

Unit III – Theory of Production

1. Meaning of Production

Production is the process of transforming inputs (resources) into outputs (goods or services) that satisfy human wants. It is one of the most important economic activities because it creates utility and adds value to raw materials.

Definition “Production is the creation of goods and services by combining the factors of production”—Land, Labour, Capital, and Entrepreneurship.

Factors of Production

Land - Natural resources such as land, water, minerals, and forests

Labour - Human effort—physical and mental work used in production

Capital - Man-made assets such as machines, tools, buildings, and equipment

Entrepreneurship - Organizes the other factors and bears business risk

Example: Bakery Production

Bakery Example Explanation: Flour, labour, machines, and electricity are the inputs. The bakery combines them through the production process to produce bread, which is the output.

2. Production Function

Meaning - A Production Function is the technical relationship between the quantity of inputs and the maximum possible output produced during a given period with available technology.

Definition - A production function expresses how much output can be produced from different combinations of labour and capital.

Formula

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

Where:

- Q = Quantity of Output
- L = Labour
- K = Capital
- f = Functional relationship

Simple Interpretation - If labour and capital increase, output generally increases. However, after a certain point, output increases at a slower rate.

Example: Bread Production

Labour (Workers)	Bread Produced (Loaves)
1	20
2	45

3	75
4	95
5	105

Explanation

- Adding the 2nd worker increases production significantly.
- The 3rd worker contributes even more.
- After the 4th and 5th workers, production still rises but at a slower rate due to limited space and machinery.

The concept of production

Any human initiative that creates a good for use can be called production. It requires four factors as inputs, namely, land, labour, entrepreneurship, and capital to complete the initial phase of production. The end product or goods are known as **outputs in economics**.

Production can result in output in the form of goods and services. Goods are products we can view and touch with our hands such as mobiles, shirts, rice, utensils, etc. while we cannot see services but can feel their use or presence. Teaching, medical services, transportation, etc., are forms of various services.

Three Types of Production Processes

Production processes can be classified into three types, which are the following:

Primary Production

Primary production processes tap or harness natural resources. It is related to obtaining natural resources in the form of raw materials.

Examples of primary production include cultivation, mining, fishing, etc.

Secondary Production

This type of production converts primary resources, such as raw materials into finished goods.

Examples include the production of railroads, houses, automobiles, shirts, and furniture. In this type of production, the raw material goes through extraction and manufacturing.

Tertiary Production

This type of production concept is related to the services.

Examples of tertiary production include servicemen like teachers, doctors, soldiers, police, hairdressers, etc.

The production concept refers to the production of goods at a mass scale so that the producers can create demand for their products in the markets. This concept was pretty applicable in the twentieth century.

However, in the twenty-first century, most companies have robust production and distribution channels and therefore companies cannot beat their competitors depending on the concept of production alone.

Production Function

- It refers to the relationship between the quantities of output of production and the input or factors of production.
- It explains the amount of output that can be produced according to the quantity of input.
- Four main factors of production exist: land, labour, capital, and entrepreneurship.
- There are two types of factors of production: Fixed factors and Variable factors.
- Fixed factors refer to those aspects of production that remain the same regardless of changes in the output.
- Variable factors are those that may change as output changes.
- The formula for production function is $Q = f(K, L)$, where Q is the output, f refers to function, K is the capital and L stands for labour.
- There are two kinds of production functions: Long Run and Short Run Production Function.

Short Run and Long Run Production Functions

The **short-run production** function refers to a period where at least one input is fixed, limiting the ability to adjust production levels.

The **long-run production function** represents a period where all inputs can be adjusted, allowing for greater flexibility in production choices.

Criteria	Short-Run Production Function	Long-Run Production Function
Definition	Represents the relationship between inputs and outputs when at least one input is fixed	Represents the relationship between inputs and outputs when all inputs can be varied
Time Horizon	Refers to a relatively fixed time period, where some inputs are fixed and cannot be adjusted	Refers to a more flexible time period, allowing for adjustments to all inputs
Fixed Inputs	Involves at least one fixed input, typically capital or physical resources	Does not have any fixed inputs; all inputs are variable
Variable Inputs	Includes the variable inputs that can be adjusted in the short run, such as labour or raw materials	Considers the flexibility to adjust all inputs, including labour, capital, raw materials, technology, etc.
Production Flexibility	Limited flexibility to adjust production levels due to fixed inputs	Higher flexibility to adjust production levels by varying all inputs
Output Change	Change in output is achieved by altering the variable input, while the fixed input remains constant	Change in output is achieved by adjusting multiple inputs simultaneously
Time to Adjust Inputs	Short-run adjustments are relatively quick and can occur within the fixed time frame	Long-run adjustments allow for sufficient time to vary all inputs effectively

