BUSINESS ECONOMICS

CHAPTER 3:

THEORY OF PRODUCTION AND COST

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Chapter 3.1:- Theory of Production

CONCEPT OF PRODUCTION

Why is Production relevant for an economy	The performance of an economy is judged by the level of its production. The amount of goods and services an economy is able to produce determines the richness or poverty of that economy. In fact, the standard of living of people depends on the volume and variety of goods and services produced in a country. Thus, the U.S.A. is a rich country just because its level of production is high
Meaning of Production in Economics	**According to James Bates and J.R. Parkinson "Production is the organized activity of transforming resources into finished products in the form of goods and services; and the objective of production is to satisfy the demand of such transformed resources.** • It should be noted that production should not be taken to mean as creation of matter because, according to the fundamental law of science, man cannot create matter. What a man can do is only to create or add utility to things that already exist in nature. • Production can also be defined as **creation or addition of utility**. For example, when a carpenter produces a table, he does not create the matter of which the wood is composed of; he only transforms wood into a table. By doing so, he adds utility to wood which did not have utility before.
How does Production process create Utility	**Form Utility** Changing the form of natural resources. Most manufacturing processes consist of use of physical inputs such as raw materials and transforming them into physical products possessing utility, e.g., changing the form of a log of wood into a table or changing the form of iron into a machine. This may be called conferring utility of form **Place Utility** Changing the place of the resources from a place where they are of little or no use to another place where they are of greater use. This utility of place can be obtained by: (a) Extraction from earth e.g., removal of coal, minerals, gold and other metal ores from mines and supplying them to markets. (b) Transferring goods from where they give little or no satisfaction, to places where their utility is more, *Illustrations* Eg. 1) Tin in Malaya is of little use until it is brought to the industrialised centres where necessary machinery and technology are available to produce metal boxes for packing. Eg.2) Apples in Kashmir orchards have a little utility to farmers. But when the apples are transported to markets where human settlements are thick and crowded like the city centres, they afford more satisfaction to greater number of people. These examples emphasise the additional utility conferred on goods, by all forms of transportation systems, by transport workers and by the agents who assist in the movement and marketing of goods **Time Utility** Making available materials at times when they are not normally available e.g., harvested food grains are stored for use till next harvest. Canning of seasonal fruits is undertaken to make them available during off-season. This may be called conferring of utility of time **Personal Utility**

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Making use of personal skills in the form of services, e.g., those of organisers, merchants, transport workers etc.

Illustration to explain how production creates utilities

In the production of a woollen suit, utility is created in some form or the other.

- ✓ Firstly wool is changed into woollen cloth at the spinning and weaving mill (utility created by changing the form).
- ✓ Then, it is taken to a place where it is to be sold (utility added by transporting it).
- ✓ Since woollen clothes are used only in winter, they will be retained until such time when they are required by purchasers (time utility).
- ✓ In the whole process, the services of various groups of people are utilised (as that of mill workers, shopkeepers, agents etc.) to contribute to the enhancement of utility.

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

Other worth noting points about Concept of "Production"

- ➢ Production process need not necessarily involve conversion of physical inputs into physical output. For example, production of services such as those of lawyers, doctors, musicians, consultants etc. involves intangible inputs to produce intangible output.
- ➢ Production does not include work done within a household by anyone out of love and affection, voluntary services and goods produced for self-consumption. Intention to exchange in the market is an essential component of production.
- ➢ The theory of production confines itself to laws of production, production function and methods of production optimisation. Aspects relating to costing and revenue are not studied under production function

FACTORS OF PRODUCTION

Meaning:- Factors of production refer to inputs. An input is a good or service which a frm buys for use in its production process. Production process requires a wide variety of inputs, depending on the nature of output

What are the main factors:- Land, labour, capital and entrepreneurial ability are the four factors or resources which make it possible to produce goods and services

(1) Land	
Meaning	▪ The term 'land' is used in a special sense in Economics. It does not mean soil or earth's surface alone, but refers to *all free gifts of nature* which would include besides land in common parlance, natural resources, fertility of soil, water, air, light, heat natural vegetation etc.
	▪ It becomes difficult at times to state precisely as to what part of a given factor is due solely to gift of nature and what part belongs to human effort made on it in the past.
	Main features of Land are as under:-
Free Gift of nature	No human effort is required for making land available for production. It has no supply price in the sense that no payment has been made to mother nature for obtaining land
Supply is fixed	Land is strictly limited in quantity. It is different from other factors of production in that, no change in demand can affect the amount of land in existence. In other words, the total supply of land is perfectly inelastic from the point of view of the economy. However, it is relatively elastic from the point of view of a firm.

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Land is Permanent & has indestructive powers	Land is permanent in nature and cannot be destroyed. According to Ricardo, land has certain original and indestructible powers and these properties of land cannot be destroyed
Passive Factor	Land is not an active factor. Unless human effort is exercised on land, it does not produce anything on its own
Immobile	In the geographical sense, land is immobile in nature. Land cannot be shifted physically from one place to another. The natural factors typical to a given place cannot be shifted to other places
Multiple Uses	Land can be used for varied purposes, though its suitability in all the uses is not the same
Heterogeneous	No two pieces of land are alike. They differ in fertility and situation

(2) Labour	
Meaning	➢ The term 'labour', means any mental or physical exertion directed to produce goods or services. All human efforts of body or of mind undergone partly or wholly with a view to secure an income apart from the pleasure derived directly from the work is termed as labour. ➢ In other words, it refers to various types of human efforts which ***require the use of physical exertion, skill and intellect***. **Imp. Point to remember** Labour, to have an economic significance, must be one which is done with the motive of some economic reward. Anything done out of love and affection, although very useful in increasing human well-being, is not labour in the economic sense of the term. ***It implies that any work done for the sake of pleasure or love does not represent labour in Economics***. *For example:-* ✓ Services of a house-wife are not treated as labour, while those of a maid servant are treated as labour. ✓ If a person sings just for the sake of pleasure, it is not considered as labour despite the exertion involved in it. On the other hand, if a person sings against payment of some fee, then this activity signifies labour. **Main features of Labour are as under:-**
Human Effort:	Labour, as compared with other factors is different. It is connected with human efforts whereas others are not directly connected with human efforts. As a result, there are certain human and psychological considerations which may come up unlike in the case of other factors. Therefore, leisure, fair treatment, favourable work environment etc. are essential for labourers
Perishable	Labour is highly 'perishable' in the sense that a day's labour lost cannot be completely recovered by extra work on any other day. In other words, a labourer cannot store his labour
Active Factor	Without the active participation of labour, land and capital may not produce anything

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Inseparable from the labourer	A labourer is the source of his own labour power. When a labourer sells his service, he has to be physically present where they are delivered. The labourer sells his labour against wages, but retains the capacity to work
Labour power differs from labourer to labourer:	Labour is heterogeneous in the sense that labour power differs from person to person. Labour power or efficiency of labour depends upon the labourers' inherent and acquired qualities, characteristics of work environment, and incentive to work.
All labour may not be productive:	All efforts are not sure to produce resources. Infact, productivity of different labour is something that is the prime factor for determining its role in the entire production process
Poor bargaining power:	Labour has a weak bargaining power. Labour has no reserve price. Since labour cannot be stored, the labourer is compelled to work at the wages offered by the employers. For this reason, when compared to employers, labourers have poor bargaining power and can be exploited and forced to accept lower wages. The labourer is economically weak while the employer is economically powerful although things have changed a lot in favour of labour during 20th and 21st centuries. differ in fertility and situation
Mobile	Labour is a mobile factor. Apparently, workers can move from one job to another or from one place to another. However, in reality there are many obstacles in the way of free movement of labour from job to job or from place to place
Supply cannot be adjusted rapidly	The total supply of labour cannot be increased or decreased instantly. Supply of labour at any given point of time depends on the population of immediate territory (capable of providing the services), their education level, skill sets etc. However, when necessary time is allowed, supply of labour can be increased since it is a mobile factor
Choice between hours of labour and hours of leisure	A labourer can make a choice between the hours of labour and the hours of leisure. *This feature gives rise to a peculiar backward bending shape to the supply curve of labou*r. ▪ The supply of labour and wage rate is directly related. It implies that, as the wage rate increases the labourer tends to increase the supply of labour by reducing the hours of leisure. ▪ However, beyond a desired level of income, the labourer reduces the supply of labour and increases the hours of leisure in response to further rise in the wage rate. That is, he prefers to have more of rest and leisure than earning more money

(3) Capital
Meaning	▪ Capital as that part of wealth of an individual or community which is used for further production of wealth. ▪ ***Difference between Capital and Wealth*** Whereas wealth refers to all those goods and human qualities which are useful in production and which can be passed on for value, only a part of these goods and services can be characterised as capital *because if these resources are lying idle they will constitute wealth but not capital* ▪ Capital has been rightly defined as *'produced means of production'* or 'man-made instruments of production'. In other words, capital refers to all man made goods that are used for further production of wealth. This definition distinguishes capital from both land and labour because both land and labour are not produced factors. They are primary or original factors of production, but capital is not a primary or original factor; it is a produced factor of production

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	Examples of Capital Machine tools and instruments, factories, dams, canals, transport equipment etc., are some of the examples of capital **Various Types of Capital are as under:-**
On the basis of time period	**Fixed capital** is that which exists in a durable shape and renders a series of services over a period of time. For example tools, machines, etc. **Circulating capital** is another form of capital which performs its function in production in a single use and is not available for further use. For example, seeds, fuel, raw materials, etc.
On the basis of Nature	**Real capital** refers to physical goods such as building, plant, machines, etc. **Human capital** refers to human skill and ability. This is called human capital because a good deal of investment has gone into creation of these abilities in humans. **Tangible capital** can be perceived by senses whereas intangible capital is in the form of certain rights and benefits which cannot be perceived by senses. For example, patents, goodwill, patent rights, etc. **Individual capital** is personal property owned by an individual or a group of individuals. **Social Capital** is what belongs to the society as a whole in the form of roads, bridges, etc

Capital Formation

Meaning:- Capital formation means a ***sustained increase in the stock of real capital*** in a country. In other words, capital formation involves production of more capital goods like, machines, tools, factories, transport equipments, electricity etc. which are used for further production of goods. Capital formation is also known as investment.

Why is there need for Capital Formation

The need for capital formation or investment is realised for two reasons:-

1) *Replacement and renovation*

2) *Creating additional productive capacity*.

Dilemma of Consumption v/s Saving

- In order to accumulate capital goods, some current consumption has to be sacrificed and savings of current income are to be made. Savings are also to be channelised into productive investment.
- The greater the extent that people are willing to abstain from present consumption, the greater the extent of savings and investment that society will devote to new capital formation. If a society consumes all what it produces and saves nothing, the future productive capacity of the economy will fall when the present capital equipment wears out.
- In other words, if the whole of the current present capacity is used to produce consumer goods and no new capital goods are made, production of consumer goods in the future will greatly decline. It is prudent to cut down some of the present consumption and direct part of it to the making of capital goods such as, tools and instruments, machines and transport facilities, plant and equipment etc.

Stages of Capital Formation

There are mainly three stages of capital formation which are as follows:

Savings	The basic factor on which formation of capital depends on the following *1)* **Ability to save**.

