CHAPTER

3

Production Analysis

"Production is any activity diverted to the satisfaction of other people's wants through exchange".

- J R Hicks

LEARNING OBJECTIVES

1 To understand the various factors of production and its characteristics.

2 To understand the short run and long run production function.

3 To understand the concept of supply.

3.1

Introduction

Production is a process of using various material and immaterial inputs in order to make output for consumption. Production process creates economic well-being. The satisfaction of needs originates from the output. Production is the result of cooperation of four factors of production (land, labour, capital and organisation). In Economics, production refers to the creation or addition of value. It simply transforms the inputs into output.

Production may be at varying levels. The scale of production influence the cost of production. All manufacturers are aware that when production of a commodity takes place on a larger scale, the average cost of its production is low. This is the reason why the entrepreneurs are interested in enlarging the scale of production of their commodities. They stand to benefit from the resulting economies of scale. There is also the possibility of making their products available in the market at lower prices.

3.2 Features of the Factors of Production

Factors of production means resources used in the process of production of commodities. There are of four types viz., land, labour, capital and organization or enterprise. Here, land represents natural resources (such as soil, mineral deposits, seas, rivers, natural forests, fisheries etc). Labour represents human resources. Together, these two factors are called the *'primary factors of production'*.

These two factors produce some units of goods for the purpose of consumption. And as consumption of these goods takes place, there is the possibility of some of these goods getting left over. Thus, saving is production minus consumption. This saved amount is called as capital, which serves as investment in the production process. Also, organisation or enterprise is a special form of labour. The third and the fourth factors are called *'secondary factors of production'*.

These four factors depend on each other. They have a coordinated impact on production of goods and services.

3.2.1 Land

In ordinary sense 'land' refers to the soil or the surface of the earth or ground. But, in Economics, land means all gifts of Nature owned and controlled by human beings which yield an income. Land is the original source of all material wealth. The economic prosperity of a country depends on the richness of her natural resources. The quality and quantity of agricultural

Land

wealth are determined by the nature of soil, climate and rainfall. The agricultural products are the basis of trade and industry. Industry survives on the availability of coal-mines or waterfall for electricity production. Hence, all aspects of economic life like agriculture, trade and industry are generally influenced by natural resources which are called as "Land" in economics.

Characteristics of Land

- Land is a primary factor of production.
- Land is a *passive* factor of production.
- Land is the free gift of Nature.
- Land has no cost of production.
- Land is fixed in supply. It is inelastic in supply.
- Land is permanent.
- Land is immovable.
- Land is heterogeneous as it differs in fertility.
- Land has alternative uses.
- Land is subject to Law of Diminishing Returns.

3.2.2 Labour

Labour is the active factor of production. In common parlance, labour means manual labour or unskilled work. But in Economics the term 'labour' has a wider

Labour

meaning. It refers to any work undertaken for securing an income or reward. Such work may be manual or intellectual. For example, the work done by an agricultural worker or a cook or rickshaw puller or a mason is manual. The work of a doctor or teacher or an engineer is intellectual. In short, labour in economics refers to any type of work performed by a labourer for earning an income.

According to Marshall, labour represents services provided by the factor labour, which helps in yielding an income to the owner of the labour-power.

Characteristics of Labour

- Labour is the animate factor of production.
- Labour is an *active* factor of production.
- Labour implies several types: it may be manual (farmer) or intellectual (teacher, lawyer etc).
- Labour is perishable.
- Labour is inseparable from the Labourer.
- Labour is less mobile between places and occupations.

- Labour is a means as well as an end. It is both the cause of production and consumer of the product.
- Labour units are heterogeneous. Labour differs in ability.
- Labour-supply determines its reward (wage).
- Labour has weak bargaining power.

3.2.3 Capital

Marshall says *"capital consists of all kinds of wealth other than free gifts of nature, which yield income"*. Bohm-Bawerk defines it as 'a produced means of production'. As said earlier, capital is a secondary means of production. It refers to that part of production which represents 'saving used as investment' in the further production process. For example, the entire mango is not eaten; a part of that (its nut) is used to produce more mangoes.

Bohm-Bawerk

It is a stock concept. All capital is wealth but all wealth is not capital. For example, tractor is a capital asset which can be used in cultivation (production) of farm, but due to some reason the same is kept unused (idle) for some period. It cannot be termed as capital for that period. It is only wealth.

Characteristics of Capital

- Capital is a man-made factor.
- Capital is mobile between places and persons.
- Capital is a passive factor of production.
- Capital's supply is elastic.
- Capital's demand is a derived demand.
- Capital is durable.
- Capital yields Income.
- Capital depriciates.

Capital may be tangible or intangible. For example, buildings, plants and machinery, factories, inventories of inputs, warehouses, roads, highways etc are tangible capital. The examples for intangible capital are investment on advertisement, expenses on training programme etc.

Financial Capital means the assets needed by a firm to provide goods and services measured in term of money value . It is normally raised through debt and equity issues .The prime aim of it is to a mass wealth in terms of profit.

3.2.4. Organization

Organization

The man behind organizing the business is called as 'Organizer' or 'Entrepreneur'. An organiser is the most important factor of production. He represents a special type of labour. Joseph Schumpeter says that an entrepreneur innovates, coordinates other factors of production, plans and runs a business. He not only runs the business, but also bears the risk of business. His reward is residual. This residual is either positive (profit) or negative (loss) or zero.

Joseph Schumpeter

Functions of an Organizer (Entrepreneur)

- *Initiation:* An organizer is the initiator of the business, by considering the situation and availability of resources and planning the entire process of business or production.

- *Innovation*: A successful entrepreneur is always an innovator. He introduces new methods in the production process.

- *Coordination:* An organizer applies a particular combination of the factors of production to start and run the business or production.

- *Control, Direction and Supervision:* An organiser controls so that nothing prevents the organisation from achieving its goal. He directs the factors to get better results and supervises for the efficient functioning of all

An entrepreneur is a person who combines land, labour and capital in the production process to earn a profit.

the factors involved in the process of production.

- ***Risk-taking and Uncertainty-bearing:*** There are risk-taking and uncertainty-bearing obstacles. Risks may be insured but uncertainties cannot be insured. They reduce the profit.

3.3

Production Function

Production function refers to the relationship among units of the factors of production (inputs) and the resultant quantity of a good produced (output).

According to George J. Stigler, *"Production function is the relationship between inputs of productive services per unit of time and outputs of product per unit of time."*

George J.Stigler

Production function may be expressed as: Q = f (N, L, K, T) Where, Q = Quantity of output, N = Land; L = Labour; K = Capital; and T = Technology. Depending on the efficiency of the producer, this production function varies.

The function implies that the level of output (Q) depends on the quantities of different inputs (N, L, K, T) available to the firm.

Short-run Production and Long run Production

In Micro economics, the distinction between long run and short run is made on the basis of fixed inputs that inhibit the production.

