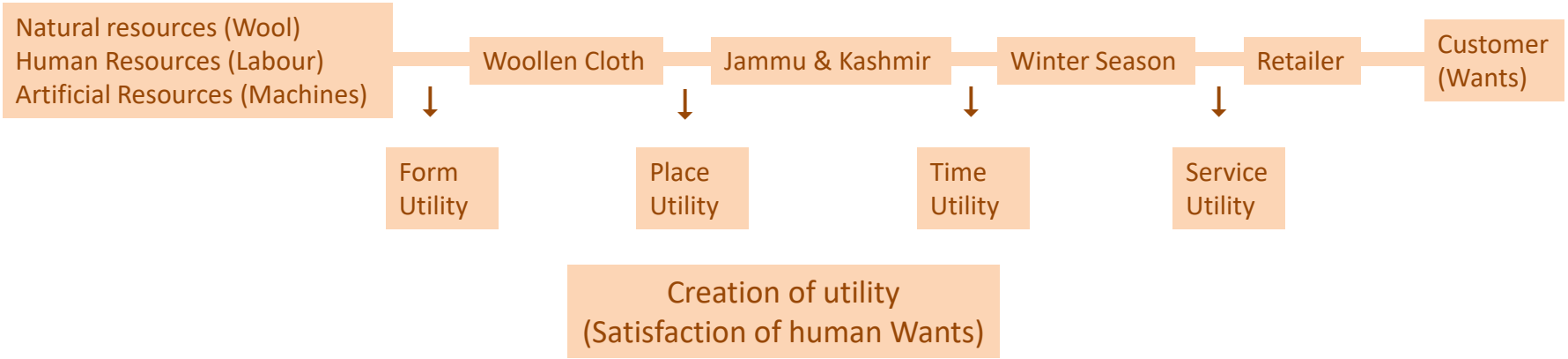
What is Production

What is Production

It is an Economic Activity
which involves Transformation of Input into Output



Thus, the entire process of production is nothing but creation of form utility, place utility, time utility and/or personal utility

What is Production

Production Involves

- Creation of utility (i.e. satisfaction of human wants)
- Transformation of Input into output
- It is an economic Activity

Note:

- Not necessarily involve conversion of physical inputs into physical output.
- But also involves intangible inputs to produce intangible output.

For example, production of services such as those of lawyers, doctors, musicians, consultants etc.

Note:

Intention to exchange in the market is an essential component of production

What is Production Function?

Production Function

Functional Relationship

Output ← Input

$Q = F(a,b,c,d....n,T)$

It takes the form of volume of goods and services

Maximum Output → Given Input
Given Output → Minimum Input

It can be land, labour, capital and Enterprises

- It states technological relationship between inputs and output.

Production Function

Assumptions of Production Function:

There are three main assumptions underlying any production function.

- Specific period of time.
- Technology is constant
- Inputs are utilized is at the maximum level

Types of Production Function

Short period production functions:

In the short period, factors of production in the short period can be divided into two types they are:-

1. **Fixed factors:** The factors which are not available in the short period they can be kept as constant. So they are called fixed factors. Example: land, building, machines etc.
2. **Variable factors:** The factors which are available to change the output in the short period, they can be changed so they are called variable factors Example: capital, labour, raw materials etc.

A period will be considered short-run period if the amount of at least one of the inputs used remains unchanged during that period

Types of Production Function

Long period production function:

A long run production function shows the maximum quantity of a good or service that can be produced by a set of inputs, assuming that the firm is free to vary the amount of all the inputs being used.

The long run is a period of time (or planning horizon) in which all factors of production are **variable.**

Note: The classification of fixed and variable factors is related to only short period. But in long period all factors are variable factors.

Law of Variable Proportion

Law of Variable Proportion

FF	VF	MP	TP	AP	Stage	Law	Ends at
5	1	100	100	**100**			
5	2	110	210	**105**			
5	3	120	330	**110**			
5	4	130	460	**115**			
5	5	140	600	**120**	**Stage 1**	**Law of Increasing Returns**	**Ends at AP maximum**
5	6	60	660	**110**			
5	7	10	670	**95.71**			
5	8	0	670	**83.75**	**Stage 2**	**Law of Diminishing Returns**	**Ends at MP =0**
5	9	-10	660	**73.33**	**Stage 3**	**Law of Negative Returns**	

Law of Variable Proportion

Concept of Products

Total Product

It refers to the total output of the firm per period of time

It is the total amount of the output obtained by the firm ‘or’ producer by the employment of total units of factors of production (labour).