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	The ability to save depends upon the income of an individual. Higher incomes are generally followed by higher savings. This is because, with an increase in income, the propensity to consume comes down and the propensity to save increases.
	2) **Willingness to save**
	▪ *Individual factors* Willingness to save depends upon the individual's concern about his future as well as upon the social set-up in which he lives. If an individual is far sighted and wants to make his future secure, he will save more.
	▪ *Government related factors* Moreover, the government can enforce compulsory savings on employed people by making insurance and provident fund compulsory. Government can also encourage saving by allowing tax deductions on income saved.
Mobilisation of savings:	It is not enough that people save money; the saved money should enter into circulation and facilitate the process of capital formation. Availability of appropriate financial products and institutions is a necessary precondition for mobilisation of savings. There should be a *wide spread network of banking and other financial institutions* to collect public savings and to take them to prospective investors.
Investment:	The process of capital formation gets completed only when the real savings get converted into real capital assets. An economy should have an *entrepreneurial class* which is prepared to bear the risk of business and invest savings in productive avenues so as to create new capital assets. Investments also depends upon the factors like expected profits, rate of interest, size of market, stability in the money value, internal peace and security, fear of foreign aggression, etc.

(4) Entrepreneur	
Meaning	♦ The most important factor in production i.e. enterprise is provided by entrepreneur. ♦ An entrepreneur is a person or group of persons who bring together the different factors of production i.e. land, labour and capital at one place; combine them in right proportions; initiate the process of production by making them work together and bear the risks and uncertainty involved in it. ♦ He is therefore also called the organizer, the manager or risk bearer **Main functions performed by an entrepreneur are as under:-**
1) Initiating a business enterprise.	▪ An entrepreneur senses business opportunities, conceives project ideas, decides on scale of operation, products and processes and builds up, owns and manages his own enterprise. ▪ The first and the foremost function of an entrepreneur is to initiate a business enterprise. An entrepreneur perceives opportunity, organizes resources needed for exploiting that opportunity and exploits it. ▪ He undertakes the dynamic process of obtaining different factors of production such as land, labour and capital, bringing about co-ordination among them and using these economic resources to secure higher productivity and greater yield. ***What is the Reward for Entrepreneur*** ▪ An entrepreneur hires the services of various other factors of production and pays them fixed contractual rewards: labour is hired at predetermined rate of wages, land or factory building at a fixed rent for its use and capital at a fixed rate of interest. ▪ The surplus, if any, after paying for all factors of production hired by him, accrues to the entrepreneur as his reward for his efforts and risk-taking.

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	▪ ***Thus, the reward for an entrepreneur, that is a profit***, is not certain or fixed. He may earn profits, or incur losses.
2) Risk Bearing and Uncertannity bearing	The ultimate responsibility for the success and survival of business lies with the entrepreneur. It may happen that as a result of certain broad changes which were not anticipated by the entrepreneur, the firm has to incur losses. Various types of risks borne by entrepreneur are as under:- **1) <u>Financial Risks</u>** The risk that operations of the enterprise may not go on in the planned manner and ultimately entrepreneur may have to incur losses is called financial risk **2) <u>Technological Risk</u>** Apart from financial risks, the entrepreneur also faces technological risks which arise due to the ***inventions and improvement in techniques of production***, making the existing techniques and machines obsolete. **<u>Frank Knight</u>** is of the opinion that profit is the reward for bearing uncertainties. While nearly all functions of an entrepreneur can be delegated or entrusted with paid managers, risk bearing cannot be delegated to anyone. Therefore, risk bearing is the most important function of an entrepreneur
3) Innovation	According to **<u>Schumpeter</u>**, the true function of an entrepreneur is to **<u>introduce innovations.</u>** ▪ Innovation refers to commercial application of a new idea or invention to better fulfilment of business requirements. Innovations, in a very broad sense, include the introduction of new or improved products, devices and production processes, utilisation of new or improved source of raw-materials, adoption of new or improved technology, novel business models, extending sales to unexplored markets etc. ▪ According to Schumpeter, the task of the entrepreneur is to continuously introduce new innovations. These innovations may bring in greater efficiency and competitiveness in business and bring in profits to the innovator. ▪ The entrepreneurs promote economic growth of the country by introducing new innovations from time to time and contributing to technological progress.

<u>Objective of an Enterprise</u>

Organic Objectives	The basic minimum objective of all kinds of enterprises is **<u>to survive or to stay alive</u>**. An enterprise can survive only if it is able to produce and distribute products or services at a price which enables it to recover its costs. If an enterprise does not recover its costs of staying in business, it will not be in a position to meet its obligations to its creditors, suppliers and employees with the result that it will be forced into bankruptcy. Therefore, survival of an enterprise is essential for the continuance of its business activity. Once the enterprise is assured of its survival, it will aim at **<u>growth and expansion.</u>** Growth as an objective has assumed importance with the rise of professional managers. **<u>Marris Theory of Firm's Growth</u>** ▪ R.L. Marris's theory of firm assumes that the goal that managers of a corporate firm set for themselves is to maximise the firm's balanced growth rate subject to managerial and financial constraints. ▪ It is pointed out that ability or success of the managers is judged by their performance in promoting the growth or expansion of the firm ▪ While owners want to maximise their utility function which relate to profit, capital, market share and public reputation, the managers want to maximise their utility function which includes variables such as salary, power, and status and job security.

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	▪ Although there is divergence and some degree of conflict between these utility functions, Marris argues that most of the variables incorporated in both of them are positively related to size of the firm and therefore, the two utility functions converge into a single variable, namely, a steady growth in the size of the firm. ▪ **The managers do not aim at optimising profits; rather they aim at optimisation of the balanced rate of growth of the firm** which involves optimisation of the rate of increase of demand for the commodities of the firm and the rate of increase of capital supply
Economic Objectives	The profit maximising behaviour of the firm has been the most basic assumption made by economists. Under this assumption, *__the firm determines the price and output policy in such a way as to maximize profits__* within the constraints imposed upon it such as technology, finance etc. ▪ The **investors** expect that their company will earn sufficient profits in order to ensure fair dividends to them and to improve the prices of their stocks. ▪ Not only investors **but creditors and employees** are also interested in a profitable enterprise. Creditors will be reluctant to lend money to an enterprise which is not making profits. Similarly, any increase in salaries, wages and perquisite of employees can come only out of profits. **Meaning of Profit in Economics** The definition of profits in Economics is different from the accountants' definition of profits. ▪ Profit, in the accounting sense, is the difference between total revenue and total costs of the firm. Economic profit is the difference between total revenue and total costs, but total costs here costs include both explicit and implicit costs. ▪ Accounting profit considers only explicit costs while economic profit reflects explicit and implicit costs i.e. the cost of self-owned factors used by the entrepreneur in his own business. Since economic profit includes these opportunity costs associated with self owned factors, it is generally lower than the accounting profit. *Concept of Normal Profit and Super profit in Economics* ▪ Normal profits include normal rate of return on capital invested by the entrepreneur, remuneration for the labour and the reward for risk bearing function of the entrepreneur. Normal_ profit (zero economic profit) is a component of costs and therefore what a business owner considers as the minimum necessary to continue in the business. ▪ Supernormal profit, also called economic profit or abnormal profit is over and above normal profits. It is earned when total revenue is greater than the total costs. Total costs in this case include a reward to all the factors, including normal profit. *Criticism of this objective* ➢ Profit maximization objective has been criticized because all firms do not aim to maximize profits. E.g.- ➢ Some firm try to achieve SECURITY with reasonable level of profit. ➢ Some firms may try to MAXIMISE SALES (Prof. Baumol) ➢ Some economists point that owners and managers of a company try to MAXIMISE THEIR UTILITY rather than profit
Social Objectives	Since an enterprise lives in a society, it cannot grow unless it meets the needs of the society. Some of the important social objectives of business are: ▪ To maintain a continuous and sufficient supply of unadulterated goods and articles of standard quality ▪ To avoid profiteering and anti-social practices.

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	▪ To create opportunities for gainful employment for the people in the society. ▪ To ensure that the enterprise's output does not cause any type of pollution - air, water or noise. An enterprise should consistently endeavour to contribute to the quality of life of its community in particular and the society in general. If it fails to do so, it may not survive for long.
Human Objectives	Human beings are the most precious resources of an organisation. If they are ignored, it will be difficult for an enterprise to achieve any of its other objectives. Therefore, the comprehensive development of its human resource or employees' should be one of the major objectives of an organisation. Some of the important human objectives are: ▪ To provide fair deal to the employees at different levels ▪ To develop new skills and abilities and provide a work climate in which they will grow as mature and productive individuals. ▪ To provide the employees an opportunity to participate in decision-making in matters affecting them. ▪ To make the job contents interesting and challenging. If the enterprise is conscious of its duties towards its employees, it will be able to secure their loyalty and support
National Objectives	An enterprise should endeavour for fulfilment of national needs and aspirations and work towards implementation of national plans and policies. Some of the national objectives are: ▪ To remove inequality of opportunities and provide fair opportunity to all to work and to progress. ▪ To produce according to national priorities. ▪ To help the country become self-reliant and avoid dependence on other nations. ▪ To train young men as apprentices and thus contribute in skill formation for economic growth and development.

Conflict between various Objectives

Various objectives of an enterprise may conflict with one another. ***For example***

▪ the profit maximisation objective may not be wholly consistent with the marketing objective of increasing its market share which may involve improvement in quality, slashing down of product prices, improved customer service, etc.

▪ Similarly, its social responsibility objective may run into conflict with the introduction of technological changes which may cause environmental pollution.

What to do in case of conflict in Business Objectives

In such situations, the manager has to strike a balance between the two so that both can be achieved with reasonable success.

Constraints of an enterprise in achievement of its Objectives

In the pursuit of the above objectives an enterprise's action may get constrained in following ways-

(i) Lack of knowledge and information about many variable that affect business.

(ii) Constraints may be experienced due to governments' restrictions on the production, price and movement of factors.

(iii) There may be infrastructural bottleneck.

(iv) Changes in business and economic conditions; change in government policies about location, prices, taxes, etc.; natural calamities like fire, flood, famine, etc.

(v) Constraints are also faced due to inflation, rising interest rates, unfavourable exchange rate, capital and labour costs, etc.

Problems of an Enterprise

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Problems relating to objectives:	The problem is that these objectives are multifarious and *very often conflict with one another.* For example, the objective of maximising profits is in conflict with the objective of increasing the market share which generally involves improving the quality, slashing the prices etc. Thus the enterprise faces the problem of not only choosing its objectives but also striking a balance among them.
Problems relating to location and size of the plant	An enterprise has to decide about the **location of its plant**. It has to decide whether the plant should be located near the source of raw material or near the market. It has to consider costs such as cost of labour, facilities and cost of transportation. Of course, the entrepreneur will have to weigh the relevant factors against one another in order to choose the right location which is most economical.
	Another problem relates to the **size of the firm**. It has to decide whether it is to be a small scale unit or large scale unit. Due consideration will have to be given to technical, managerial, marketing and financial aspects of the proposed business before deciding on the scale of operations. It goes without saying that the management must make a realistic evaluation of its strengths and limitations while choosing a particular size for a new unit.
Problems relating to selecting and organising physical facilities	**Type of equipment** • A firm has to make decision on the nature of production process to be employed and the type of equipments to be installed. The choice of the process and equipments will depend upon the design chosen and the required volume of production. • As a rule, production on a large scale involves the use of elaborate, specialized and complicated machinery and processes. • Quite often, the entrepreneur has to choose from among different types of equipments and processes of production. Such a choice will be based on the evaluation of their relative cost and efficiency. **Arrangement of Equipment** • Having determined the equipment to be used and the processes to be employed, the entrepreneur will prepare a layout illustrating the arrangement of equipments and buildings and the allocation for each activity
Problems relating to Finance	An enterprise has to undertake not only physical planning but also **expert financial planning** which involves:- (i) determination of the amount of funds required for the enterprise with reference to the physical plans already prepared (ii) assessment of demand and cost of its products (iii) estimation of profits on investment and comparison with the profits of comparable existing concerns to find out whether the proposed investment will be profitable enough and (iv) determining capital structure and the appropriate time for financing the enterprise etc
Problems relating to organisation structure	▪ An enterprise also faces problems relating to the organisational structure. It has to divide the total work of the enterprise into major specialised functions and then constitute proper departments for each of its specialized functions. ▪ Not only this, the functions of all the positions and levels would have to be clearly laid down and their inter-relationship (in terms of span of control, authority, responsibility, etc) should be properly defined. ▪ In the absence of clearly defined roles and relationships, the enterprise may not be able to function efficiently