The short-run is the period where some inputs are variable, while others are fixed. Another feature is that firms do not enter into the industry and existing firms may not leave the industry.

Long run, on the other hand, is the period featured by the entry of new firms to the industry and the exit of existing firms from the industry.

In general, Production function may be classified into two

- Short-run Production Function as illustrated by the Law of Variable Proportions.
- Long-run Production Function as explained by the Laws of Returns to Scale.

3.4

Law of Variable Proportions

The law states that if all other factors are fixed and one input is varied in the short run, the total output will increase at an increasing rate at first instance, be constant at a point and then eventually decrease. Marginal product will become negative at last.

According to G.Stigler, *"As equal increments of one input are added, the inputs of other productive services being held constant, beyond a certain point, the resulting increments of product will decrease, i.e., the marginal product will diminish".*

Assumptions

The Law of Variable Proportions is based on the following assumptions.

- Only one factor is variable while others are held constant.
- All units of the variable factor are homogeneous.
- The product is measured in physical units.
- There is no change in the state of technology.
- There is no change in the price of the product.

Total Product (TP)

It refers to the total amount of commodity produced by the combination of all inputs in a given period of time.

- Summation of marginal products, i.e. **TP = ΣMP**

where, TP= Total Product, MP= Marginal Product

Average Product (AP)

It is the result of the total product divided by the total units of the input employed. In other words, it refers to the output per unit of the input.

Mathematically, $AP = TP/N$

Where,

AP= Average Product

TP= Total Product

N= Total units of inputs employed

Marginal Product (MP)

It is the addition or the increment made to the total product when one more unit of the variable input is employed. In other words, it is the ratio of the change in the total product

to the change in the units of the input. It is expressed as

$$MP = \Delta TP / \Delta N$$

where,

MP   = Marginal Product

ΔTP   = Change in total product

ΔN   = Change in units of input

It is also expressed as

$$MP = TP(n) - TP(n-1)$$

Where,

MP = Marginal Product

TP(n) = Total product of employing n^{th} unit of a factor

TP(n-1) = Total product of employing the previous unit of a factor, that is, $(n-1)^{th}$ unit of a factor.

The Law of Variable Proportions is explained with the help of the following schedule and diagram:

In table 3.1, units of variable factor (labour) are employed along with other fixed factors of production. The table illustrates that there
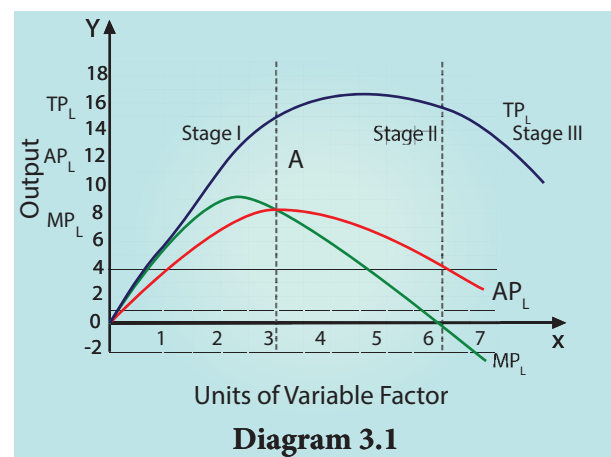

Diagram 3.1

Table 3.1 Stages of Production

Units of variable factor (L)	Total Product (TP_L)	Marginal Product (MP_L)	Average Product (AP_L)	Stages
1	2	2	2	I
2	6	4	3	
3	12	6	4	
4	16	4	4	II
5	18	2	3.6	
6	18	0	3	
7	16	-2	2.28	III

are three stages of production. Though total product increases steadily at first instant, constant at the maximum point and then diminishes, it is always positive for ever. While total product increases, marginal product increases up to a point and then decreases. Total product increases up to the point where the marginal product is zero. When total product tends to diminish marginal product becomes negative.

In diagram 3.1, the number of workers is measured on X axis while TP_L, AP_L and MP_L are denoted on Y axis. The diagram explains the three stages of production as given in the above table.

Stage I

In the first stage MP_L increases up to third labourer and it is higher than the average product, so that total product is increasing at an increasing rate. The tendency of total product to increase at an increasing rate stops at the point A and it begins to increase at a decreasing rate. This point is known as *'Point of Inflexion'*.

Stage II

In the second stage, MP_L decreases up to sixth unit of labour where MP_L curve intersects the X-axis. At fourth unit of labor $MP_L = AP_L$. After this, MP_L curve is lower than the AP_L. TP_L increases at a decreasing rate.

Stage III

Third stage of production shows that the sixth unit of labour is marked by negative MP_L, the AP_L continues to fall but remains positive. After the sixth unit, TP_L declines with the employment of more units of variable factor, labour.

Relationship among Total, Average and Marginal Products

Stages	Total Product	Marginal Product	Average Product
Stage I	Initially it increases at an increasing rate and then increases at a decreasing rate	At the beginning it increases, then reaches a maximum and starts to decrease	At the first instant it increases, then attains maximum
Stage II	It continues to increase at a diminishing rate and reaches maximum.	It continues to diminish and becomes equal to zero	It is equal to MP and then begins to diminish
Stage III	It diminishes	It becomes negative	It continues to diminish but always greater than zero (positive)

3.5

Laws of Returns to Scale

In the long- run, there is no fixed factor; all factors are variable. The laws of returns to scale explain the relationship between output and the scale of inputs in the long-run when all the inputs are increased in the same proportion.

Assumptions

Laws of Returns to Scale are based on the following assumptions.

- All the factors of production (such as land, labour and capital) are variable but organization is fixed.
- There is no change in technology.
- There is perfect competition in the market.
- Outputs or returns are measured in physical quantities.

Three Phases of Returns to Scale

(1) **Increasing Returns to Scale:**

In this case if all inputs are increased by one percent, output increase by more than one percent.

(2) **Constant Returns to Scale:**

In this case if all inputs are increased by one percent, output increases exactly by one percent.
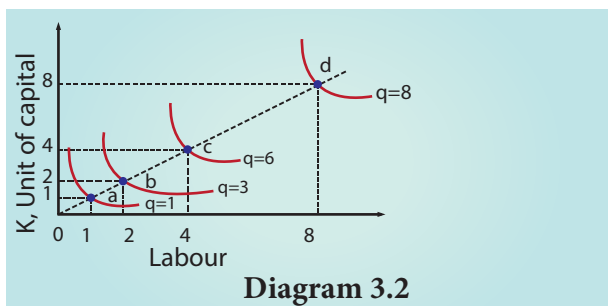
(3) **Diminishing Returns to Scale:**

In this case if all inputs are increased by one percent, output increases by less than one percent.

Diagrammatic Illustration

The three laws of returns to scale can be explained with the help of the diagram below.