When the marginal productivities of labour added then total productivity can be obtained

TP = f [ql] (or) TP = ∑mp

Law of Variable Proportion

Concept of Products

Average Product

Average Product is total output per unit of the variable input.

Thus Average Product is total product divided by the number of units of the variable factor.

It is the product per unit of labour when the total product is divided with no. of units of labour average product can be obtained.

AP= TP/L

Law of Variable Proportion

Concept of Product

Marginal Product:

Marginal Product is the change in total product resulting from using an additional unit of the variable factor.

It is an additional product obtained by the firm or producer by the employment of additional unit of labour or one more unit of labour. The change in the total product is also called marginal product.

$MP = \Delta TP/\Delta L$

$MP = TPn – TPn\text{-}1$

Law of Variable Proportion

Introduction

- It explains the relationship between inputs and outputs in the short period.
- According to this law output can be changed by changing some factors (variable factors) while other factors are constant. So it is called law of variable proportions.
- This law was developed by “Alfred Marshall”.

Statement/Definition

“An increase in the amount of labour and capital applied in the cultivation of land causes in general a less than proportionate increase in the amount of output raised unless it happens to coincide with the improvements in the arts of agriculture”. – Marshall

Law of Variable Proportion

Assumptions:

- There is a possibility to change the some factors (Variable factors), while other factors are constants (fixed factors).
- There is a possibility to change the combination of fixed and variable factors.
- There must be no change in the level of technology.
- It is applicable to only short period

Law of Variable Proportion

FF	VF	MP	TP	AP	Stage	Law	Ends at
5	1	100	100	**100**			
5	2	110	210	**105**			
5	3	120	330	**110**			
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5	9	-10	660	**73.33**	**Stage 3**	**Law of Negative Returns**	

Law of Variable Proportion

FF	VF	MP	TP	AP
5	1	100	100	**100**
5	2	110	210	**105**
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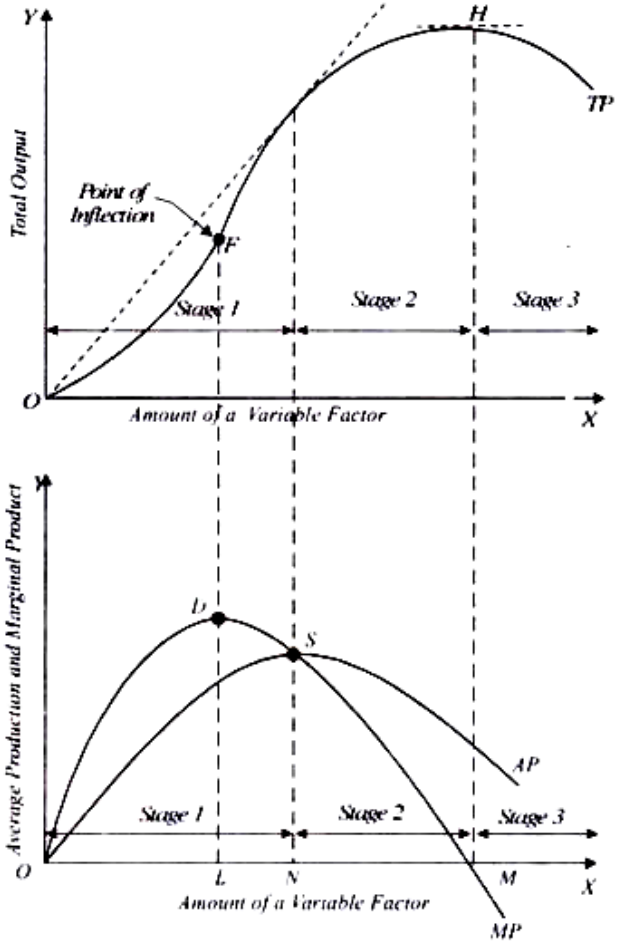