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Problems relating to marketing	Proper marketing of its products and services is essential for the survival and growth of an enterprise. For this, the enterprise has to discover its target market by identifying its actual and potential customers, and determine tactical marketing tools it can use to produce desired responses from its target market. After identifying the market, the enterprise has to make decision regarding 4 P's namely, ▪ **Product:** variety, quality, design, features, brand name, packaging, associated services, utility etc. ▪ **Promotion:** Methods of communicating with consumers through personal selling, social contacts, advertising, publicity etc. ▪ **Price:** Policies regarding pricing, discounts, allowance, credit terms, concessions, etc. ▪ **Place:** Policy regarding coverage, outlets for sales, channels of distribution, location and layout of stores, inventory, logistics etc.
Problems relating to legal formalities	A number of legal formalities have to be carried out during the time of launching of the enterprise as well as during its life time and its closure. These formalities relate to assessing and paying different types of taxes (corporate tax, excise duty, sales tax, custom duty, etc.), maintenance of records, submission of various types of information to the relevant authorities from to time, adhering to various rules and laws formulated by government (for example, laws relating to location, environmental protection and control of pollution, size, wages and bonus, corporate management licensing, prices) etc.
Problems relating to industrial relations	With the emergence of the present day factory system of production, the management has to devise special measures to win the co-operation of a large number of workers employed in industry. Misunderstanding and conflict of interests have assumed enormous dimensions that these cannot be easily and promptly dealt with. Various problems which an enterprise faces with regard to industrial relations are – ▪ the problem of winning workers' cooperation, ▪ the problem of enforcing proper discipline among workers, ▪ the problem of dealing with organised labour and ▪ the problem of establishing a state of democracy in the industry by associating workers with the management of industry.

PRODUCTION FUNCTION

Meaning	➢ Output is a function of inputs i.e. factor services such as land, labour and capital which are used in production. In other words, production is a transformation of PHYSICAL INPUTS into PHYSICAL OUTPUT. ➢ The functional relationship between physical inputs and physical output, per unit of time under a given state of technology is called **production function.** ➢ It can also be expressed in the form of a mathematical equation in which output is the dependent variable and inputs are the independent variables. Q = f (a, b, c n) Where - Q denotes quantity of output of a commodity per unit of time f stands for function of i.e. depends on a, b, c,... n denotes quantity of various inputs
Assumption	The production function is based on the following assumptions: 1. It is specified with reference to a *specified period of time.* 2. It is assumed that the *state of technology remains the same*, during the period of time. Any innovation would cause change in the relationship between the given inputs and their

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	output. For example, use of robotics in manufacturing or a more efficient software package for financial analysis would change the input-output relationship. **3.** Whatever input combinations are included in a particular function, the output resulting from their utilization is at the **maximum level**
Two ways to look at Production function	Because of the above assumption regarding the study of production function, it can analysed in two different ways:- 1) It can be defined for a given state of technology i.e., ***the maximum amount of output that can be produced with given quantities of inputs*** under a given state of technical knowledge. **(Samuelson)** 2) It can also be defined as the minimum quantities of various inputs that are required to yield a given quantity of output. ***Point to Remember*** For the purpose of analysis, the whole array of inputs in the production function can be reduced to two; L and K. Restating the equation given above, we get: Q = f (L, K). Where Q = Output L= Labour K= Capital
Short run v/s Long run Production function	The production function of a firm can be studied in the **context of short period or long period**. *What is the basis for differentiating between Short term and Long term* It is to be noted that in economic analysis, the distinction between short-run and long-run is not related to any particular measurement of time (e.g. days, months, or years). ***In fact, it refers to the extent to which a firm. can vary the amounts of the inputs in the production process*** . **Short Run period** ▪ A period will be considered short-run period if the amount of at least one of the inputs used remains unchanged during that period. Thus, short-run production function shows ***the maximum amount of a good or service that can be produced by a set of inputs, assuming that the amount of at least one of the inputs used remains unchanged***. ▪ Thus, in the short-run, the production function is studied by holding the quantities of capital fixed, while varying the amount of other factors (labour, raw material etc.) This is done when the **law of variable proportion** is studied. **Long run Period** ▪ The long run is a period of time (or planning horizon) in which **all factors of production are variable**. It is a time period when the firm will be able to install new machines and capital equipments apart from increasing the variable factors of production. ▪ 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 behaviour of production when all factors are varied is the subject matter of the law of **returns to scale.**
Cobb-Douglas Production Function	**Background** A famous statistical production function is Cobb-Douglas production function. Paul H. Douglas and C.W. Cobb of the U.S.A. studied the production function of the American manufacturing industries. In its original form, this production function applies not to an individual firm but to the whole of manufacturing in the United States

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What does this function reflect

In this case, output is manufacturing production and inputs used are labour and capital. Cobb-Douglas production function is stated as:

$$Q = KL^a C^{(1-a)}$$

where 'Q' is output, 'L' the quantity of labour and 'C' the quantity of capital. 'K' and 'a' are positive constants

Conclusions drawn

The conclusion drawn from this famous statistical study is that labour contributed about 3/4th and capital about 1/4th of the increase in the manufacturing production. Although, the Cobb-Douglas production function su_ers from many shortcomings, it is extensively used in Economics as an approximation.

Important Differences Relevant for Study of Production Function

Basis of Comparison	Fixed Inputs	Variable Inputs
(i) Meaning	The factors which cannot be easily and quickly changed and require long time to make adjustment in them with the changes in the level of output are called fixed inputs or fixed factors of production. ♦ In other words, factor inputs whose quantity does not vary from day-to-day are called as fixed inputs	The factors which can be easily and quickly changed and readily adjusted with the changes in the level of output are called variable inputs or variable factors of production. ♦ In other words, factor inputs whose quantity may vary from day-to-day are called as variable inputs.
(ii) Examples	♦ **Examples of fixed inputs** - buildings, machinery, plant, top management, etc. ♦ It requires long time to make variations in them. ♦ **E.g.** To construct a new factory building with a larger area and capacity.	♦ **Examples of variable inputs** - ordinary labour, raw-material, power, fuel chemicals, etc. ♦ It can be readily changed.
(iii) Relation with Output	♦ Fixed inputs do not vary with the level of output. ♦ Its quantity remains the same, whether the output is more or less or zero in SHORT RUN	♦ Variable inputs vary directly with the level of output. ♦ Such factors are required more, when output is more; less, when output is less and zero, when output is zero in SHORT RUN.
(iv) Cost	♦ The cost of the fixed inputs is called FIXED COST. ♦ In the short run the firm has to bear the fixed cost even if the output is zero. ♦ Since the quantity of fixed inputs remains the same, fixed cost remains the same whatever be the level of output.	♦ The cost of the variable inputs is called VARIABLE COST. ♦ Since variable inputs vary directly with the level of output, variable costs are also positively related with output. If output is zero, variable cost is also zero. ♦ If output is increased variable cost also increases and vice-versa.

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Basis of Comparison	Short Run	Long Run
(i) Meaning	♦ The short run is defined as the period of time in which some factors of production or at least one factor is fixed i.e. does not vary with output.	♦ The long run is defined as the period of time in which all factors may vary.
	♦ Thus, in the short period some factors are FIXED FACTORS **E.g.** Factory building, machinery, management, etc. and some are VARIABLE FACTORS **E.g.** Labour, raw-material, power, fuel, etc.	♦ In the long run, **all factors become variable** and so there is no distinction between fixed and variable factors.
(ii) Scale of Production OR Size of the Firm	♦ In the short run, the output is produced with a GIVEN SCALE OF PRODUCTION i.e. the size of plant or firm (and so the production capacity) remains unchanged. ♦ Hence, production can be increased or decreased only by changing the amount of variable factors.	♦ In the long run, the output is produced with the CHANGE IN THE SCALE OF PRODUCTION i.e. the size of plant or firm can be increased (and so the production capacity). ♦ Hence, production can be increased by varying all factors i.e. fixed factors (of short period) as well as variable factors.
(iii) Production Law	♦ The production function which is studied in the short run period is called as the Law of Variable Proportions.	♦ The produc tion function which is studied in the long run period is called as the Law of Returns to Scale.
(iv) Decisions about Change in factors	♦ The decisions to change the amount of variable factors (like raw material, labour, etc.) are taken very frequently depending upon changes in demand of the commodity. ♦ Hence, short run is the 'ACTUAL PRODUCTION PERIOD' during which some factors are fixed while some are variable. ♦ Thus, firms operate in the short run period.	♦ The decisions to change the amount of fixed factors i.e. scale of production or to close down the firm are taken only once in a while. ♦ Hence, long run is the 'PLANNING PERIOD'. ♦ Thus, firms plan in the long run period.
(v) Nature of Supply	♦ In the short run period, supply can be adjusted upto a limited extent as per changes in demand. ♦ In other words, supply is relatively inelastic.	♦ In the long run period, supply can be fully adj usted as per changes in demand. ♦ In other words, supply is relatively elastic.
(vi) Nature of Cost	♦ In short run period, cost is classified as FIXED COST and VARIABLE COST. ♦ Fixed cost is the cost of fixed inputs and Variable cost is the cost of variable inputs. ♦ **Fixed cost is the main feature of short run period**	♦ In long run period ALL COSTS ARE VARIABLE. ♦ **Variable cost is the main feature of long run period.**
(vii) Effect on Price	♦ In short-run, the price determination of a commodity is more influenced by - (a) The demand forces than supply forces because supply in short-run is relatively inelastic, and (b) The UTILITY of the commodity. ♦ The short-run price is called SUB-NORMAL PRICE	♦ In long-run, the price determination of a commodity is more influenced by- (a) The supply forces than demand forces because supply in long-run is relatively elastic, and (b) The COST OF PRODUCTION of the commodity. ♦ The long-run price is called NORMAL PRICE.

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(viii) Average Cost Curve	♦ The short-run average cost curve is 'U' shaped. ♦ Its U-shape is explained with the Law of Variable Proportions.	♦ The long-run average cost curve is also U shaped. ♦ But its U- shape is not as prominent as short-run average cost curve. ♦ Its U-shape is explained with the Law of Returns to Scale. ♦ Long-run average cost curve is also called 'PLANNING CURVE' and 'ENVELOPE CURVE'.
(ix) Profit of Firms	♦ In the short-run period - (a) The firms under perfect competition on being at equilibrium may earn normal profits, super normal profits or incur losses; (b) The monopoly firm on being at equilibrium may earn normal profits, super normal profits or incur losses; (c) The firms under monopolistic competition on being at equilibrium may earn normal profits, super normal profits or incur losses.	♦ In the long run period- **(a)** The firms under perfect competition earn only NORMAL PROFITS and **operate at optimum level.** (b) The monopoly firm can earn SUPER NORMAL PROFITS and **operate at sub-optimum level.** (c) The firms under monopolistic competition earn only NORMAL PROFITS and **operate at sub-optimum level.**

CONCEPTS OF PRODUCT

♦ Product i.e. output refers to the volume of goods produced by a firm in a particular period of time.