In the diagram 3.2, the movement from point **a** to point **b** represents

Diagram 3.2

Stages	Input	Output	Returns to Scale
a to b	100% ↑	200% ↑	Increasing
b to c	100% ↑	100% ↑	Constant
c to d	100% ↑	33.33% ↑	Decreasing

increasing returns to scale. Because, between these two points input has doubled, but output has tripled.

The law of constant returns to scale is implied by the movement from the point *b* to point *c*. Because, between these two points inputs have doubled and output also has doubled.

Decreasing returns to scale are denoted by the movement from the point **c** to point **d** since doubling the factors from 4 units to 8 units produce less than the increase in inputs, that is, by only 33.33%

3.6 Economies of Scale

'Scale of Production' refers to the ratio of factors of production. This ratio can change because of availability of factors. The Scale of Production is an important factor affecting the cost of production. Every producer wishes to reduce the costs of production. Hence he (he includes she as well) uses an advantage of economy of scale. This economy of scale is effected both

by the internal and external factors of the firm. Accordingly, Economies are broadly divided into two types by Marshall.

1.   Internal Economies and
2.   External Economies

Economies of scale reduces the cost of production: and, diseconomies of scale increases the cost of production.

3.6.1   Internal Economies of Scale

‹The term Internal Economies of Scale› refers to the advantages enjoyed by the production unit which causes a reduction in the cost of production of the commodity. For example, a firm enjoying the advantage of an application of most modern machinery, generation of internal capital, an improvement in managerial skill etc. are sure to reduce the cost of production. They are of various types:

■   *Technical Economies*: When the size of the firm is large, large amount of capital can be used. There is a possibility to introduce up-to-date technologies; this improves productivity of the firm. Here research and development strategies can be applied easily.

- *Financial Economies*: Big firms can float shares in the market for capital expansion, while small firms cannot easily float shares in the market.

- *Managerial Economies*: Large scale production facilitates specialisation and delegation.

- *Labour Economies*: Large scale production implies greater and minute division of labour. This leads to specialisation which enhances the quality. This increases the productivity of the firm.

- *Marketing Economies*: In the context of large scale production, the producers can both buy raw-materials in bulk at cheaper cost and can take the products to distant markets. They enjoy a huge bargaining power.

- *Economies of Survival*: Product diversification is possible when there is large scale production. This reduces the risk in production. Even if the market for one product collapses, market for other commodities offsets it.

3.6.2 External Economies of Scale

External Economies of Scale refer to changes in any factor outside the firm causing an improvement in the production process. This can take place in the case of industry also. These are the advantages enjoyed by all the firms in the industry due to the structural growth. Important external economies of scale are listed below.

1. *Increased transport facilities*
2. *Banking facilities*
3. *Development of townships*

4. *Development of information and communication*

3.7 Diseconomies of Scale

The diseconomies of the scale are a disadvantage to a firm or an industry or an organisation. This necessarily increases the cost of production of a commodity or service. Further it delays the speed of the supply of the product to the market. These diseconomies are of two types:

a) *Internal Diseconomies of Scale: and*
b) *External Diseconomies of Scale*

3.7.1 Internal Diseconomies of Scale

When the scale of production increases beyond optimum limit, its efficiency may come down.

3.7.2 External Diseconomies of Scale

The term "External diseconomies of scale" refers to the threat or disturbance to a firm or an industry from factor lying outside it. For example a bus strike prevents the easy and correct entry of the workers into a firm. Similarly the rent of a firm increases very much if new economic units are established in the locality.

3.8 Iso-quants

Production function may involve, at a time, the use of more than one variable input. This is presented with the help of

iso-quant curves. The two words 'Iso' and 'quant' are derived from the Greek language, meaning 'equal' and 'quantity' respectively. In our presentation only two factors, labour and capital are used.

In Economics, an iso-quant is a curve drawn by joining the combinations of changing the quantities of two or more inputs which give the same level of output. Isoquants are similar to indifference curves.

An iso-quant curve can be defined as the locus of points representing various combinations of two inputs capital and labour yielding the same output. The iso-quant is also called as the "*Equal Product Curve*" or the "*Product Indifference Curve*"

3.8.1 Definition of Iso-quant

According to Ferguson, "*An iso-quant is a curve showing all possible combinations of inputs physically capable of producing a given level of output*"

Iso-quants are based on the following assumptions.

1. It is assumed that only two factors are used to produce a commodity.

2. Factors of production can be divided into small parts.

3. Technique of production is constant.

4. The substitution between the two factors is technically possible. That is, production function is of 'variable proportion' type rather than fixed proportion.

5. Under the given technique, factors of production can be used with maximum efficiency.

Iso-quant Schedule

Let us suppose that there are two factors namely., labour and capital. An Iso-quant schedule shows the different combinations of these two inputs that yield the same level of output. It is given below.

Table 3.2 Iso-quant

Combination	Units of Labour	Units of Capital	Output of Cloth (meters)
A	2	30	400
B	4	22	400
C	6	16	400
D	8	12	400
E	10	10	400

It is seen from the table 3.2 that the five combinations of labour units and units of capital yield the same level of output, i.e., 400 meters of cloth.
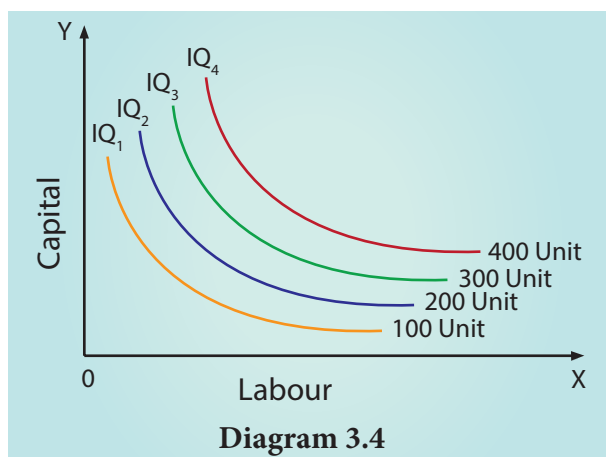
3.8.2 Iso-quant Curve

An equal product curve represents all those combinations of two inputs which
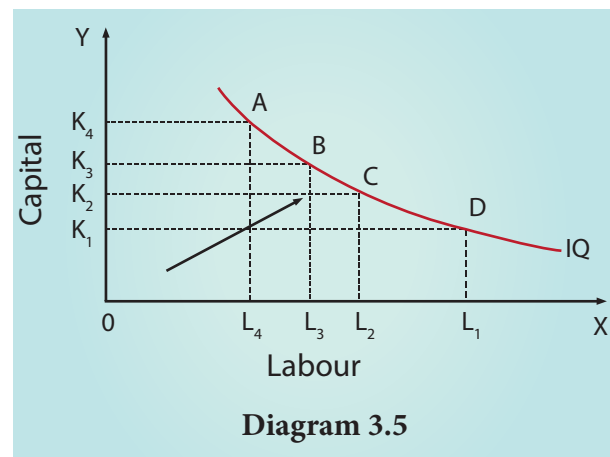
Diagram 3.3