Fig. 16.3. *Three Stages of the Law of Variable Proportions*

Law of Variable Proportion

Stage 1 : Law of increasing return

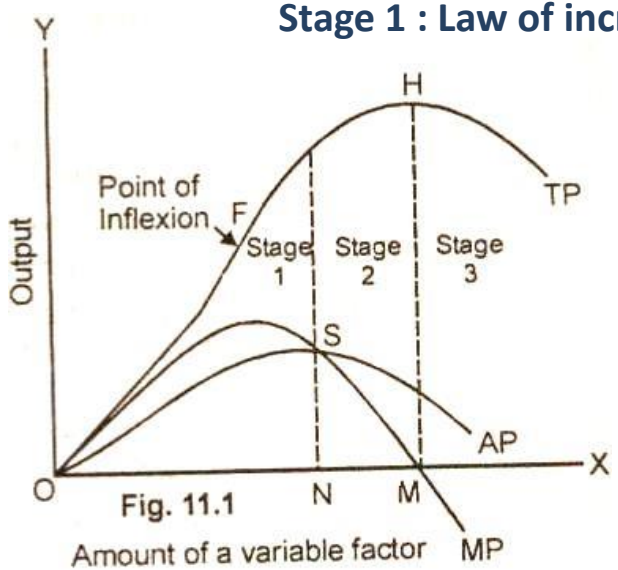


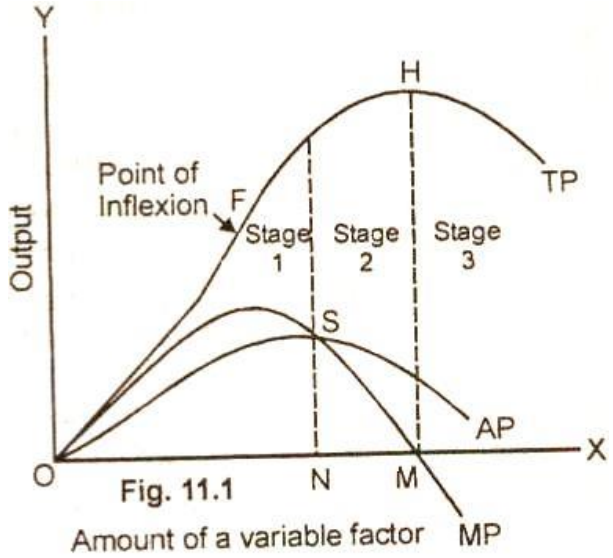
Fig. 11.1

5	1	100	100	100
5	2	110	210	**105**
5	3	120	330	**110**
5	4	130	460	**115**
5	5	140	600	**120**

Point	MP	TP	AP	Reason or Explanation
Before Point F	MP ↑ (+ ve)	TP ↑@ increasing rate	AP↑	1. Division of Labour 2. Specialization 3. Indivisibility Of Fixed Factor(FF>VF)
At Point F	MP max	TP ↑	AP↑	
After Point F	MP ↓ (+ ve)	TP ↑@ diminishing rate	AP↑	

Law of Variable Proportion

Stage 2 : Law of Diminishing return



5	6	60	660	110
5	7	10	670	95.71
5	8	0	670	83.75

Point	MP	TP	AP	Reason or Explanation
After Point S	MP↓ (+ve)	TP↑ @ diminishing rate	AP↓	1. Indivisibility of Fixed Factor(VF>FF) 2. Imperfect Substitute

Law of Variable Proportion

Stage 3 : Law of Negative return

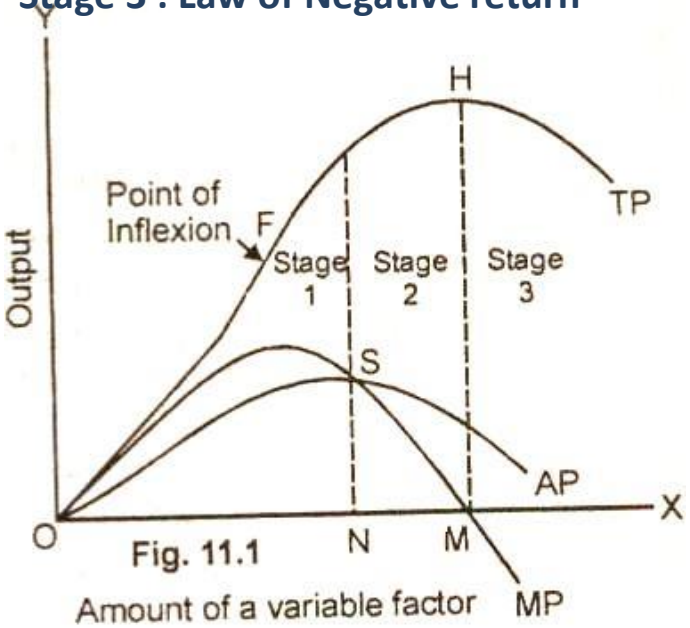


Fig. 11.1

5	9	-10	660	73.33

Point	MP	TP	AP	Reason or Explanation
After Point M	MP↓ (-ve)	TP↓	AP↓	1. More of VF >FF

Area of Operation

With the knowledge of the three stages of the law, a producer can choose the appropriate stage of its operation.

Stage III

- A rational producer would not like to operate in Stage III.
- In this stage TP↓ and MP↓ becomes negative.