♦ There are three concepts relating to the physical production by factors namely-

1. Total Product **(TP),**

2. Average Product **(AP),** and

3. Marginal Product **(MP).**

Total Product	♦ The total output produced by all the factors per unit of time is called total product. ♦ Total product increases with an increase in the variable factor input.
Average Product	♦ The average product means the total product per unit of a variable factor. ♦ In other words, it is the total product divided by the number of units of a variable factor. Average Product $= \dfrac{\text{Total Product}}{\text{No.of units of variable factor}}$ OR $AP = \dfrac{TP}{QVF}$
Marginal Product	♦ The marginal product means addition made to total product by the use of an extra unit of variable factor. ♦ It may be stated as- $MP_n = TP_n - TP_{n-1}$ where, MP_n = Marginal product when 'n ' units of variable factors are used TP = Total Product n = number of units of variable factors used.

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	♦ Marginal Product may also be defined as the change in total output due to use of additional unit of variable factor
	$MP = \dfrac{\Delta TP}{\Delta QVF}$
	Where -
	Δ = a small change Column No. (4) of the following table shows the marginal product schedule

Relationship between AP and MP

Labour	TP	AP	MP	Analysis
1	2	2	2	MP & AP both increases; MP>AP;
2	5	2.5	3	TP also increases
3	9	3	4	**MP=AP, AP = maximum**
4	12	**3**	**3**	
5	14	2.8	2	MP & AP both decreases,
6	15	2.5	1	MP<AP; TP increases
7	**15**	2.1	**0**	**MP = 0, TP= maximum**
8	14	1.7	-1	AP > MP both decreases
9	12	1.3	-2	TP decreases

(a) Both AP and MP can be calculated by TP.

(b) When AP rises then MP also rises but MP >AP.

(c) When AP is maximum then MP =AP or say MP curve cuts the AP curve at its maximum point

(d) When AP falls then MP also falls but MP <AP.

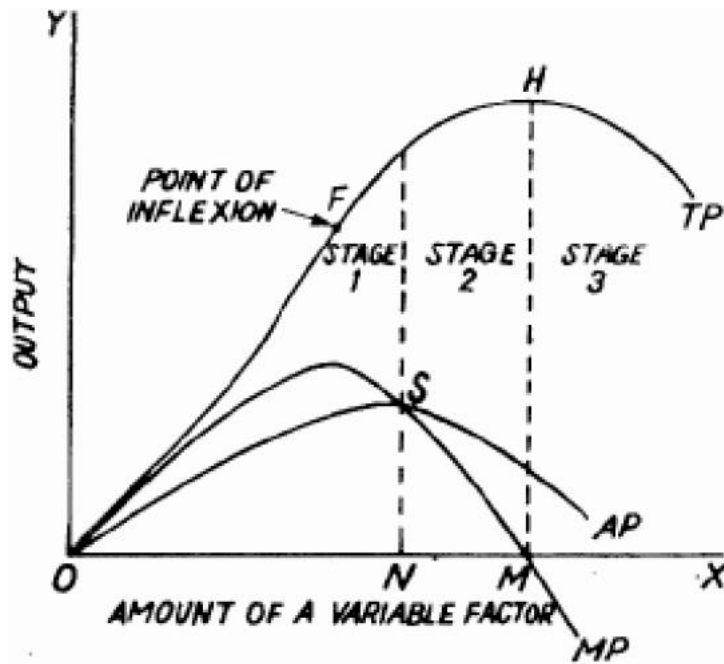(e) There may be a situation when MP decreases and AP increases but opposite never happened.

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Law of Variable Proportions

What does this law state	• The Law of Variable Proportions examines the production function i.e. the input-output relation in short run where one factor is variable and other factors of production are fixed. • In other words, it examines production function when the output is increased by varying the quantity of one input. • Thus, the law examines the effect of change in the proportions between fixed and variable & factor inputs on output in three stages viz. **Increasing returns, diminishing returns and negative returns.** **Statement of the Law** **"As the proportion of one factor in a combination of factors is increased, after a point first | the marginal and then the average product of that factor will diminish". (F. Benhan)**
Assumptions	a) *The state of technology is assumed to be given and unchanged*. If there is any improvement in technology, then marginal product and average product may rise instead of falling. b) There must be *some inputs whose quantity is kept fixed*. This law does not apply to cases when all factors are proportionately varied. When all the factors are proportionately varied, laws of returns to scale are applicable. c) The law does not apply to those cases where the factors must be used in fixed proportions to yield output. When the various factors are required to be used in fixed proportions, an increase in one factor would not lead to any increase in output i.e., marginal product of the variable factor will then be zero and not diminishing. d) We consider only physical inputs and outputs and not economic profitability in monetary terms.

Understanding through Diagrammatic and Numerical Example

Labour	TP	AP	MP	Analysis for Law of Variable Proportion
1	2	2	2	Stage-I- Law of increasing returns
2	5	2.5	3	
3	9	3	4	
4	12	3	3	AP = MP and AP is maximum
5	14	2.8	2	Stage-II- Law of decreasing returns
6	15	2.5	1	
7	15	2.1	0	MP =0, TP is Maximum
8	14	1.7	-1	Stage-III-Law of Negative returns

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9	12	1.3	-2		

Three Stages of Production under Short run production Function

STAGE	TP	MP	AP
Stage I	Increases at an increasing rate.	Increases and reaches at maximum point.	Increases and reaches its maximum point.
Stage II	Increases at diminishing rate and reaches its maximum point	Decreases and` becomes zero	After reaching its maximum point beings to decrease.
Stage III	Begins to fall.	Becomes Negative	Continues to diminish

Stage 1 – Increasing returns to Factor	**Reasons for this Stage** 1) **Indivisibility of fixed factors:-** The law of increasing returns operates because of indivis-ibility of fixed factors. It means, in order to produce goods upto a given limit, atleast one unit of the fixed factor is a fixed 2) **Division of Labour & Specialisation** The second reason why we get increasing re-turns in the initial stages is that with sufficient quantity of variable factor, introduction of di- vision of labour and specialization becomes

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	possible, which results in higher productivity **Note :** *Point of Inflexion* is that point on TP at which MP is maximum

Stage 2:-
Diminishing
Returns to
Factor
	Reasons for this Stage
	
	   1) Inadequate relative of fixed factors:-
	Once the point is reached at which the amount of variable factor is sufficient to ensure the efficient utilization of the fixed factor, then further increases in the variable factor will cause marginal and average product to decline because the fixed factor then becomes inadequate relative to the quantity of variable factors
	
	   2) Imperfect substitutability: -
	Another reason offered for the operation of the diminishing returns is the imperfect substitutability of factors for one another.
	
	Note : *Saturation point* is that point at which TP is maximum and MP is zero

Stage 3:- **Negative** **Returns to** **Factor**	<u>**Too excessive quantity of variable factor**</u> :-In this stage the quantity of variable factor be-comes too excessive relative to the fixed factor so that they get in each other's way with a result that the total output falls instead of rising. In such a situation a reduction in the units of the variable factor will increase the total output.

In which Stage would a Producer achieve equilibrium

➤ *Why not in Stage 3*
Rational producer will never produce in stage 3 where marginal product of the variable factor is negative. This being so, a producer can always increase his output by reducing the amount of variable factor. Even if the variable factor is free of cost, a rational producer stops before the beginning of the third stage.

➤ *Why not in Stage 1:-*
A rational producer will also not produce in stage 1 as he will not be making the best use of the fixed factors and he will not be utilising fully the opportunities of increasing production by increasing the quantity of the variable factor whose average product continues to rise throughout stage 1. Even if the fixed factor is free of cost in this stage, a rational entrepreneur will continue adding more variable factors.

Remember*:- It is thus clear that a rational producer will never produce in stage 1 and stage 3. These stages are called stages of 'economic absurdity' or 'economic non-sense'*

➤ *Equilibrium always achieved in Stage 2:-*
. A rational producer will always produce in stage 2 where both the marginal product and average product of the variable factors are diminishing. At which particular point in this stage, the producer will decide to produce depends upon the prices of factors.

Returns to Scale

♦ The Law of Returns to Scale examines the production function i.e. the input - output relation in long run where increase in output can be achieved by varying the units of ALL FACTORS IN THE SAME PROPORTION.

♦ Thus, in long run all factors become variable.

♦ It means that in long run the scale of production and the size of the firm can be increased.

♦ The law of returns to scale analyse the effects of scale on the level of output as-

1. Increasing **Returns to** **Scale**	■ When the output increases by a greater proportion than the proportion increases in all the factor inputs, it is increasing returns to scale.

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	■ **E.g.** When all inputs are increased by 10% and output rises by 30%. ■ The reasons of increasing returns to scale are - internal and external economies of scale; indivisibility of fixed factors; improved organisation; division of labour and specialisation; better supervision and control; adequate supply of productive factors, etc.
2. Constant Returns to Scale	■ When the output increases exactly in the same proportion as that of increase in all factor inputs, it is constant returns to scale. ■ **E.g.** - When all inputs are increased by 10% and output also rises by 10%. ■ The reason of constant returns to scale is that beyond a certain point, internal and external economies are NEUTRALISED by growing internal and external diseconomies Constant returns to scale, otherwise called as "Linear Homogeneous Production Function", may be expressed as follows: kQx = f(kK, kL) = k (K, L) If all the inputs are increased by a certain amount (say k) output increases in the same proportion (k). It has been found that an individual _rm passes through a long phase of constant returns to scale in its lifetime.
3. Diminishing Returns to Scale	■ When the output increases by a lesser proportion than the proportion increase in all the factor inputs, it is diminishing returns to scale. **E.g.** When all inputs are increased by **20%** but output rises by **10%.** ■ The reason of diminishing returns to scale is increased internal and external diseconomies of production. ■ Internal diseconomies like difficulties in management, lack of supervision and control, delay in decision-making etc. ■ External diseconomies like insufficient transport system, high freights, high prices of raw materials, power cuts, etc.

Understanding Returns to Scale through Cobb-Douglas Production Function

The Cobb-Douglas production function, explained earlier is used to explain "returns to scale" in production. Originally, Cobb and Douglas assumed that returns to scale are constant. The function was constructed in such a way that the exponents summed to a+1-a=1. However, later they relaxed the requirement and rewrote the equation as follows:

$$Q = K L^a C^b$$

Where 'Q' is output, 'L' the quantity of labour and 'C' the quantity of capital, 'K' and 'a' and 'b' are positive constants.

➤ If a + b > 1 Increasing returns to scale result i.e. increase in output is more than the proportionate increase in the use of factors (labour and capital).
➤ If a + b = 1 Constant returns to scale result i.e. the output increases in the same proportion in which factors are increased.
➤ If a + b < 1 decreasing returns to scale result i.e. the output increases less than the proportionate increase in the labour and capital.

Table : Law of returns to scale

Units of Labour & Capital	Marginal Product (Units)	Total Product (Units)	Remarks
1	200	200	**Stage I**
2	300	500	Increasing Returns
3	400	900	**Stage II**
4	400	1300	Constant Returns

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5	400	1700	
6	300	2000	**Stage III**
7	200	2200	Diminishing Returns.
8	100	2300	
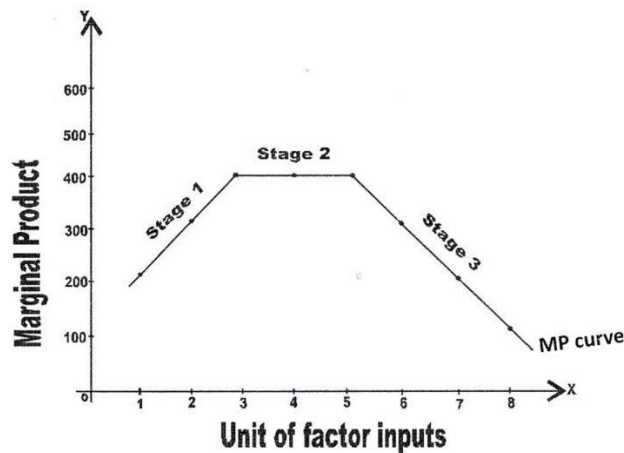
Figure : Returns to Scale

RETURNS TO FACTOR AND RETURNS TO SCALE

	Returns to Factor	Returns to Scale
1. Meaning	- Returns to factor refers to the various production sizes where one factor is variable and other factor of production are fixed. - In other words, it examines production function when the output is increased by varying the quantity of one input. - It examines the effect of CHANGE IN THE PROPORTIONS between inputs on output.	- Returns to scale refers to the various production sizes where increase in output can be achieved by varying the units of ALL FACTORS in the SAME PROPORTIONS. - It show the effects on output when all factor inputs are varied in the same proportion simultaneously.
2. Nature of Inputs	- Quantities of some inputs are fixed while the quantities of other inputs vary. - In other words, there are FIXED and VARIABLE factors of production.	- Quantities of all inputs can be varied. - In other words, all factors of production are VARIABLE.
3. Time Element	- Returns to factor is called a SHORT RUN production function.	- Returns to scale is called a LONG RUN production function.
4. Application	- It does not apply where the factors must be used in fixed proportion to produce a commodity.	- It does apply where the factors must be used in fixed proportions to produce a commodity.