Efficiency Consideration	Short-run production may not achieve optimal efficiency due to fixed input constraints	Long-run production allows for the possibility of achieving optimal efficiency
Planning Horizon	Short-run decisions focus on immediate adjustments to production levels	Long-run decisions involve strategic planning for long-term growth and efficiency
Economies of Scale	Limited potential for achieving economies of scale due to fixed inputs	Greater potential for realizing economies of scale by adjusting all inputs optimally
Cost Analysis	Short-run cost analysis includes both fixed costs and variable costs	Long-run cost analysis considers all costs as variable, including fixed costs
Business Decision-Making	Short-run decisions involve tactical adjustments to manage current production constraints	Long-run decisions involve strategic considerations for expanding capacity and optimizing resources
Examples	Renting factory space with fixed square footage, hiring a fixed number of workers	Building a new factory, expanding production capacity, introducing new technology

The Law of Variable Proportions

The **Law of Variable Proportions** states that as the quantity of a factor is increased while keeping other factors constant, the Total Product (TP) first rises at an incremental rate, then at a decremental rate and lastly the total production begins to fall. In other words, as one of the factors in production makes some variation in its quantity, keeping all the other factors constant, the ratio between all the factors starts varying, which further influence the level of output.

Assumptions of Law of Variable Proportion

Law of variable proportion holds good under certain circumstances, which will be discussed in the following lines.

1. **Constant state of Technology:** It is assumed that the state of technology will be constant and with improvements in the technology, the production will improve.
2. **Variable Factor Proportions:** This assumes that factors of production are variable. The law is not valid, if factors of production are fixed.
3. **Homogeneous factor units:** This assumes that all the units produced are identical in quality, quantity and price. In other words, the units are homogeneous in nature.
4. **Short Run:** This assumes that this law is applicable for those systems that are operating for a short term, where it is not possible to alter all factor inputs.

Stages of Law of Variable Proportion

The Law of Variable proportions has three stages, which are discussed below.

1. **First Stage or Stage of Increasing returns:** In this stage, the total product increases at an increasing rate. This happens because the efficiency of the fixed factors increases with addition of variable inputs to the product.
2. **Second Stage or Stage of Diminishing Returns:** In this stage, the total product increases at a diminishing rate until it reaches the maximum point. The marginal and average product are positive but diminishing gradually.

Third Stage or Stage of Negative Returns: In this stage, the total product declines and the marginal product becomes negative.

Laws of Returns to Scale

The laws of returns to scale refer to an increase in output due to an increase in all factors in the same proportion. Such an increase is called returns to scale. $P = f(L, K)$

There are three types of returns to scale-

1. Increasing returns to scale refers to the situation when output increases at a higher rate than the increase in inputs.
2. Diminishing returns to scale refers to the situation when output increases at a lower rate than the increase in inputs.
3. Constant returns to scale refers to the situation when output increases at a rate equal to the increase in inputs.

Difference between the Law of Variable Proportions and Returns to Scale

The Law of Variable Proportions applies to the short run, where one factor of production is variable and others are fixed. Returns to Scale applies to the long run, where all factors of production are changed in the same proportion.

Basis	Law of Variable Proportions	Returns to Scale
Meaning	Studies the effect of changing one variable input while keeping other inputs fixed	Studies the effect of changing all inputs in the same proportion
Time Period	Short run	Long run
Factors of Production	One factor is variable; others are fixed	All factors are variable
Input Change	Only labour or one input changes	Labour, capital, land, etc. change together
Scale of Production	Scale remains constant	Scale of production expands
Output Result	Output may increase, then diminish, and finally fall	Output may increase more, equally, or less than the increase in inputs
Main Concept	Efficient use of a fixed factor	Expansion of the firm's size
Example	Adding more workers to 5 sewing machines	Increasing workers and sewing machines together

Economies of Scale

Definition: Economies of Scale refer to the reduction in the average cost of production as the scale of production increases in the long run.

When a firm produces goods on a larger scale, it enjoys several advantages such as specialization, bulk purchasing, modern technology, and efficient management. These advantages reduce the cost per unit of output.