3.8.4 Properties of Iso-quant Curve

Diagram 3.5
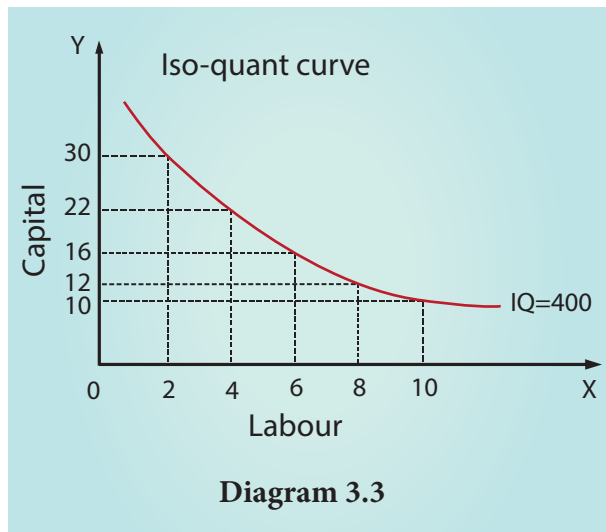
are capable of producing the same level of output. An iso-product curve can be drawn with the help of isoquant schedule.

3.8.3 Iso-quant Map

Diagram 3.4

An iso-quant map has different iso-quant curves representing the different combinations of factors of production, yielding the different levels of output. In simple term, an iso-quant map is a family of iso-quants. In other words, if more than one iso-quant is drawn in a diagram, it is called iso-quant map.

1. *The iso-quant curve has negative slope*. It slopes downwards from left to right indicating that the factors are substitutable. If more of one factor is used, less of the other factor is needed for producing the same level of output.

   In the diagram combination A refers to more of capital K_5 and less of labour L_2. As the producer moves to B, C, and D, more labour and less capital are used.

2. *Convex to the origin.*

   This explains the concept of diminishing Marginal Rate of Technical Substitution ($MRTS_{LK}$). For example, the capital substituted by 1 unit of labour goes on decreasing when moved from top to bottom. If so, it is called diminishing MRTS. Constant MRTS (straight line) and increasing MRTS (concave) are also possible. It depends on the nature of iso-quant curve.

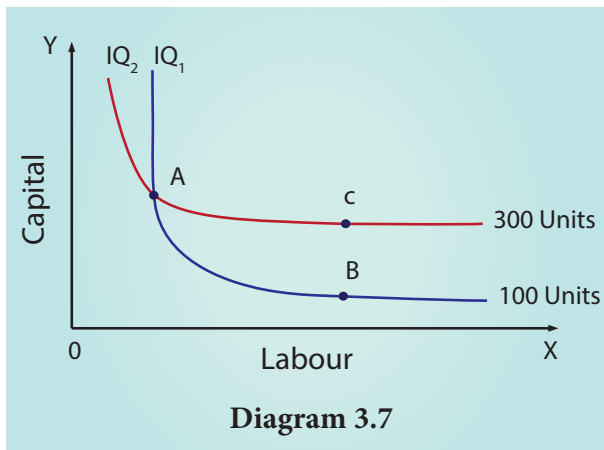   This means that factors of production are substitutable to each other. The capital substituted per

Diagram 3.6
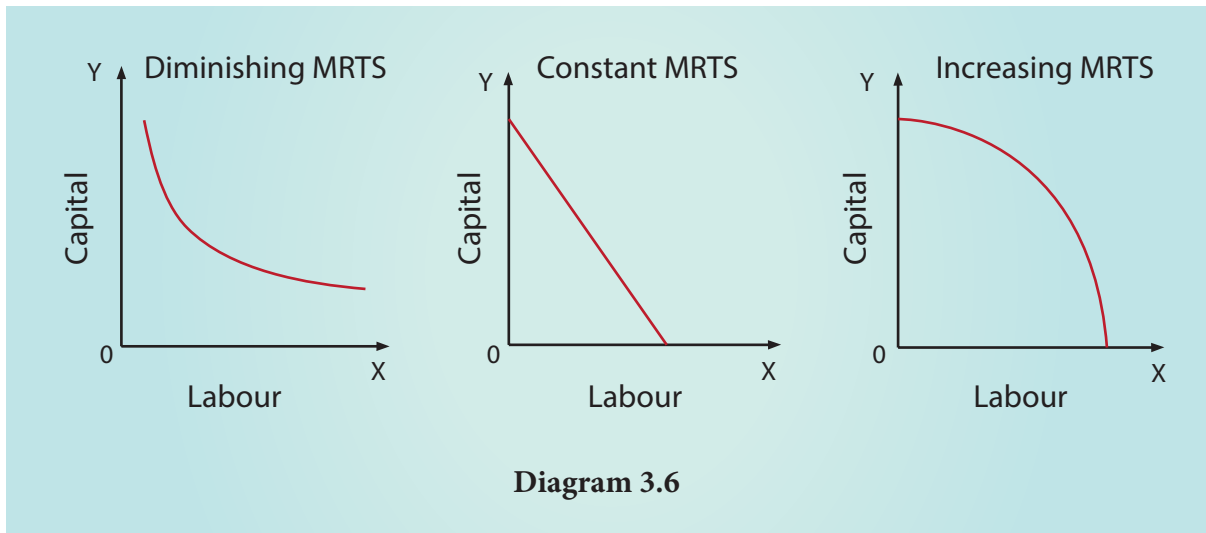
unit of labour goes on decreasing when the iso-quant is convex to the origin.

3. **Non inter-section of Iso-quant curves.**

Diagram 3.7

For instance, point A lie on the iso-quants IQ_1 and IQ_2. But the point C shows a higher output and the point B shows a lower level of output IQ_1. If C=A, B=A, then C=B. But C>B which is illogical.

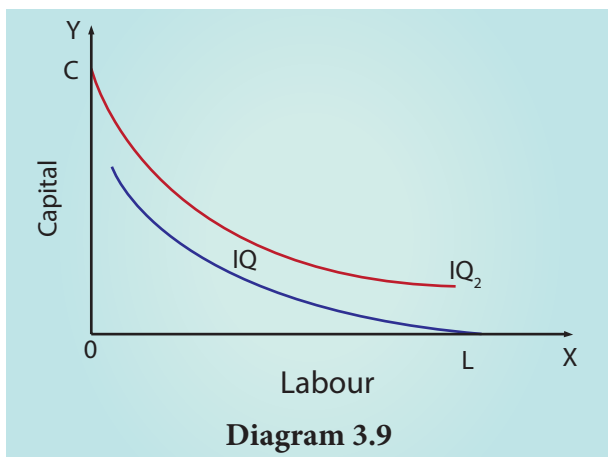4. **An** *upper iso-quant curve represents a higher level of output*.