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5. Stages of Law	- The law has three stages namely - {a) Increasing Returns to factor, (b) Diminishing Returns to Factor, & (c) Negative Returns to factor - Of the three stages, diminishing returns pre-dominate.	- The law has three stages namely - (a) Increasing Returns to Scale, (b) Constant Returns to Scale, (c) Diminishing Returns to Scale. - All the three stages of return appear.
6. Causes of Operation	- Increasing returns to factor is due to indivisibility of fixed factors and division of labour and specialisation. - Diminishing returns is due to non- optimal factor proportion and imperfect substitutability of factors. - Negative returns fall in the efficiency of fixed and variable factors.	- Increasing returns to scale is due to increased internal and external economies. - Constant returns to scale is due to the fact that internal and external economies are neutralised by growing internal and external diseconomies. - Diminishing returns is due to internal and external diseconomies of scale.
7. Scale of Production	- The scale of output is unchanged and the production plant or the size and efficiency of the firm remain constant. - This is because, only one factor is variable and all other factors are fixed.	- The scale of output can be increased and so the size of the firm too can be expanded. - This is because all factors are variable and hence can be increased in the same proportion simultaneously.

INTERNAL ECONOMIES

♦ **Internal economies** are those benefits which accrue to a firm when it expands the scale of production.

♦ Internal economies are the result of the firm's own efforts independent of the actions of other firms.

♦ These economies are particular to the individual firms and are different for different firms depending upon the size of the firm.

♦ The main types of internal economies are as follows

Technical Economies & Diseconomies	- The large scale production is associated with technical economies. - As the firm increases its scale of production, it becomes possible to use better plant, machinery, equipment and techniques of production. - Following are the main forms (causes/reasons) of technical economies ■ **Economies of superior techniques.** - A large sized firm can use sophisticated and costly machines and equipments. - Use of superior techniques reduces the cost of production per unit and increases aggregate output. ■ **Economies of increased dimensions.** - A large firm can get the mechanical advantage in using large machines and other mechanical units to produce more output. - **E.g.** A Large boiler, large furnace, etc. can be operated by same team as required by smaller boiler, furnace, etc. ■ **Economies of linked processes.** - A large sized firm can develop its own sources of raw material, means of transportation, distribution system, etc.

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	■ **Economies of the use of By-products.** - A large sized firm can avoid all kinds of wastage of materials. The firm can use its by-products and waste material to produce another material. - **E.g.-** Sugar industry can make alcohol out of the molasses ■ **Economies of specialization.** - A large sized firm can introduce greater degree of division of labour and specialisation
Managerial Economies	- Large sized firms can introduce division of labour in managerial tasks. - They can employ business executive of high skill and qualification to look after the functioning of various departments like production, finance, sales, advertising, personnel, etc. - This helps to increase the efficiency and productivity of managers resulting in reduction in managerial costs
Commercial Economies	- A large sized firm is able to reap economies of bulk purchases. - It can get discounts from suppliers, railways, transport companies, etc. - It enjoys prompt and regular supply of raw materials. - A large sized firm can also afford to spend large amount of money on advertising, publicity, etc. - It can also give various concessions to wholesale and retail dealers and customers and thus capture markets for its product
Financial Economies	- A big firm enjoys goodwill among lenders or investors. - For raising finance it can either borrow from bank as it can offer better security or it can raise finance by issuing shares, debentures and by inviting public deposits. Such opportunities are not available to small firms.
Risk Bearing Economies	- A large firm is better placed to face the uncertainties and risks of business. - A big firm producing many variety of goods is in a better position to withstand economic ups and downs. Therefore, it enjoys economies of risk bearing.

INTERNAL DISECONOMIES

♦ **Internal diseconomies** means all those factors which raise the cost of production per unit of a particular firm when the scale of production is expanded beyond the point of optimal capacity.

♦ Such diseconomies of scale are as follows

Production Diseconomies	- Production diseconomies sets in when expansion of firm's production beyond optimum size leads to rise in the cost per unit of output. - E.g. Use of inferior or less efficient factors due to non-availability of efficient factors raises the per unit cost of output.
Managerial Diseconomies	- As the scale of production increases burden on management also increases. - Co-ordination of work among different departments becomes difficult. Supervision and control over the activities of subordinates becomes difficult, decision taking is delayed, etc.

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	- As a result, wastage increase and the efficiency and productivity decrease. - Per unit cost starts rising
Technical Diseconomies	Every equipment has an optimum point at which it works more efficiently and economically. - Beyond optimum point they are overworked and may result in breakdowns, heavy cost of maintenance, etc.
Financial Diseconomies	Expansion of production beyond the optimum scale results in increase in the cost of capital. - It may be due to increased dependence on external finances
Marketing Diseconomies	- Selling diseconomies set in if the scale of production is expanded beyond optimum level. - The advertisement expenditure and marketing overheads increase more proportionately with the scale

EXTERNAL ECONOMIES

♦ **External economies** are those benefits which accrue to all the firms operating in a given industry from the growth and expansion of that industry.

♦ External economies are not related to an individual firm's own cost reduction efforts.

♦ These are common to all the firms in an industry and shared by many firms or industries.

♦ The main types of external economies are as follows

Technological Economies	- When the whole industry expands, it may result in the discovery of new technical knowledge, firms pool manpower and finance for research and development resulting in new and improved methods of production and new inventions. - Use of improved and better machinery improves production function and cost of production per unit fails
Economies of Localization	- When in an area, many firms producing the same commodity are set up, it is called localization of an industry. * Due to localization there is expansion of railways, post & telegraph, banking services, insurance, setting up of booking offices by transport, companies, setting up of powerful transformer by electricity department, etc. - All the firms get these facilities at low prices
Economies of Information	- As pointed earlier, firms pool their resources for research and development. - All firms get the benefit of the research in terms of market information, technical information, information about governments economic policies, information about availability of new source of raw material, etc. - Also, specialized journals give information about latest developments
Cheaper Inputs	- When an industry expands its needs for raw materials, machines, etc. also expand. - This may result in exploration of new and cheaper sources of raw materials, machinery, etc. - Also, the industries producing such inputs also expand in scale. - Therefore, they can supply these inputs at lower prices. - As a result the cost of production per unit of the firm using these inputs falls.

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Growth of Ancillary Industries	- With the growth of an industry, many firms specialized in the production of inputs like raw material, tools, machinery, etc. come up. - Such firms are called ancillary units which provides inputs at lower cost to the main industry. - Likewise, some firms may get developed by processing the waste products of the industry. - Thus, wastes are converted into **by-products.** This reduces the cost of production in general
Development of Skilled Labour	- When an industry expands specialized institutions like colleges, training centers, management institutes, etc. develop. - This results in continuous availability of skilled labour like technicians, engineers, management experts, etc
Better transportation & Marketing Facilities	- When an industry expands many specialized transporters also develop. - The firm in need of specialized transport service can get them easily at cheaper rates. - Also many new marketing outlets and specialized marketing institutions develop. The firm need not spend on developing its own marketing outlets. - This reduces the cos

External Diseconomies

♦ The growth and expansion of an industry in a particular area beyond optimum level results in many disadvantages for firms in the industry.

♦ Such disadvantages increases the costs of production of each firm.

♦ Therefore, they are called **external diseconomies. Some of the external diseconomies are as follows :-**

Diseconomies of Scarcity of Inputs	- When an industry expands its need for raw materials, machines, tools and equipments, etc. also expands. - Some inputs are such which cannot be totally substituted. - The firms supplying these inputs come under pressure and may supply inputs at a higher price. - This raises the cost of production per unit of the firm who uses these inputs
Diseconomies of Strains on Infrastructure	- Due to concentration of firms in an area infrastructural facilities become inadequate over a time. - E.g. Excessive pressure on transport system results in delayed transportation of raw materials and finished goods. - Other facilities like electric power supply, communication system, water supply, etc. are also over taxed. - This puts strain on infrastructural facilities resulting in increased cost of production
Diseconomies of High Factor Prices	- With the concentration of an industry in a particular area, the demand for factors of production rises. Thus, the prices of the factors of production go up resulting in increased cost of production
Diseconomies of Expenditure on Advertising	- Expansion of an industry also means increase in the number of firms. - Likewise, some firms may get developed by processing the waste products of the industry. - Thus, wastes are converted into **by-products.** This reduces the cost of production in general

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PRODUCTION OPTIMISATION

Concept of Isoquants:

An iso-product curve or isoquant is a curve, which represents the various combinations of two variable inputs that give the same level of output. As all combinations on the iso-product curve give the same level of output, the producer becomes indifferent to these combinations. That is why iso-product curve are also called **'production indifference curve'** or **'equal product curve'.** To understand consider the following production isoquant schedule.

Schedule I				Schedule II			
Combinations	Units of CAPITAL	Units of LABOUR	Units of OUTPUT	Combinations	Units of CAPITAL	Units of LABOUR	Units of OUTPUT
A	1	12	100	F	2	15	200
B	2	8	100	G	3	11	200
C	3	5	100	H	4	8	200
D	4	3	100	I	5	6	200
E	5	2	100	J	6	5	200

In the schedule I above, the producer is indifferent whether he gets combination A, B, C, D or E. This is because all the combinations of capital and labour give the same level of output i.e. 100 units.

By plotting the above combinations on a graph, we can derive an iso-product curve as shown in the following figure:
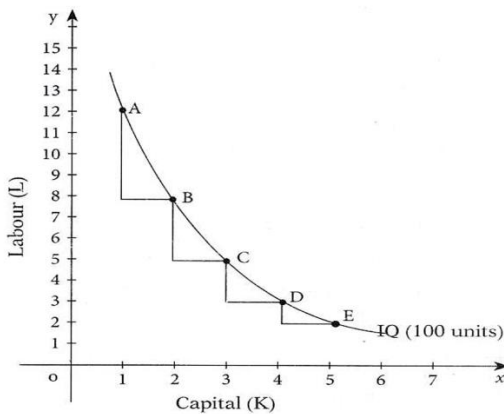
In the diagram, quantity of capital is measured on X-axis and quantity of labour on Y-axis.

The various combinations A, B, C, D, E of capital and labour are plotted and on joining them we derive an iso-product curve. All combinations lying on the iso-product curve yield the same level of output i.e. 100 units and hence technically equally efficient.