FF	VF	MP	TP	AP	Stage
5	1	5	5	5	
5	2	9	14	7	
5	3	16	30	10	
5	4	26	56	14	
5	5	19	75	15	
5	6	15	90	15	Stage 1
5	7	8	98	14	
5	8	4	102	12.8	
5	9	0	102	11.3	Stage 2
5	10	-4	98	9.8	Stage 3

Area of Operation

With the knowledge of the three stages of the law, a producer can choose the appropriate stage of its operation.

Stage I

- A producer does not operate in stage I.
- Here MP↑ and TP↑ with the increase in a variable factor.
- There is a scope for more efficient utilization of fixed factors by employing more units of a variable factor.
- A rational producer would not therefore, like to stop in stage I but will expand further.

FF	VF	MP	TP	AP	Stage
5	1	5	5	5	
5	2	9	14	7	
5	3	16	30	10	
5	4	26	56	14	
5	5	19	75	15	
5	6	15	90	15	Stage 1
5	7	8	98	14	
5	8	4	102	12.8	
5	9	0	102	11.3	Stage 2
5	10	-4	98	9.8	Stage 3

Area of Operation

With the knowledge of the three stages of the law, a producer can choose the appropriate stage of its operation.

Stage II

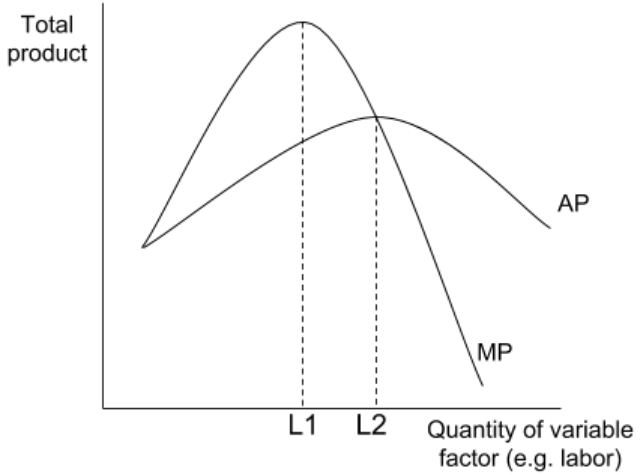
- A rational producer never chooses first and third stages for production.
- He, therefore, likes to operate in the stage II, the stage of diminishing returns.
- In this way this stage of the law of variable proportions is the most relevant stage of operation for a producer.

FF	VF	MP	TP	AP	Stage
5	1	5	5	5	
5	2	9	14	7	
5	3	16	30	10	
5	4	26	56	14	
5	5	19	75	15	
5	6	15	90	15	Stage 1
5	7	8	98	14	
5	8	4	102	12.8	
5	9	0	102	11.3	Stage 2
5	10	-4	98	9.8	Stage 3

Relationship between Average Product and Marginal Product

Relationship between Average Product and Marginal Product

1. If MP > AP – AP increase
2. If MP < AP – AP decrease
3. If MP = AP – AP remains unchanged is maximum



Isoquant

Production Isoquant

In long run – all factors are variable - So factor can be varied (increased or decreased)

For e.g. Suppose a company XYZ needs to produce 1000 quantities
Firm has two variable inputs (factors) i.e. X and Y

Now, Firm can combine Factor X and Factor Y in different proportion in order to produce 1000 quantities under given technology

Combination	Factor X (Labour)	Factor Y (Capital)	Production
A	1	15	1000
B	2 ↑	11 ↓	1000
C	3 ↑	8 ↓	1000
D	4	6	1000

Isoquant/ Equal Product Curve/ Iso-product curve/Production indifference curve

Isoquants are similar to indifference curves in the theory of consumer behaviour.

An isoquant shows all those combination of factors (inputs) which produce the same level of Production

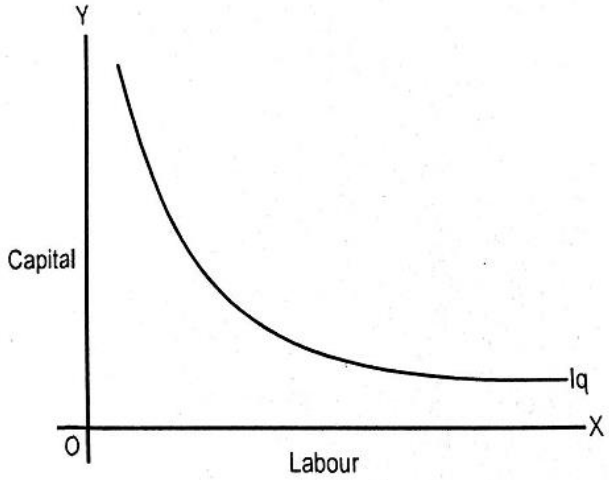
Production Isoquant

Isoquant Schedule
(Various Combination Of Factors)