Higher IQ_2 show higher outputs and lower IQ_1 show lower outputs, for upper iso-quant curve implies the use of more factors than the lower isoquant curve.

Diagram 3.8
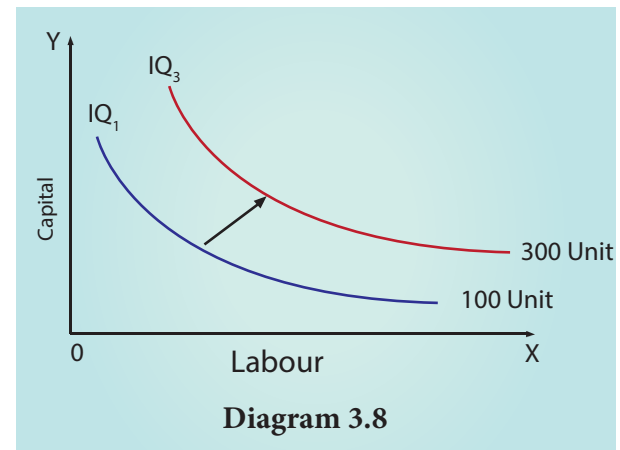
The arrow in the figure shows an increase in the output with a right and upward shift of an iso-quant curve.

5. *Iso-quant curve does not touch either X axis or Y axis.*

No iso-quant curve touches the X axis or Y axis because in IQ_1, only capital is used, and in IQ_2 only labour is used.

Diagram 3.9

Suppose that a producer has a total budget of ₹120 and for producing a certain level of output, he has to spend this amount on two factors Labour (L) and Capital (K). Prices of factors K is ₹30 and L is ₹10. Iso Cost Curve can be drawn by using the following hypothetical table.

As shown in Table, there are five combinations of capital and labour such as combination A represents 4 units of capital and zero units of labour and this combination costs ₹120. Similarly other combinations (B,C,D and E) cost same amount of rupees (₹120).

3.9
The Iso-cost Line

The iso-cost line is an important component in analysing producer's behaviour. The iso-cost line illustrates all the possible combinations of two factors that can be used at given costs and for a given producer's budget. Simply stated, an iso-cost line represents different combinations of inputs which shows the same amount of cost. The iso-cost line gives information on factor prices and financial resources of the firm. It is otherwise called as "iso-price line" or "iso-income line" or "iso-expenditure line" or "total outlay curve".
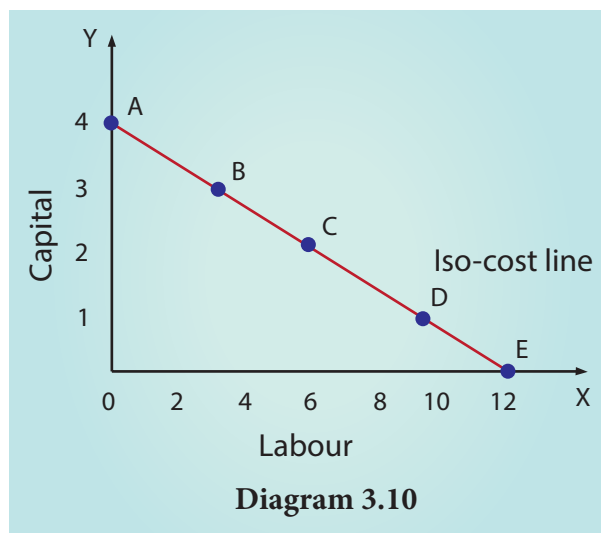

Diagram 3.10

Table 3.3 The Iso-cost

Combinations	Units of Capital Price = ₹30	Units of Labour Price = ₹10	Total Expenditure (in Rupees)
A	4	0	120
B	3	3	120
C	2	6	120
D	1	9	120
E	0	12	120

Symbolically,

4K + 0L= ₹.120

3K + 3L= ₹.120

2K + 6L= ₹.120

1K + 9L= ₹.120, and

0K + 12L= ₹.120.

Thus, all the combinations
A, B, C, D and E cost the
same total expenditure.

From the figure 3.10, it is shown that the costs to be incurred on capital and labour are represented by the triangle OAE. The line AE is called as Iso-cost line.

3.10

Producer's Equilibrium

Producer equilibrium implies the situation where producer maximizes his output. It is also known as *optimum combination of the factors of production.* In short, the producer manufactures a given amount of output with *'least cost combination of factors'*, with his given budget.

Optimum Combination of Factors implies either

- there is output maximisation for given inputs or
- there is cost minimisation for the given output.

Conditions for Producer's Equilibrium

The two conditions that are to be fulfilled for the attainment of producer equilibrium are:

- The iso-cost line must be tangent to iso-quant curve.

- At point of tangency, the iso-quant curve must be convex to the origin or $MRTS_{Lk}$ must be declining.

When the outlay and prices of two factors, namely, labour and capital are given, producers attain equilibrium (or least cost combination of factors is attained by the firm) where the iso-cost line is tangent to an iso-product curve. It is illustrated in the following Diagram 3.11.

Diagram 3.11
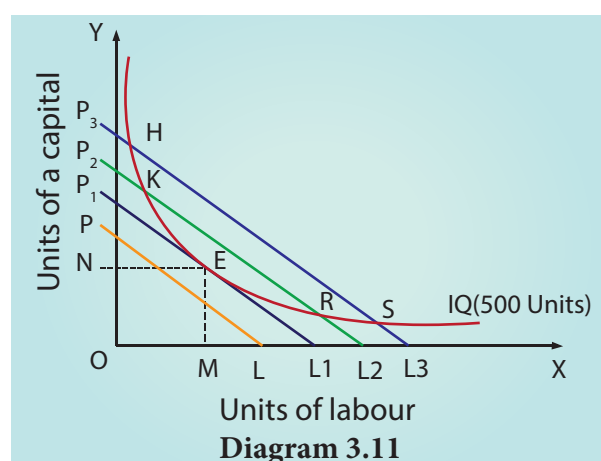
In the above figure, profit of the firm (or the producer) is maximised at the point of equilibrium E.

At the point of equilibrium, the slope of the iso cost line is equal to the slope of iso product curve (or the MRTS of labour for capital is equal to the price ratio of the two factors)

Hence, it can be stated as follows.

$$MRTS_{L,K} = \frac{P_L}{P_K} = 10/30 = 1/3 = 0.333$$

At point E, the firm employs OM units of labour and ON units of capital. In other words, it obtains least cost combination or optimum combination of the two factors to produce the level of output denoted by the iso-quant IQ.

The other points such as H, K, R and S lie on higher iso cost lines indicating that a larger outlay is required, which exceeds the financial resources of the firm.

