li>It refers to increase in total product when only one factor is increased, keeping all other factors fixed.</li><li>It applies to short run production function.</li><li>There is no change in scale of operation, only level of production changes.</li><li>Output change due to change in marginal productivity of variable factor.</li></ul> | <ul style="list-style-type: none"><li>It refers to the change in output when all factor inputs are changed simultaneously in same proportion in the long run.</li><li>It is concerned with long run production function.</li><li>There is change in scale of operation.</li><li>Output changes due to change in efficiency of all factors.</li></ul> |
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