Combination	Factor X (Labour)	Factor Y (Capital)	Production
A	1	15	1000
B	2 ↑	11 ↓	1000
C	3 ↑	8 ↓	1000
D	4	6	1000

Inverse Relationship Between factors

Isoquant Curve
(Various Combination Of Factors)



Production Isoquant

Isoquant map/Production map

An isoquant map is family of Isoquant

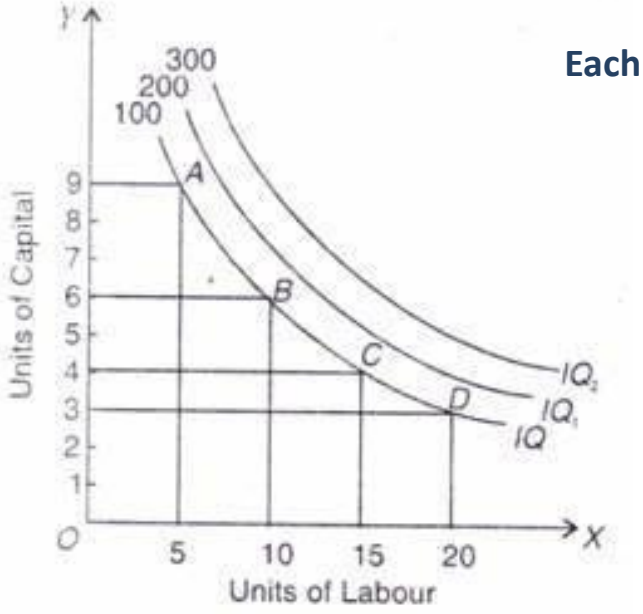


Fig. 1.

Each Isoquant represents a specific volume of output

IC1 represents the output of 100

IC2 represents the output of 200

IC3 represents the output of 300

Properties of Isoquant

Properties of Production Isoquant

Isoquant/ Equal Product Curve/ Iso-product curve/production indifference curve

Isoquants have properties similar to indifference curves.

Note: However, there is one important difference between the two: whereas in an indifference curve it is not to quantify the level of satisfaction acquired by the consumer, the level of production acquired by the produce quantified

Properties of Production Isoquant

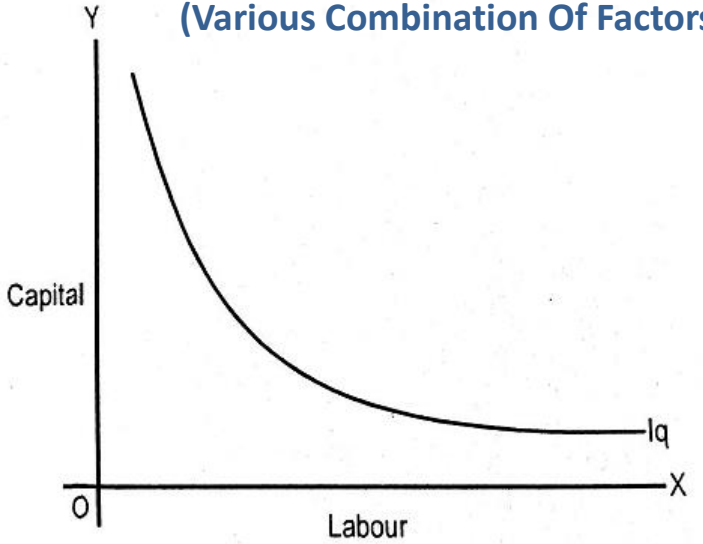
Isoquant/ Equal Product Curve/ Iso-product curve/production indifference curve

1. Isoquant Slopes Downward From Left to Right

Isoquant Schedule
(Various Combination Of Factors)

Combination	Factor X (Labour)	Factor Y (Capital)	Production
A	1	15	1000
B	2 ↑	11 ↓	1000
C	3 ↑	8 ↓	1000
D	4	6	1000

Isoquant Curve
(Various Combination Of Factors)