3.11 Cobb-Douglas Production Function
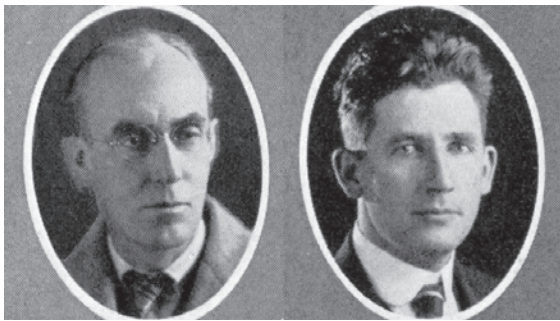
W.Cobb and Paul H.Douglas

Cobb-Douglas Production Function is a specific standard equation applied to describe how much output can be made with capital and labour inputs. It is used in empirical studies of manufacturing industries and in inter-industry comparisons. The relative shares of labour and capital in total output can also be determined. It is still used in the analysis of economies of modern, developed and stable nations in the world.

The Cobb-Douglas Production Function was developed by Charles W. Cobb and Paul H. Douglas, based on their empirical study of American manufacturing industry. It is a linear homogeneous production function which implies that the factors of production can be substituted for one another up to a certain extent only.

The Cobb-Douglas production function can be expressed as follows.

$$Q = AL^{\alpha} K^{\beta}$$

Where, Q = output; A = positive constant; K = capital; L = Labor α and β are positive fractions showing, the elasticity coefficients of outputs for the inputs labor and capital, respectively.

ß = (1- α) since α + ß = 1. denoting constant returns to scale.

Factor intensity can be measured by the ratio ß / α.

The sum of α + ß shows the returns to scale.

i)   (α + ß) =1, constant returns to scale.
ii)   (α + ß) <1, diminishing returns to scale.
iii) (α + ß) >1, increasing returns to scale.

■ The production function explains that with the proportionate increase in the factors, the output also increases in the same proportion.

■ Cobb-Douglas production function implies constant returns to scale.

■ Cobb-Douglas production function considered only two factors like

■ Cobb-Douglas Production Function is a specific standard equation applied to describe how much output can be made with capital and labour inputs. It is used in empirical studies of manufacturing industries and in inter-industry comparisons. The relative shares of labour and capital in total output can also be determined. It is still used in the analysis of economies of modern, developed and stable nations in the world.

- labour and capital. Production takes place only when both factors are employed.
- Labour contributes three-fourth of production and capital contributes one-fourth of production.
- The elasticity of substitution between the factors is equal to one.

3.12

Law of Supply

Law of Supply is associated with production analysis. It explains the positive relationship between the price of a commodity and the supply of that commodity. For example, if the price of cloth increases, the supply of cloth will also increase. This is due to the fact that when price rises, it is profitable to increase the production and hence supply increases.

> Law of Supply describes a direct relation between price of a good and the supply of that good.

Definition

The Law of Supply can be stated as:

"*Other things remaining the same, if the price of a commodity increases its quantity supplied increases and if the price of a commodity decreases, quantity supplied also decreases*".

3.12.1 Supply Function

The supply of a commodity depends on the factors such as price of commodity, price of labour, price of capital, the state of technology, number of firms, prices of related goods, and future price

expectations and so on. Mathematically the supply function is

$$Q_s = f(P_x, P_r, P_f, T, O, E)$$

Where Q_s = Quantity supplied of x commodity

P_x = Price of x Commodity

P_r = Price of related goods

P_f = Price of factors of production

T = Technology

O = Objective of the producer

E = Expected Price of the commodity.

Assumptions

Law of Supply is based on the following assumptions.

- There is no change in the prices of factors of production
- There is no change in price of capital goods
- Natural resources and their availability remain the same
- Prices of substitutes are constant
- There is no change in technology
- Climate remains unchanged
- Political situations remain unchanged
- There is no change in tax policy

Explanation

Suppose that the supply function is

$$Q_s = f(P) \text{ or } Q = 20P$$

P is an independent variable. When its value changes, new values of Q_s can be calculated.

Supply Schedule

A supply schedule shows the different quantities of supply at different prices.

This information is given in the supply schedule given below.

Table 3.4 Price and Supply

Price (P)	Supply (Q$_s$)
1	20
2	40
3	60
4	80
5	100

$Q_s = 20P$

3.12.2 Supply Curve

A supply curve represents the data given in the supply schedule. As the price of the commodity increases, the quantum supplied of the commodity also increases. Thus the supply curve has a positive slope from left to right. (see diagram 3.12.)

Diagram 3.12
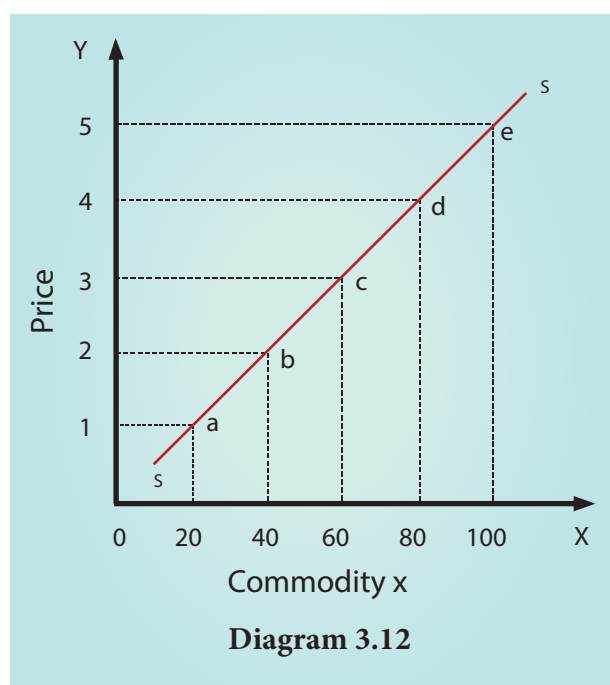
The quantum supplied of commodity x is represented on X axis. And the price of the commodity is represented on the Y axis. The points such as a, b, c, d and e on the supply curve SS', represent various quantities at different prices.

3.12.3 Factors determining supply

1. **Price of the commodity**

   Higher the price larger the supply. Price is the incentive for the producers and sellers to supply more.

2. **Price of other commodities**

   The supply of a commodity depends not only upon its price but also price of other commodities. For instance if the price of commercial crops like cotton rise, this may result in reduction in cultivation of food crops like paddy and so its supply.

3. **Price of factors**

   When the input prices go up, this results in rise in cost and so supply will be affected.

4. **Price expectations**

   The expectation over future prices determines present supply. If a rise in price is anticipated in future, sellers tend to retain their produce for future sale and so supply in present market is reduced.

5. **Technology**

   With advancement in technology, production level improves, average cost **declines and as a result supply level increases.**

6. **Natural factors**

   In agriculture, natural factors like monsoon, climate etc. play a vital

role in determining production level.

7. **Discovery of new raw materials**

The discovery of new raw materials which are cheaper and of high quality tends to increase supply of the product.