Types of Economies of Scale

Economies of Scale are classified into two major categories:

1. Internal Economies of Scale
2. External Economies of Scale

A. Internal Economies of Scale

1. Technical Economies

Technical economies arise from the use of advanced machinery and improved production techniques.

Explanation: Large firms can afford modern automated machines, which increase production speed and reduce labour cost.

Example: A biscuit manufacturing company installs computerized packing machines, reducing packaging cost and increasing output.

2. Managerial Economies

Managerial economies arise because large firms appoint specialized managers for different departments.

Explanation: Instead of one person handling everything, separate managers supervise production, finance, marketing, and human resources.

Example: A cement company appoints individual managers for quality control, production, and sales, improving efficiency.

3. Financial Economies

Large firms enjoy better access to finance.

Explanation: Banks and financial institutions offer loans at lower interest rates to financially strong companies.

Example: A large automobile company receives a loan at 8% interest, whereas a small firm pays 12%.

4. Marketing Economies

Large-scale firms reduce selling and advertising costs per unit.

Explanation: Advertising expenses are distributed over millions of products, reducing the cost per unit.

Example: A soft drink company advertises nationally, but the advertisement cost per bottle becomes very low.

5. Purchasing Economies

Large firms purchase raw materials in bulk and receive trade discounts.

Example: A paper mill buying 100 tonnes of pulp receives a lower price than a small manufacturer buying 5 tonnes.

6. Risk-Bearing Economies

Large firms diversify their products and markets, reducing business risk.

Example: A company producing soaps, shampoos, and detergents can survive even if demand for one product declines.

B. External Economies of Scale

External economies arise outside the firm and benefit all firms in the industry.

1. Economies of Localization

When many firms of the same industry operate in one place, they share common facilities.

Example: Tiruppur textile cluster provides common dyeing units, transport facilities, and suppliers.

2. Transport Economies

Improved roads, ports, and railway facilities reduce transportation costs.

Example: Industrial estates located near highways reduce delivery expenses.

3. Skilled Labour Economies

Educational institutions and training centres supply skilled workers to industries.

Example: Engineering colleges provide trained employees to automobile industries.

4. Research Economies

Government and research institutions develop new technologies that benefit all firms.

Example: Agricultural research improves seed quality for food-processing industries.

Diseconomies of Scale

Definition: Diseconomies of Scale refer to the increase in the average cost of production when a firm expands beyond its optimum size.

When production becomes excessively large, coordination problems, communication delays, and administrative inefficiency increase production costs. Example: A retail chain expands from 20 stores to 300 stores. Managing employees, inventory, and customer service becomes difficult. As a result, operational costs rise and average cost increases.

Causes of Diseconomies of Scale

A. Internal Diseconomies

1. Managerial Inefficiency

Large organizations become difficult to supervise.

Example: Factory managers cannot effectively monitor thousands of workers.

2. Communication Problems

Information passes through many administrative levels, causing delays.

Example: A production issue takes several days to reach top management.

3. Coordination Difficulties

Different departments fail to coordinate effectively.

Example: The marketing department receives insufficient stock due to poor communication with production.

4. Employee Dissatisfaction

Workers may feel ignored in large organizations, reducing motivation and productivity.

5. Bureaucracy

Too many rules and approvals slow down decision-making.

Example: Purchasing a small machine requires approval from multiple departments.

B. External Diseconomies

1. Shortage of Raw Materials

Rapid industrial growth increases demand and raises raw material prices.

2. Labour Scarcity

Industries compete for skilled workers, increasing wages.

3. Traffic Congestion

Industrial clusters experience transport delays and higher logistics costs.

4. Environmental Regulations

Large industries incur additional expenses to control pollution and comply with legal requirements.

Difference between Isoquants and Iso-Cost Lines

Basis	Isoquant	Iso-Cost Line
Meaning	Shows combinations of factors producing the same output	Shows combinations of factors having the same total cost
Main focus	Production	Cost
Represents	Equal level of output	Equal level of expenditure
Factors	Usually labour and capital	Usually labour and capital
Example	Different combinations producing 100 units	Different combinations costing ₹1,000
Purpose	Helps to study efficient production combinations	Helps to study the firm's budget and factor expenditure
Slope	Shows the rate at which one factor can replace another while maintaining the same output	Shows the rate at which one factor can be substituted for another while maintaining the same total cost
Shape	Usually downward sloping and convex to the origin	Usually a straight downward-sloping line
Key concept	Same output	Same cost