Factor X ↑ Factor Y↓
Factor X ↓ Factor Y↑

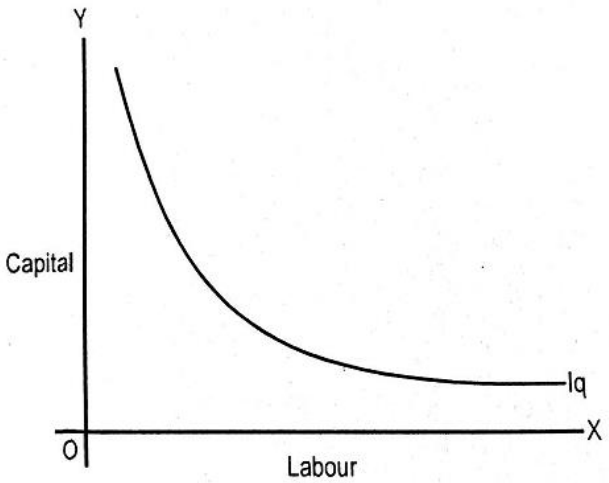
Inverse Relationship Between factors Downward Sloping From Left to Right

Properties of Production Isoquant

Isoquant/ Equal Product Curve/ Iso-product curve/production indifference curve

2. Isoquant are Convex to Origin

Combination	Factor X (Labour)	Factor Y (Capital)	MRTS Slope =△Y/△X	Production
A	1	15		1000
B	2 ↑	11 ↓	4	1000
C	3 ↑	8 ↓	3	1000
D	4	6	2	1000