8. **Taxes and subsidies**

Subsidies for inputs, credit, power etc. encourage the producers to produce more. Withdrawal of such incentives will hamper production. Taxes both direct and indirect kill the ability and willingness to produce more.

9. **Objective of the firm**

When the goal of the firm is sales maximisation or improving market share, the supply of the product is likely to be higher.

3.12.4 Elasticity of Supply

Elasticity of supply may be defined as *the degree of responsiveness of change in supply to change in price on the part of sellers.*

It is mathematically expressed as:

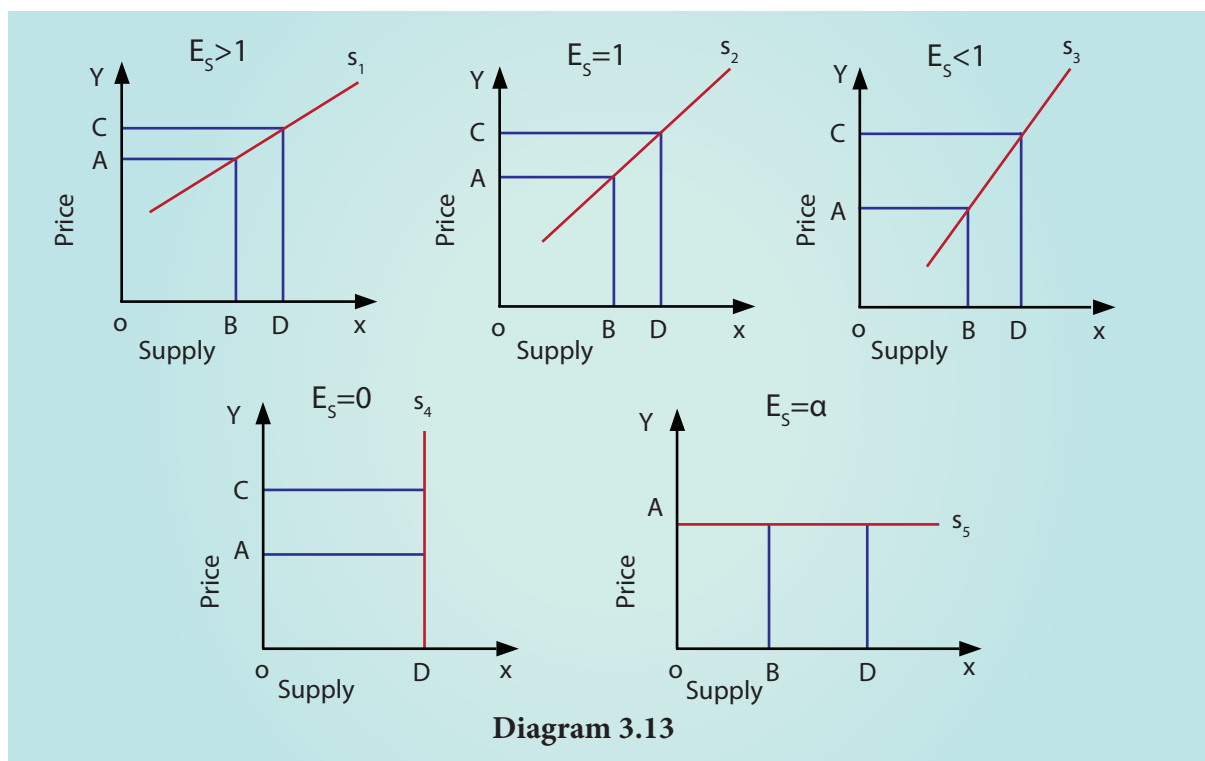| Elasticity of supply	=	proportionate change in supply / proportionate change in price

$$e_{s=}(\Delta Q_s / Q_s) \;/\; (\Delta P/P); \; e_s = \Delta Q_s \;/\; \Delta P \times P/Q_s$$

Where Q_s represents the supply, P represents price, Δ denotes a change.

3.12.5 Types of Elasticity of Supply

There are five types of elasticity of supply.

1. **Relatively elastic supply (see Diagram 3.13)**

Diagram 3.13

The co-efficient of elastic supply is greater than 1($E_s > 1$). One percent change in the price of a commodity causes more than one per cent change in the quantity supplied of the commodity.

2. **Unitary elastic supply (see Diagram 3.13)**

The coefficient of elastic supply is equal to 1 ($E_s = 1$). One percent change in the price of a commodity causes an equal (one per cent) change in the quantity supplied of the commodity.

3. **Relatively inelastic supply (see Diagram 3.13)**

The coefficient of elasticity is less than one ($E_s < 1$). One percent change in the price of a commodity causes a less than one per cent change in the quantity supplied of the commodity.

4. **Perfectly inelastic supply (see Diagram 3.13)**

The coefficient of elasticity is equal to zero ($E_s = 0$). One percent change in the price of a commodity causes no change in the quantity supplied of the commodity.

5. **Perfectly elastic supply (see Diagram 3.13)**

The coefficient of elasticity of supply is infinity. ($E_s = \alpha$). One percent change in the price of a commodity causes an infinite change in the quantity supplied of the commodity.

3.12.6 Factors governing elasticity of supply

1. **Nature of the commodity**

Durable goods can be stored for a long time. So, the producers can wait until they get a high price. Once they get higher price, larger supply is possible. The elasticity of supply of durable goods is high. But perishables are to be sold immediately. So perishables have low elasticity of supply.

2. **Cost of production**

When production is subject to either constant or increasing returns, additional production and therefore increased supply is possible. So elasticity of supply is greater. Under diminishing returns, increase in output leads to high cost. So elasticity of supply is less.

3. **Technical condition**

In large scale production with huge capital investment, supply cannot be adjusted easily. So elasticity of supply is lesser. Where capital equipment is less and technology simple, the supply is more elastic.

4. **Time factor**

During very short period when supply cannot be adjusted, elasticity of demand is very low. In short period, variable factors can be added and so supply can be adjusted to some extent. So elasticity of supply is more. In long period, even the fixed factors can be added and hence supply is highly elastic.

3.13

Conclusion

Production takes place with the view to fulfilling the demands of the consumers. Today consumption expands in a variety of ways. Hence, production has to necessarily expand

in size and improve in quality. Production should also help in the determination of the price of the factors so that the amount of the income generated be appropriately spent on the factors of production.

Glossary

- **Production:** An activity that transforms input into output.

- **Factors of Production:** Four factors are Land, Labour, Capital and Organisation. Factor services are used in the process of production.

- **Land:** All gifts of Nature.

- **Labour:** Physical or mental effort of human being in the process of production.

- **Capital:** Man-made material source of production.

- **Organisation:** which takes decisions and bears risk.

- **Production function:** Technological relationship between inputs and output.

- **Supply:** The quantity of output which producers are willing and able to offer to the market at various prices.