If the production schedule II is also plotted on the graph, we will get another iso-product curve IQ_{200}. This will lie above the IQ_{100} as the combinations contain greater quantities of capital and labour. A set of iso-product curves is called iso-product curve map.
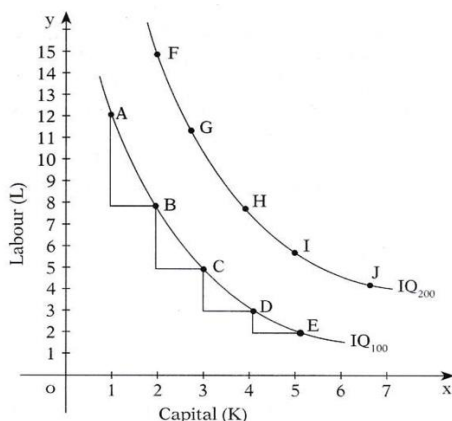
In the diagram, it can be observed that each iso-product curve is labelled in terms of output. All combinations lying of IQ_{100} give the output of 100 units and all the combinations lying on IQ_{200} give the output of 200 units. Higher iso-product curve represent higher level of output. Also it indicates how much more output can be achieved.

Marginal Rate of Technical Substitution

The rate at which one factor of production is substituted in place of the other factor without any change in the level of output is called as the marginal rate of technical substitution. Consider the following schedule.

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Combinations	Units of CAPITAL (K)	Units of LABOUR (L)	Marginal Rate of Technical substitution. MRTS= $\frac{\Delta L}{\Delta K}$	Units of OUTPUT
A	1	12	-	100
B	2	8	4L: IK	100
C	3	5	3L: IK	100
D	4	3	2L: IK	100
E	5	2	1L: IK	100

Each of the factor combinations in the table above yields same level of output. Moving from combination A to B, one unit of capital replaces 4 units of labour. Similarly, moving from B to C, one unit of capital now replaces only 3 units of labour and so on. It implies that labour and capital are imperfect substitutes. That is why MRTS$_{KL}$ is continuously diminishing. We can measure MRTS$_{KL}$ on an iso-product curve.

'Iso-Cost Line' OR 'Equal Cost Lines'

Iso-cost line (also known Equal Cost Line; Price Line; Outlay Line; Factor Price Line) shows the various combinations of two factor inputs which the firm can purchase with a given outlay (i.e. budget) and at given prices of two inputs.

Example. A firm has with itself Rs. 1,000 which it would like to spend on factor 'X' and factor 'Y'. Price of factor 'X' is Rs. 20 per unit.

Price of factor 'Y' is Rs. 10 per unit.

Therefore, if the firm spends the whole amount on factor X, it can buy 50 units of X and if the whole amount is spent on factor Y, it can buy 100 units of Y. However, in between these two extreme limits, it can have many combinations of X and Y for the outlay of Rs. 1,000. Graphically it can be shown as follows -
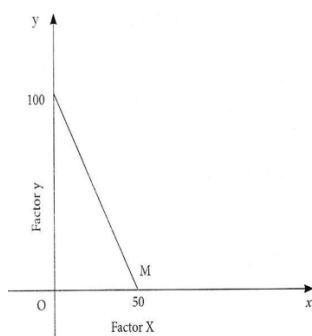
In the diagram OP shows 100 units of Y and OM shows 50 units of X. When we join the two points P and M, we get the iso-cost line. All the combinations of factor X and factor Y lying on iso-cost line can be purchased by the firm with an outlay of Rs. 1,000. If the firm increases the outlay to Rs. 2,000, the iso-cost line shifts to the right, if prices of two factors remains unchanged. The slope of the iso-cost line is equal to the ratio of the prices of two factors. Thus,

$$\text{Slope of line PM} = \frac{\text{Price of X}}{\text{Price of Y}}$$

Producer's Equilibrium OR Production Optimization.

A firm always try to produce a given level of output at minimum cost. For this it has to use that combination of inputs which minimizes the cost of production. This ensures maximization of profits and produce a given level of output with **least cost combination** of inputs. The least-cost combination of inputs or factors is called producer's equilibrium or production optimization. This is determined with the help of (a) isoquants, & (b) iso-cost line.

An **isoquant or iso-product curve** is a curve which shows the various combinations of two inputs that produce same level of output. The isoquants are negatively sloped and convex to origin. The slope of isoquants shows the marginal rate of technical substitution which diminishes. Thus, MRTS$_{xy}$

$$= \text{Slope} = \frac{\Delta y}{\Delta x} = \frac{MP_x}{MP_y}$$

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Iso-cost line shows the various combination of two factor inputs which the firm can purchase with a given outlay and at given prices of inputs. There can be different outlays and hence different iso-cost lines. Slope of iso-cost line shows the ratio of the price of two inputs i.e. $\frac{P_x}{P_y}$.
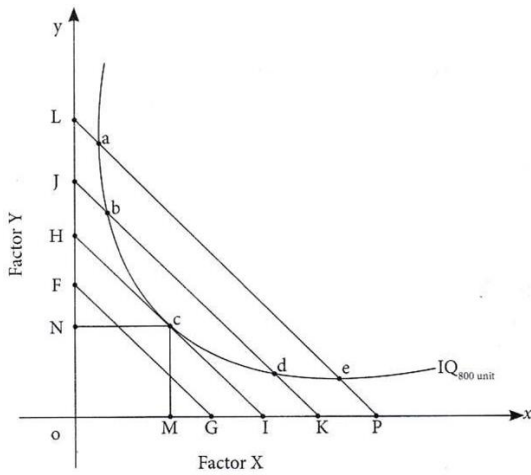
Which will be the least cost combination can be understood with the help of following figure. Suppose firm wants to produce 300 units of a commodity. It will first see the isoquant that represents 300 units.

In the adjoining diagram we find that all combinations a, b, c, d and e can produce 300 units of output. In order to produce 300 units firm with try to find out least cost combination. For this it will super impose the various iso-cost lines on isoquant as shown in the diagram. The diagram shows that combination 'C' is the least cost combination as here isoquant is tangent to iso-cost line **HI.** All other combinations a, b, d and e lying on isoquant cost more as these points lie on higher iso-cost lines. Hence, the point of tangency of isoquant and iso-cost line shows least cost combination. At the point of tangency.

Slope of iso-quant = Slope of iso-cost line

$\therefore \text{MRTS}_{xy} = \frac{P_x}{P_y}$

Thus, the firm will choose OM units of factor X and ON units of factor Y and be at equilibrium as the marginal physical products of two factors are proportional to the factor prices

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Chapter 3.2:- Theory of Cost

♦ In the production analysis we had considered quantitative relationship between inputs and outputs.

♦ In the **cost analysis** we are concerned with financial side of production i.e. the cost behaviour in relation to size of output, scale of operations, prices of factors of production, etc.

♦ Therefore, a businessman must have a clear understanding of various concepts of costs

Relevant Concepts of Cost

Accounting Costs and Economic Costs.	**Accounting costs** ▪ These are those cash payments which firms make to outsiders for purchasing or hiring the services of various productive factors which do not belong to the entrepreneur. ▪ The accounting costs are in the nature of **contractual payments** to the factor suppliers. **E.g.** - Contractual payments like wages, rent on hired land, interest on borrowed capital, cost of power and fuel, purchase of raw-materials, insurance premium, transportation, advertising, taxes, etc. ▪ These costs are recorded in firm's account book. ▪ **All these money expenses are also known as EXPLICIT COSTS or accounting costs** as they form part of the cost of production and accounted by the firm. **Economic Costs** ▪ Economists take a broader view of the cost concept. Economist's cost refer to what may be called **FULL COSTS** or **ECONOMIC COSTS.** **Economic Costs** = Explicit costs (or accounting costs) + Implicit costs (or imputed costs) ▪ Thus, economic cost is the sum total of accounting costs (also called explicit costs) and implicit cost (also called imputed costs or opportunity cost) ▪ Implicit costs are costs of self owned and self supplied resources by an entrepreneur which are generally **not recorded in the firm's account book.** There is **no contractual obligation for payment to any body else. E.g.-** An entrepreneur may utilise his own building or his own capital or may act as a manager of his firm himself. For these productive services, he does not pay rent or interest or salary to himself although the payments accrue to him. ▪ These are **implicit** or **imputed (estimated) costs** of various factors owned and supplied by the owner himself. When an entrepreneur invests capital in his business, devotes his time and skills in his business, he has to forego the opportunity of investing his, capital, time and skills elsewhere. ▪ Implicit costs involves the sacrifice of alternatives that have been foregone in the production of a commodity. Hence, implicit costs are also called "opportunity cost" and forms part of the economic costs. ▪ A firm earns **economic profits** or normal profit when it recovers both explicit costs as well as implicit costs. Thus, normal profit is a part of implicit cost. Profit earned over and above normal profit is called super normal profit.
Outlay Cost and Opportunity Cost	1. Outlay costs involve actual outlay of funds on wages, material, rent, interest etc. Outlay costs involve financial expenditure at some time and thus are recorded in the books of account. 2. Our wants are unlimited and resources are scarce but have alternative uses. Hence, the problem of choice among the alternative uses of a given resource for particular purpose arises.

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	3. This is because, the use of a resource in producing a commodity always involves the loss of opportunity of production of some other commodity.
	4. **The sacrifice or loss of alternative use of a given resource is termed as " opportunity cost."**
	5. Thus, the opportunity cost is measured in terms of the **foregone benefits** from the **next best alternative use** of a given resource.
	E.g.- The opportunity cost of producing a car is production of **10** scooters sacrificed, which could have been produced with the same amount of factors that make a car.
	6. Hence, **opportunity costs relate to sacrificed alternatives.** They are NOT RECORDED in the books of account.
	7. The concept of opportunity cost is useful in the determination of relative prices of goods, normal remuneration to a factor, in decision making and in analysing optimum allocation of resources.
Direct (or Traceable) Costs and Indirect (or Non-Traceable) Costs	*Direct Costs* A direct or traceable cost is one which can be identified easily and indisputably with a unit of operation, **E.g.-** a product, a department, a plant or a process. **E.g.-** In the production of shoes, the cost of leather is a direct cost. *Indirect Cost* • Indirect Costs or Non-Traceable Costs or Common Costs are those costs that are not traceable to plant, department and operation as well as those that are not traceable to individual final products but are charged to jobs or products in standard accounting practice. • Such costs although not directly traceable to the product may bear some functional relationship to production and may vary with output in some definite way. **E.g.-** ELECTRIC POWER. Such **common costs** which are incurred for general operation of business and benefits all products jointly are called **indirect cost.**
Incremental costs and Sunk Costs:	• Incremental costs are related to the concept of **marginal cost.** While marginal cost refer to additional cost of producing an extra unit of output, **incremental cost** refers to the total additional cost when business decisions are taken like-to expand the production, hire more workers, materials, machinery, equipment, replace old plant and machinery, etc. • **Sunk costs** refer to the costs which has been already incurred in the **past** and cannot be recovered. It also includes an expenditure that has to be made in future under past commitments or contractual agreements. Sunk costs are **irrelevant for decision making** as it cannot be recovered. **Sunk costs do not vary with the changes in business activity.** Such costs also act as an important barrier to entry of firms into business. **E.g.- expenses on advertising, R&D, special equipments, etc**
Historical costs and Replacement costs	**1. Historical costs** are those costs on purchase of assets in the past. **2. Replacement costs** refer to the expenditure to be made for replacing old assets. 3. Instability in asset prices make the two costs differ
Private costs and Social costs	1**. Private costs** are those costs which are incurred or provided for by firms. These may be either explicit or implicit since they form part of total cost of production, it implies they figure in business decisions. Therefore, private costs are **internalized cost.** **2. Social costs** refer to the total cost to the society due to business activity. Social costs include both **private cost and the external cost.** It includes resources for which the firm is

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	not required to pay the price like - atmosphere, rivers, lakes, roads, etc. and the cost in terms of disutility created like pollution of all types.

COST FUNCTION

♦ Cost function is the functional relation between COSTS and OUTPUT.