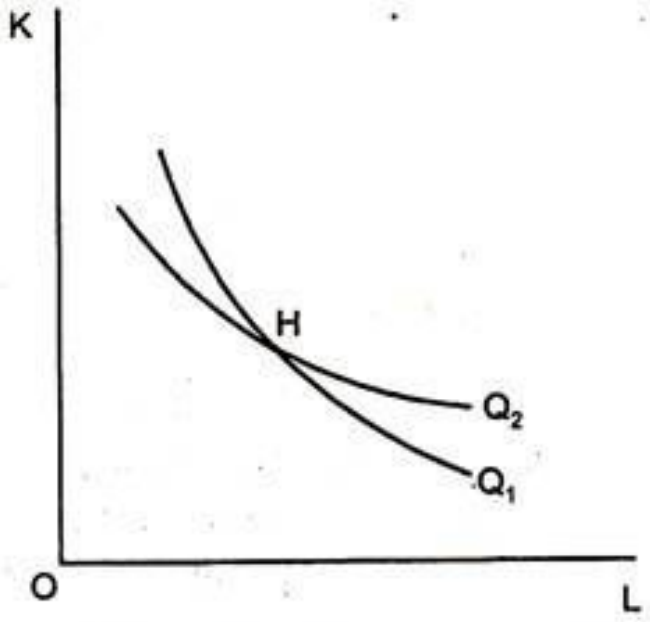


Isoquant are convex to origin →MRTS is Diminishing

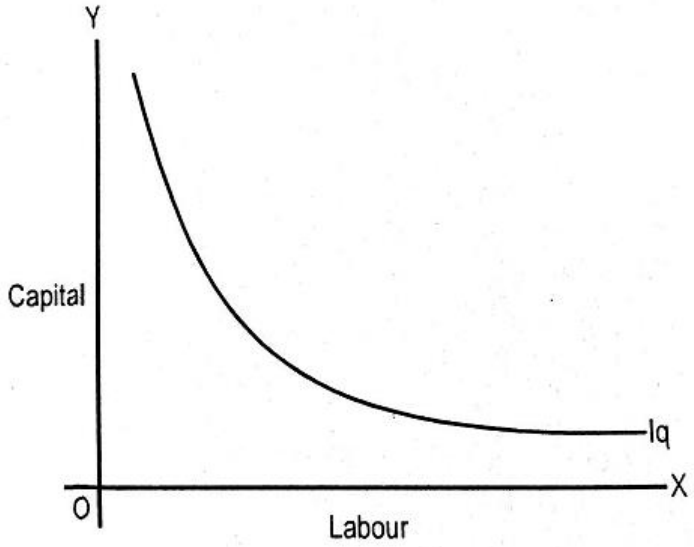
Properties of Production Isoquant

Isoquant/ Equal Product Curve/ Iso-product curve/production indifference curve

3. Isoquant do not intersect



4. Isoquant cannot touch either axis



Properties of Production Isoquant

Isoquant/ Equal Product Curve/ Iso-product curve/production indifference curve

5. Higher Isoquant - Higher Production

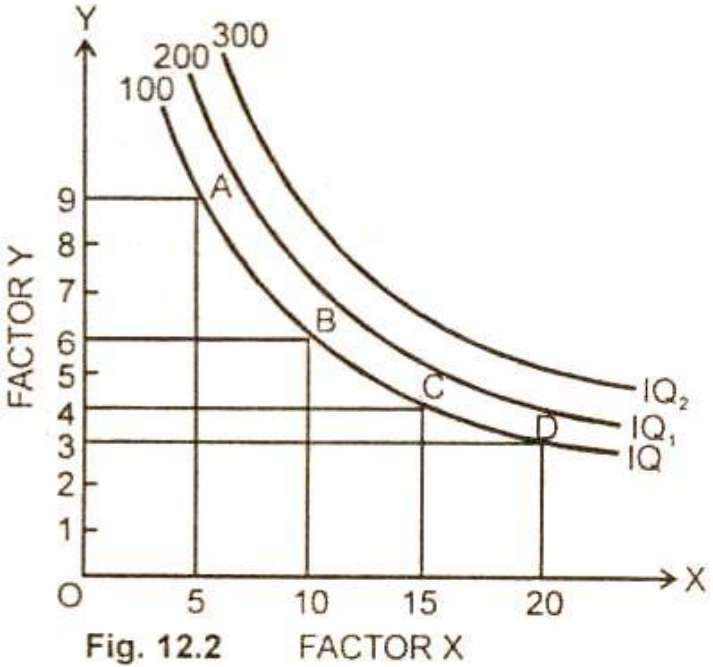


Fig. 12.2

Isocost

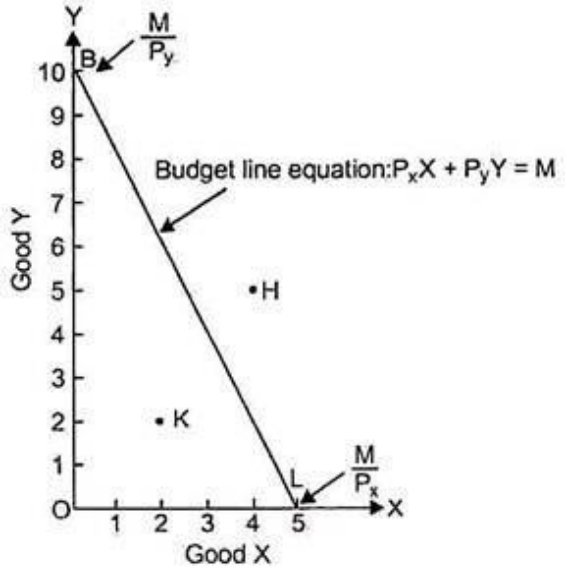
Iso- cost

Isocost Line/Equal Cost line (Budget)

Isocost line, also known as budget line or the budget constraint line, shows the various alternative combinations of two factors which the firm can buy with given outlay.

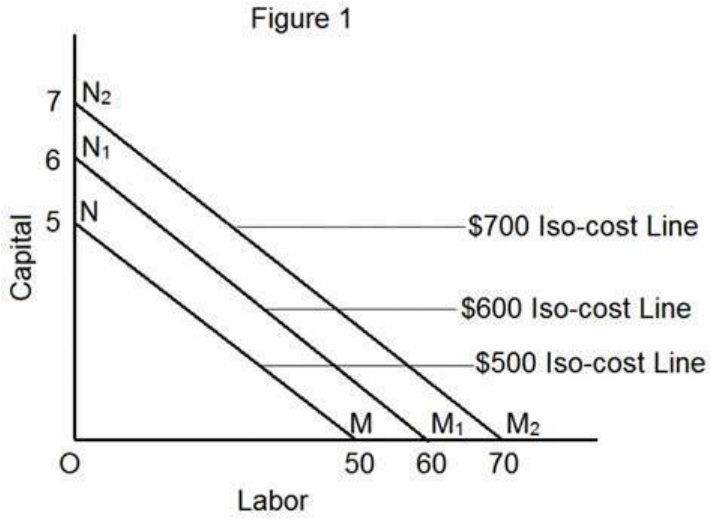
Consider that company XYZ has 100 Rs. to produce the output
Price of Factor X is Rs. 20 & Price of Factor X is Rs. 10

Combination	Factor X (Labour)	Factor Y (Capital)
A	5	0
B	4 ↑	2 ↓
C	3 ↑	4 ↓
D	2	6
E	1	8
F	0	10