- **Elasticity of Supply:** Responsiveness of the quantity supplied of a good to a change in its price.

- **Iso-quant:** All the combination of two inputs which are capable of producing same level of output.

- **Iso-cost:** All combination of two inputs shows that a firm can purchase with the same amount of money.

- **Short-run Production Function:** Relationship between inputs and output, when there is at least one fixed factor in the production process.

- **Long-run Production Function:** Relationship between inputs and output when all factors are variable.

- **Economies of Scale:** A proportionate saving in costs gained by an increased level of production.

ICT CORNER

LAW OF VARIABLE PROPORTION

**Analyse the changes in TPL and APL with respect to the changes in MPL.**
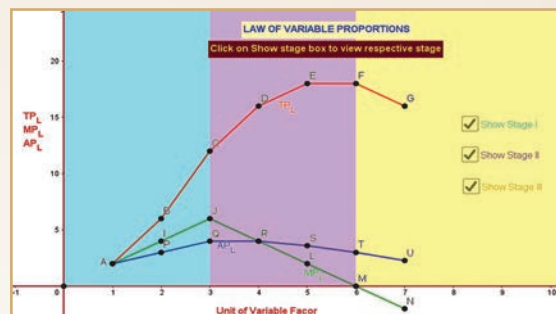
Steps:

- Open the Browser type the URL given (or) Scan the QR Code.
- GeoGebra Work book called "XI STD ECONOMICS" will appear. Open the worksheet named "Law of Variable Proportions"
- In the Right side of the work sheet Total Product, Marginal Product and Average Product are given and in the left side Respective graph is shown. Analyse the data and the graphs drawn and the points.
- vAnalyse the change in MPL and click the check boxes, STAGE-I,STAGE-II and STAGE-III so that Each stage appears in different colours. Now analyse TPL and APL in each stage and compare what is given in the text book lesson.
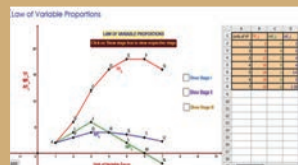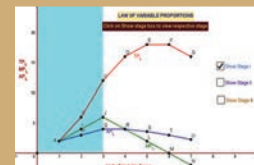
Step1	Step2	Step3	Step4

Pictures are indicatives only*

URL:

https://ggbm.at/ddY3wkjp

(or) scan the QR Code

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Part-A Multiple Choice Questions

1. The primary factors of production are:
   a. Labour and Organisation
   b. Labour and Capital
   c. Land and Capital
   d. Land and Labour.

2. The man-made physical goods used to produce other goods and services are referred to as.
   a. Land   b. Labour
   c. Capital   d. Organization.

3. Formula for calculating AP is
   a. $\Delta TP/N$
   b. $\Delta TP/\Delta N$
   c. TP/MP
   d. TP/N

4. Which factor is called the changing agent of the Society
   a. Labourer
   b. Land
   c. Organizer
   d. Capital

5. Who said, that one of the key of an entrepreneur is "uncertainty-bearing".
   a. J.B.Clark
   b. Schumpeter
   c. Knight
   d. Adam Smith

6. The functional relationship between "inputs" and "outputs" is called as
   a. Consumption Function
   b. Production Function
   c. Savings Function
   d. Investment Function

7. In a firm 5 units of factors produce 24units of the product. When the number of factor increases by one, the production increases to 30 units. Calculate the Avarage Product.
   a. 30
   b. 6
   c. 5
   d. 24

8. The short-run production is studied through
   a. The Laws of Returns to Scale
   b. The Law of Variable Proportions
   c. Iso-quants
   d. Law of Demand

9. The long-run production function is explained by
   a. Law of Demand
   b. Law of Supply
   c. Returns to Scale
   d. Law of Variable Proportions

10. An Iso-quant curve is also known as
    a. Inelastic Supply Curve
    b. Inelastic Demand Curve
    c. Equi-marginal Utility
    d. Equal Product Curve

11. Mention the economies reaped from inside the firm
    a. financial
    b. technical
    c. managerial
    d. all of the above

12. Cobb-Douglas production function assumes
    a. Increasing returns to scale
    b. Diminishing returns to scale
    c. Constant returns to scale
    d. All of the above

13. Name the returns to scale when the output increases by more than 5%, for a 5% increase in the inputs,
    a. Increasing returns to scale
    b. decreasing returns to scale
    c. Constant returns to scale
    d. All of the above

14. Which of the following is not a characteristic of land?
    a. Its limited supply.
    b. It is mobile
    c. Heterogeneous
    d. Gift of Nature

15. Product obtained from additional factors of production is termed as
    a. Marginal product
    b. Total product
    c. Average product
    d. Annual product

16. Modern economists have propounded the law of
    a. Increasing returns
    b. decreasing returns
    c. Constant returns
    d. variable proportions.

17. Producer's equilibrium is achieved at the point where:
    a. Marginal rate of technical substitution(MRTS) is greater than the price ratio
    b. MRTS is lesser than the price ratio
    c. MRTS and price ratio are equal to each other
    d. The slopes of isoquant and isocost lines are different.

18. The relationship between the price of a commodity and the supply of commodity is
    a. Negative
    b. Positive
    c. Zero
    d. Increase

19. If average product is decreasing, then marginal product
    a. must be greater than average product
    b. must be less than average product
    c. must be increasing
    d. both a and c

20. A production function measures the relation between

   a. input prices and output prices

   b. input prices and the quantity of output

   c. the quantity of inputs and the quantity of output.

   d. the quantity of inputs and input prices.

Part-A   Answers

1	2	3	4	5	6	7	8	9	10
d	C	d	c	c	b	c	b	c	d
11	12	13	14	15	16	17	18	19	20
d	C	a	b	a	a	c	b	b	c

Part-B   Answer the following questions in one or two sentences.

21. Classify the factors of production.

22. Define Labour.

23. State the production function.

24. Define Marginal Product of a factor.

25. What is Iso-cost line?

26. What are the conditions for producer's equilibrium?

27. What are the reasons for upward sloping supply curve?

Part-C   Answer the following questions in one paragraph.

28. What are the characteristics of land?

29. What are the factors governing elasticity of supply?

30. What are the functions of Entrepreneur?

31. State and explain the elasticity of supply.

32. Bring out the Relationship among Total, Average and Marginal Products.

33. Illustrate the concept of Producer's Equilibrium.

34. State the Cobb-Douglas Production Function.

Part-D Answer the following questions in about a page

35. Examine the Law of Variable Proportions with the help of a diagram.

36. List out the properties of iso-quants with the help of diagrams.

37. Elucidate the Laws of Returns to Scale. Illustrate.

38. Explain the internal and external economies of scale.

ACTIVITY

1. Visit a market and write a report on the factors that influence the quantity of supply of a commodity of your locality.

2. Visit a factory and show how the four factors of production are effectively employed to produce the product in your locality.

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