♦ The PRODUCTION FUNCTION of a firm and the PRICES it pays for the inputs determine the firm's cost function.

♦ Thus, cost function refers to the relation between COST OF A PRODUCT and the various DETERMINANTS OF ITS COST.

♦ It can also be expressed in the form of a mathematical equation in which unit cost or total cost is the dependent variable and the prices of various inputs are independent variables.

$$C = f (O,S,T,U,P\text{------})$$

Where –

C is cost

O is the level of output

S is the size of plant

T is time under consideration

P is the prices of factors of production

♦ Production function determines the cost function.

♦ Therefore, the behaviour of cost of production and the shapes of the cost curves depend upon the laws of returns.

♦ The LAW OF RETURNS TO FACTOR determine the shapes of short - period cost curves while the LAW OF RETURNS TO SCALE determine the shapes of long - period cost curves.

SHORT RUN TOTAL COSTS

♦ **TOTAL COST (in short run) = TOTAL FIXED COST + TOTAL VARIABLE COST**

Points	FIXED COST	VARIABLE COST
1. Meaning	- Fixed costs are incurred on the use of the fixed inputs. - Fixed inputs cannot be varied in the short run. - Therefore, fixed costs do not change with changes in output in short run. - Fixed costs are thus, INDEPENDENT of output. - These include both EXPLICIT COSTS and IMPLICIT COSTS.	- Variable costs are incurred on the use of the variable inputs. - Variable inputs can be varied in the short run. - Therefore, variable costs changes with the changes in output i.e. they increase or decrease when output rises or falls. - Variable costs thus, DEPEND on output.
2. Can Be Zero Or Not?	- Fixed cost can never be zero. - If the level of output falls to ZERO, fixed costs are to be incurred in the short run. - In other words, if firm closes down for sometime in short run but remains in business, these costs have to be borne by it	- Variable cost can become zero. - If the level of output falls to zero, variable costs also falls to zero. - In other words, if a firm shuts down for some time in short run, it will not incur any variable cost as it will not use variable factors of production.

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3. Examples	- E.g. Contractual rent, maintenance cost, property taxes, interest on capital invested, wages of permanent staff, depreciation, etc.	- E.g.- wages of labour employed, prices of raw materials, power and fuel, expenses on transport, etc.
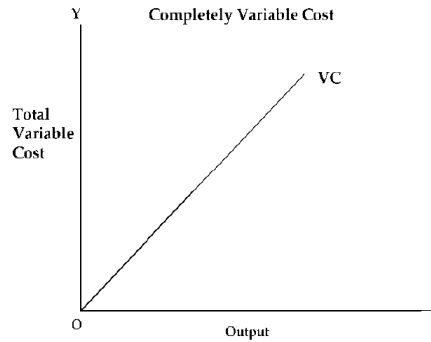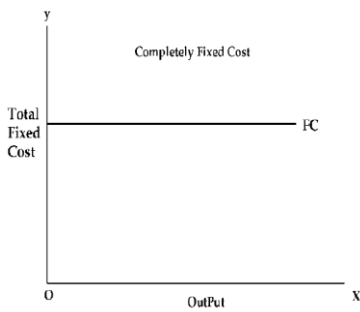
Concept of Semi Variable Cost
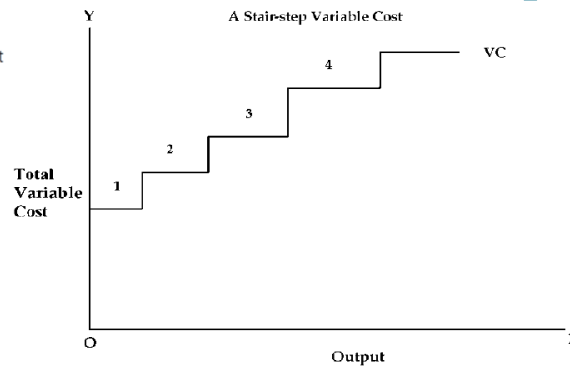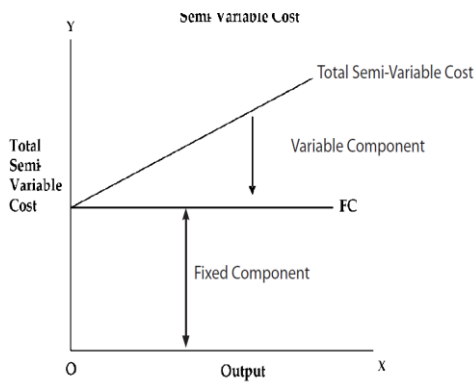
- There are some costs which are neither perfectly variable, nor absolutely fixed in relation to the changes in the size of output. They are known as semi-variable costs. Example: Electricity charges include both a fixed charge and a charge based on consumption.
- There are some costs which may increase in a stair-step fashion, i.e., they remain fixed over certain range of output; but suddenly jump to a new higher level when output goes beyond a given limit. E.g. Costs incurred towards the salary of foremen will have a sudden jump if another foreman is appointed when the output crosses a particular limit

Relationship between TFC, TVC and TC

Features of TFC Curve

➢ Graphically, the TFC curve is a horizontal straight line parallel to X- axis.
➢ It indicates that fixed cost remains unchanged at all levels. TFC curve originates from F on Y- axis indicating that fixed cost is to be borne even at zero level of output.
➢ Hence, at zero output TC is not zero. It equals TFC

Features of TVC Curve

➢ Graphically, the TVC curve is positively sloped. It indicates that variable cost increases with the increase in output.
➢ TVC curve originates from 0 i.e. origin indicating that Variable cost is zero at zero level of output.

Features of TC Curve

➢ TC reflect the behaviour of TVC. Hence, the shape of TC resembles TVC
➢ TC cost starts from Y axis because even when the output is Nil, TC is equal to TFC at that point

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➢ TC curve remains parallel to TVC Curve since their distance (TFC Curve) remains constant throughout
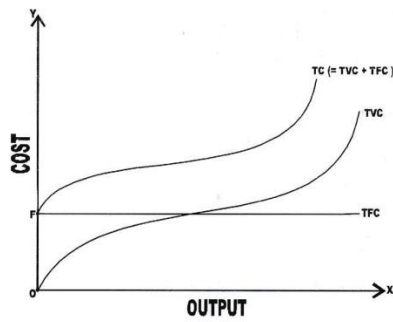
Short run average cost

♦ For the purpose of making decisions about operations, unit cost functions or average costs are more useful than the total cost functions.

♦ We examine here three of these unit cost functions namely -

1. Average Fixed Cost (AFC),

2. Average Variable Cost (AVC),

3. Average Total Cost (ATC).

1. Average Fixed Cost:

- Average Fixed Cost is the **fixed cost per unit of output.** Thus,

- Average Fixed Cost $= \frac{\text{Total Fixed Cost}}{\text{Total Output}}$

- OR AFC $= \frac{\text{TFC}}{\text{Q}}$

Table : Average Fixed Cost   Fig. : Average Fixed Cost Curve

Output (units)		TFC (Rs.)	AFC (Rs.)
0		60	-
1		60	60
2		60	30
3		60	20
4		60	15
5		60	12
6		60	10
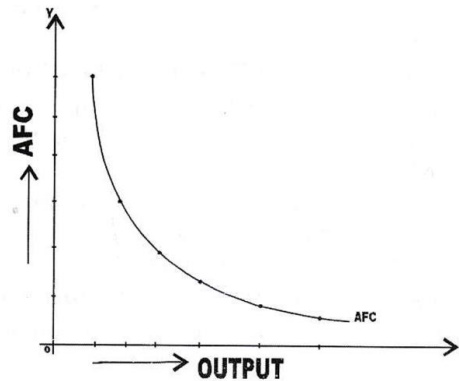
➢ The above table shows that as the output increases, *AFC goes on falling*. The reason being TFC is spread over larger quantities of output.
➢ When graphed, the AFC curve *slopes downwards from left to right* throughout its length.
➢ The AFC curve comes closer and closer to the X - axis but not touch the X-axis as TFC can never be zero.. AFC *curve will not touch Y-axis* also because at zero level of output, TFC is a POSITIVE VALUE. Any positive value divided by zero will provide infinite value
➢ The AFC curve is a *RECTANGULAR HYPERBOLA* because mathematically it shows the same level of TFC at all its points and geometrically the area of every rectangle on this curve at all points will be equal to the area of every other rectangle.

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2. <u>Average Variable Cost:</u>

- Average variable Cost is the **variable cost per unit of output.** Thus,

- Average variable Cost $= \frac{\text{Total variable Cost}}{\text{Total Output}}$

- OR AVC $= \frac{\text{TVC}}{\text{Q}}$

Table : Average Variable Cost   **Fig. : Average Variable Cost Curve**

Output (units)	TVC (Rs.)	AVC (Rs.)	
0	0	-	
1	40	40	
2	76	38	
3	102	34	
4	132	33	
5	170	34	
6	222	37	

➤ The above table shows that as the output expands, average variable cost falls initially due to increasing returns to the variable factor.
➤ It is minimum at the optimum capacity output.
➤ Beyond optimum capacity average variable cost rises very sharply due to diminishing returns to variable factor.

<u>Thus, AVC and AVERAGE PRODUCT of variable factor are inversely related.</u>

➤ When graphed, AVC curve declines over some range of output, reaches the minimum at optimum capacity, as at point 'M' in the above diagram and then goes on rising as output increases.
➤ Thus, *AVC curve is U-shaped indicating three phases decreasing phase, constant phase and increasing phase* corresponding to the three phases of AVERAGE PRODUCT of variable factor in the law of Variable Proportions.

3. <u>Average Total Cost: (Or Simply Average Cost):</u>

- Average Total Cost is the cost per unit of output. Thus,

- Average Total Cost or Average Cost $=\frac{\text{Total Cost}}{\text{Total Output}}$

- ATC or AC $= \frac{\text{TC}}{\text{Q}}$

- ATC or AC $= \frac{\text{TFC}}{\text{Q}} + \frac{\text{TVC}}{\text{Q}}$

- ATC or AC = AFC + AVC

Table : Average Total Cost   **Fig.: Average Total Cost Curve**

Output (units)	TC (Rs.)	ATC (Rs.)	
0	60	-	
1	100	100	
2	136	68	

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3	162	54	
4	192	48	
5	230	46	
6	282	47	
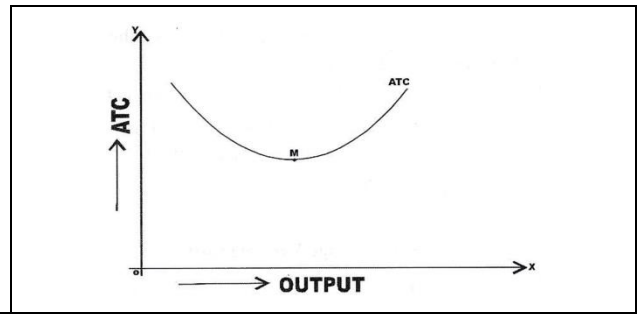
- The above table shows that as output increases, ATC falls initially, reach its minimum and then rises due to the Law of variable proportions.
- Since, ATC = AFC + AVC, it follows that the behaviour and shape of the ATC curve depends upon the behaviour of AVC curve and AFC curve.
- In the beginning, the ATC curve falls sharply when output expands. REASON being, initially both AVC and AFC curves fall.
- When AVC curve starts rising, but AFC curve continue to fall steeply, the ATC will continue to fall. REASON being, fall in AFC curve is MORE than the RISE in AVC curve.
- As output further increases, ATC curve rises. REASON being, there is sharp rise in AVC which offsets the, fall in AFC. Thus, ATC curve first fall, reach its minimum and then rise.

- *Therefore, ATC curve is TJ∵ shaped for the same reasons for which the AVC is a 'U' - shaped curve.*

4. Marginal Cost.

- Marginal Cost is addition to the total cost caused by producing one more unit of output.