Iso-cost

Different Iso-cost Line of Different Budget



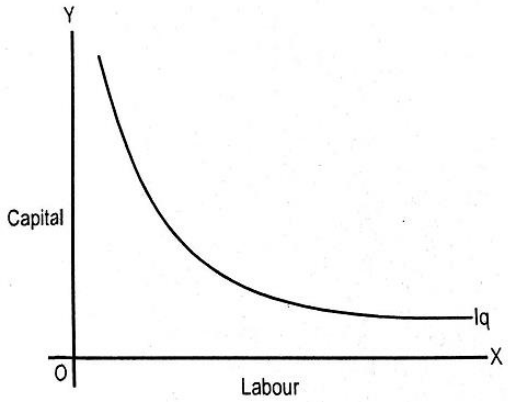
Producer Equilibrium

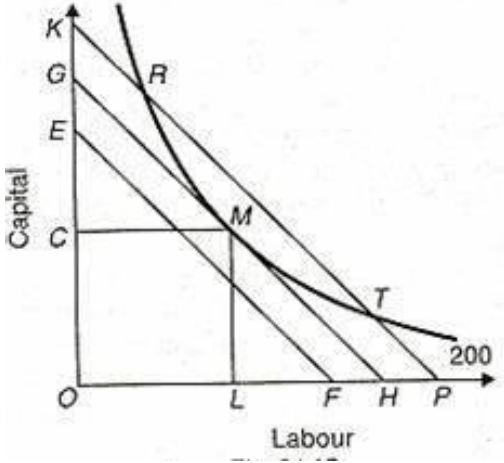
Producer Equilibrium

- **The firm will try to use the least-cost combination of factors.**
- **The least cost combination of factors can be found by super-imposing the isoquant that represents the pre decided level of output on the isocost lines.**

Producer Equilibrium

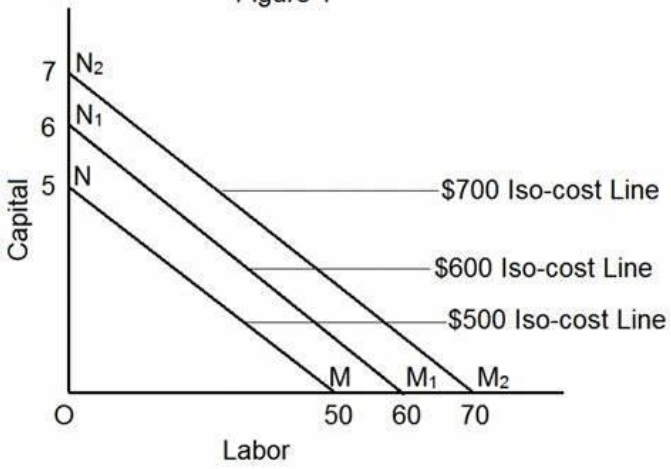
Isoquant





Isocost Line

Figure 1



- **Thus, the factor combination represented by point M is the optimum combination for the producer.**
- **It represents the least-cost of producing 1,000 units of output.**
- **It is thus clear that the tangency point of the given isoquant with an isocost line represents the least cost combination of factors for producing a given output.**

Law of return to scale

Law of Return to Scale

Introduction

- **It shows the relationship between inputs and outputs in the long period.**
- **The change in the quantity of the factors is called scale. But, all the factors of production must be changed in the same multiple times. For example, all the factors of production are doubled or trebled.**
- **Law of returns to scale explains changes in the output due to changes in the inputs in the long period**

Law of Return to Scale

Statement

“ As a firm in the long run increases the quantities of all factor employed, other things being constant, the out may rise initially at a more rapid rate than the rate of increase in inputs, the output may increase in the same proportion of input and ultimately, output increases less proportionately”

Returns to scale may be constant, increasing or decreasing

Law of Return to Scale

Assumption

1. **Technique of production remain unchanged**
2. **All units of factor are homogenous**
3. **Returns are measured in physical terms**

Law of Return to Scale

Increasing Return to scale

Increasing returns to scale means that output increases in a greater proportion than the increase in inputs.

%△ Change in Output > %△ Change in Input
i.e. 20% > 10%

Increasing return to scale

Reason for increasing returns:

1. **Specialization (or) Division of labour**
2. **Indivisible factors.**
3. **Dimensional economics**
4. **Volume discounts etc.,**

Law of Return to Scale

Constant Return to scale

Constant returns to scale means that with the increase in the scale in some proportion(10%), output increases in the same proportion(10%)

%△ Output = %△ Input
i.e. 10% = 10%

Constant return to scale

Law of Return to Scale

Decreasing Return to scale

When output increases in a smaller proportion with an increase in all inputs, decreasing returns to scale are said to prevail.

%△ Output < %△ Input
i.e. 5% < 10%

Reason
Increasing difficulties of management, coordination and control.

Cause for diminishing returns:

1. **Management problems.**
2. **Limit to human factor**
3. **3. Lack of corporation and co-ordination**
4. **Rise of the prices of inputs**