- Thus, marginal cost is the cost of the additional unit of output.

- It is measured by the change in total cost resulting from a unit increase in output. Thus,

$MC_n = TC_n - TC_{n-1}$ Or $MC = \frac{\Delta TC}{\Delta Q}$ where, Δ — change

- E.g.- If 5 units are produced, total cost = Rs. 206 If 6 units are produced, total cost = Rs. 236 Marginal Cost of 6th unit of output = Rs. 30

- The Marginal Cost is INDEPENDENT OF FIXED COST. In the short period, total fixed cost are constant for all levels of output.

- The only change in total cost when output changes is CHANGE IN VARIABLE COST. **Hence, marginal cost is affected only by the variable cost.**

- Therefore, marginal cost can also be defined as a change in TVC as a result of a unit change in output. This can be proved as follows -

$MC_n = TC_n - TC_{n-1}$

since, TC = TFC + TVC

$MC_n = (TVC_n + TFC_n) - (TVC_{n-1} + TFC_{n-1})$

$= TVC_n + TFC_n - TVC_{n-1} + TFC_{n-1}$

$= TVC_n - TVC_{n-1}$

Table : Marginal Cost   **Fig. : Marginal Cost Curve**

Output (unit)	TFC (Rs.)	TVC (Rs.)	TC (Rs.)	MC (Rs.)
1	30	50	80	-
2	30	90	120	40

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3	30	120	150	30
4	30	170	200	50
5	30	250	280	80
6	30	360	390	110

- The above table shows that as the output increases, MC initially falls due to increasing returns to factor but finally MC rises due to diminishing returns to factor. **Thus, marginal cost is the inverse of the marginal product of the variable factor.**

- When graphed, the MC curve first declines, reaches minimum and then goes on rising as output increases.

- Thus, MC curve is U - shaped, this is due to the operation of the law of returns to factor and due to TC or TVC (AC or AVC).

- *MC curve passes through the minimum points of AVC and ATC curves*

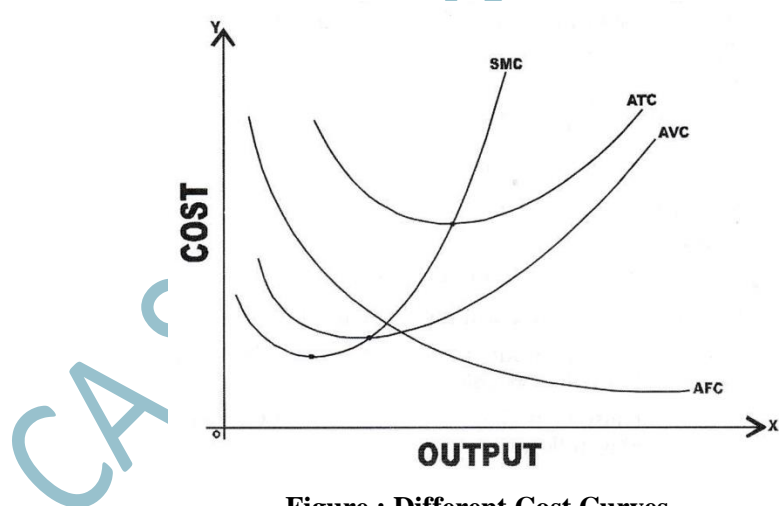- *MC curve reaches its minimum point earlier to the minimum points of AVC and ATC curves.*

Figure : Different Cost Curves

<u>Relationship between Average Cost and Marginal Cost</u>.

♦ Average Total Cost or Average Cost is the Cost per unit of output. Thus,

.Average Total Cost $= \frac{\text{Total Cost}}{\text{Total Output}}$

or $\quad AC = \frac{TC}{Q}$

E.g.- Suppose the total cost of producing 5 units of a commodity is Rs. 230, then average cost will be $\frac{\text{Rs.230}}{\text{5 units}} =$ Rs. 46

♦ Marginal Cost is addition to the total cost caused by producing one more unit of output. Thus, marginal cost is the cost of the additional unit of output. Symbolically,

$MC_n = TC_n - TC_{n-1}$

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E.g.- The total cost of producing 5 units is Rs. 206 and that of 6 units is Rs. 236. Then, marginal Cost of producing one more unit = Rs. 236 - Rs. 206 = Rs. 30.

♦ The relationship between Average Total Cost and Marginal Cost can be illustrated with the help of following table and graph.

Table : Relationship between Average Cost and Marginal Cost

Output (unit)	TC (Rs.)	ATC (Rs.)	MC (Rs.)	
1	10	10.00	10	
2	19	9.50	9	
3	27	9.00	8	
4	35	8.75	8	
5	44	8.80	9	
6	54	9.00	10	
7	65	9.28	11	
8	77	9.62	12	

♦ Both the table and diagram above bring out the relationship between average cost and marginal cost clearly as follows :-

1. Both AC and MC are derived from total cost of production. They are derived from the same source

$$\text{Average Cost} = \frac{\text{Total Cost}}{\text{Total Output}}$$

$$\text{Marginal Cost} = \frac{\text{Change in Total Cost}}{\text{Change in units of Output}}$$

2. When average cost falls with increase in output, marginal cost also falls and is less than average cost.

- It means that marginal cost falls faster.
- Thus, when AC curve is falling, MC curve will be below AC curve.
- MC curve reaches minimum point 'C earlier then AC curve.
- Then, MC curve start rising from point 'C to point T' even when the AC curve is falling

3. The MC curve cuts the AC curve at its minimum point. 'P' in the diagram.

- It is the minimum point on AC curve i.e. point of optimum capacity where the average cost is minimum.
- Points 'A' and 'B' on the AC curve shows higher average cost due to under and over utilization of plant capacity at respective points.
- At point 'P' where the MC curve cuts the AC curve i.e. at point of optimum capacity, MC = AC.

4. When AC rises, with increase in output, MC also rises and is higher than AC. It means that MC rises faster.

- Thus, when AC curve is rising, MC curve will be above the AC curve.

5. - Between AC and MC, it is MC which brings about changes (i.e. rise or fall) in AC and not other way round.

Thus -

(a) When MC < AC, it pulls down AC and AC falls,

(b) When MC = AC, AC is constant and at its minimum, and

(c) When MC > AC, it pulls up AC and AC rises.

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Remember:-

The concept of MC is more significant in finding out equilibrium output while that of AC in finding profit and loss *(Discussed in detail in next Chapter)*
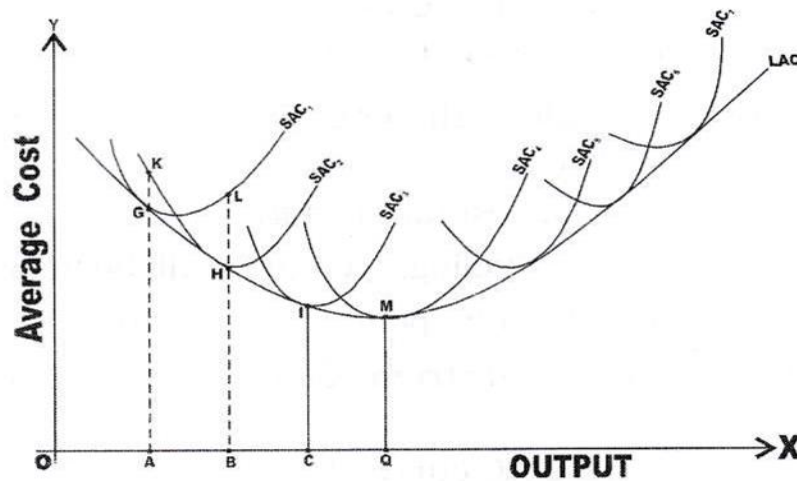
LONG RUN AVERAGE COST CURVE :

♦ Long run is a period of time during which the firm can vary all inputs. In short run we have seen that, some inputs are fixed and others can be varied to increase the level of output. But in long run all inputs are variable.

♦ In the short run, the size of the plant is fixed. The size of plant cannot be increased or reduced. However, in the long run the firm has sufficient time to bring about changes in the size of plant (i.e. machinery building etc.) in order to expand or contract output.

♦ *<u>Thus, in the long run the firm moves from one plant to another. It can increase the size of plant to increase its output or can have smaller plant if it has to reduce output.</u>*

♦ The long run average cost curve shows the minimum possible average cost for producing various levels of output.

♦ Consider the following figure -

Figure : Long Run Average Cost Curve

How is LAC Derived

- In the **fig.,** a smooth long run average cost curve has been shown which has been labelled as LAC.
- The LAC curve envelopes infinite short run average cost curves each representing a plant. Hence, SACs are also called **plant curves.**
- In the fig., the LAC curve is derived as a tangent to all the short run average cost curve from SAC, to SAC_7. Thus, it is U- shaped.
- In the long run, a firm can produce a particular output by building a relevant size of plant and operate on the corresponding SAC.
- It selects that size of plant i.e. SAC which gives the lowest cost of producing the given output.

Explanation to the above graph

- ✓ In the **fig.,** seven short run average cost curves SAC,, to SAC_7 corresponding to seven different plants are drawn.
- ✓ In the fig., if the firm wants to produce OA level of output, it will operate on SAC, at a cost of AG per unit.
- ✓ If the firm produce OA level of output with SAC, it will cost AK per unit to produce which is more.
- ✓ Similarly, if the firm wants to produce OB level of output with SAC, it will cost more i.e. BL per unit.
- ✓ So the firm to produce OB output will have to increase the size of plant and operate with SAC, where the cost per unit is less i.e. BH per unit.
- ✓ **Thus, larger outputs can be economically produced i.e. at lowest cost with the bigger plants and small output can be economically produced i.e. at lowest cost with smaller plants.**
- ✓ In the **fig.,** OQ is the **optimum output** as it is being produced at the minimum point of LAC and corresponding SAC i.e. SAC_4. Thus, the long run average cost is minimum at output   OQ.
- ✓ If the firm is producing less than optimum output OQ, the other plants are underutilized than their full capacity.

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✓ If the firm is producing more than optimum output OQ, the other plants are overutilized than their full capacity.

Remember

1) *LAC curve is not tangent to the minimum points of the SAC curves.*
   - ➢ When LAC curve is sloping downwards, it is tangent to falling portions of SACs.
   - ➢ When LAC curve is rising upwards, it is tangent to rising portions of SACs.

2) *LAC curve is also called planning curve.*
   Thus is because firm plans output in the long run but operates in the short run i.e. by choosing a plant on LAC corresponding to the given output. Thus, LAC helps the firm to make choice about the size of plant for producing a particular output at minimum cost.

3) *LAC Curve is also called Envelope Curve*
   The long-run average cost curve is also called "Envelope curve", because it envelopes or supports a family of short run average cost curves from below.

Why Long Run Average Cost Curve is of U-shape ?

The shape of LAC curve depends on the Law of Returns to Scale.

- ➢ As the firm expands, there is increasing returns to scale which means fall in long run average cost due to economies of scale.
- ➢ When decreasing returns to scale occur it means rise in long run average cost due to diseconomies of scale.

Modern Day Long run Cost Curves

- ▪ The above figure depicting long-run average cost curve is arrived at on the basis of traditional economic analysis. It is flattened 'U' shaped. *This type of curve could exist only when the state of technology remains constant.*
- ▪ But, empirical evidence shows modern firms face **'L-shaped'** cost curve over a considerable quantity of output.
- ▪ The L-shaped long run cost curve implies that initially when the output is increased due to increase in the size of plant (and associated variable factors), per unit cost falls rapidly due to economies of scale.
- ▪ The long-run average cost curve does not increase even after a sufficiently large scale of output as it continues to enjoy economies of scale.