

# PRODUCTION PROCESS

# OVERVIEW OF 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.

# TYPES OF PRODUCTION FUNCTION

- Short Run Production Function and Long Run Production Function are two types of production function.
- Short run production function is the relationship between the specific variable input and quantity of output.
- In the short run production function, only one factor is variable, while others remain fixed.
- Long run production function explains the relationship between all inputs and the quantity of output.
- In the long run production function, all factors of production, or inputs are variable.

# TOTAL PRODUCT, MARGINAL PRODUCT, AVERAGE PRODUCT

- Total Product refers to the total amount of goods and services produced in a given period of time within a given input.
- Marginal Product is the quantity of total goods and services when an additional unit of the variable factor is used.
- Average Product refers to the total product per unit of variable factors or input.

- **The Two Laws of Production are as follows:**
- 1. Law of variable proportions
- 2. Law of return to scale

# 1. Law of Variable Proportions

- The law of variable proportion is considered an important principle in economics. This is known as the law that states that when the quantity of a factor of production increases while holding all other factors constant, there will be a fall in the marginal product of that factor.

The law of variable proportion is also known as the law of proportionality. When the variable factor is exceeded, it can lead to a negative value of the marginal product.

The law of variable proportion can be understood as follows.

- When the variable factor increases keeping all other factors constant, the total product will initially increase at an increasing rate, then it will increase at a decreasing rate, and
- finally, the rate of production will decrease.

# Assumption of the law of variable

The law of variable proportions is fulfilled in certain circumstances, which will be discussed in the following lines.

**1. Continuous State of Technology:** It is believed that the state of technology will remain stable and production will improve with the improvement of technology.

**2. Relationship of variable factors:** it is assumed that the factors of production are variable. If the means of production are fixed, then the law is invalid.

**3. Homogeneous factorial units:** All units produced are assumed to be equal in quality, quantity, and price. In other words, the units are homogeneous.

**4. Short run:** This assumes that this law is applicable for systems that operate in the short run, where it is not possible to change all factor inputs.

## Steps of the Law of Variable Proportions

The law of variable proportions has three steps, discussed below.

1. The first stage or stage of increasing returns: In this stage, the total product increases at an increasing rate. This is because adding variable inputs to output increases the efficiency of the fixed factors.

2. The second stage or stage of diminishing returns: In this stage, the total product increases at a decreasing rate until reaching a maximum point. Marginal and average products are positive but gradually decrease.

3. Third stage or stage of negative returns: In this stage the total product decreases and the marginal product becomes negative.

- Law of Variable Proportion is regarded as an important theory in Economics. It is referred to as the law which states that when the quantity of one factor of production is increased, while keeping all other factors constant, it will result in the decline of the marginal product of that factor.
- Law of variable proportion is also known as the Law of Proportionality. When the variable factor becomes more, it can lead to negative value of the marginal product.
- The law of variable proportion can be understood in the following way.
- When variable factor is increased while keeping all other factors constant, the total product will increase initially at an increasing rate, next it will be increasing at a diminishing rate and eventually there will be decline in the rate of production.



# ASSUMPTIONS OF LAW OF 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.
  3. **Third Stage or Stage of Negative Returns:** In this stage, the total product declines and the marginal product becomes negative.

# TABLE OF VARIABLE PROPORTION

Table 1.

Units of Land	Units of Labour	Total Production	Average Production	Marginal Production
10 Acres	0	-	-	-
"	1	20	20	20
"	2	50	25	30
"	3	90	30	40
"	4	120	30	30
"	5	140	28	20
"	6	150	25	10
"	7	150	21.3	0
"	8	140	17.5	-10

} 1st stage  
 } MP > AP  
 } AP = MP  
 } 2nd stage  
 } MP=0 and TP Maximum  
 } 3rd stage MP < 0

Total Product	Marginal Product	Average Product
<p><b>Stage I</b> First increases at increasing rate then at diminishing rate.</p>	<p>Increases in the beginning then reaches a maximum and begins to decrease.</p>	<p>First increases, continues to increase and becomes maximum.</p>
<p><b>Stage II</b> Continues to increase at diminishing rate and becomes maximum.</p>	<p>Continues to diminish and becomes equal to zero.</p>	<p>Becomes equal to MP and then begins to diminish.</p>
<p><b>Stage III</b> Diminishes</p>	<p>Becomes negative.</p>	<p>Continues to diminish but will always be greater than zero.</p>

# LAWS OF RETURNS TO SCALE

- Changes in output when all factors change in the same proportion are referred to as the law of return to scale. This law applies only in the long run when no factor is fixed, and all factors are increased in the same proportion to boost production.
- **There are three stages in all.**
- Increasing the scale's return
- Constant scale returns
- Decrease in Returns on the scale

Unit of Labour	Unit of capital	% in crease in labour and capital	Total production	% in crease in TP	Stages
1	3	–	10	–	increasing
2	6	100%	30	200%	
3	9	50%	60	100%	
4	12	33%	80	33%	constant
5	15	25%	100	25%	
6	18	20%	110	10%	diminishing
7	21	16.6%	120	8.3%	

# INCREASING RETURNS TO SCALE

- It describes a condition in which all of the factors of production are raised, resulting in a higher rate of output. For example, if inputs are raised by 10%, the output will be increased by 20%.
- **Reasons**
- Due to the economy of scale
- Specialisation through better division of labour

# Constant returns to scale

- It describes a condition in which all of the factors of production are increased at the same time, resulting in a steady growth in output. For example, if inputs are raised by 10%, the output is also increased by 10%.
- **Reasons**
- As the firm's production grows, it reaches a point where all of the economy's resources have been fully utilised, and output equals input.



- Cost analysis is all about the study of the behavior of cost with respect to various production criteria like the scale of operations, prices of the factors of production, size of output, etc. It is all about the financial aspects of production.

# Diminishing returns to scale

- When all of the production factors are increased simultaneously, output grows at a slower rate. For example, if inputs are raised by 10%, the output will be increased by 5%.
- **Reasons**
- The major cause of diminishing returns to scale is large-scale economies, diseconomies of scale occur when a company has grown to such a size that it is difficult to manage
- Lack of coordination

# Difference between variable factor and fixed factor

- Variable factors can be modified in the short run, whereas fixed factors cannot be changed in the short run
- Variable factors fluctuate immediately with output, whereas fixed factors do not vary directly with output
- Variable factors include raw materials, casual labour, power, and fuel, whereas fixed factors include expenses related to buildings, plant and machinery, components, etc

- In the short run, the output can be modified by altering only variable factors, whereas, in the long run, the output may be changed by changing all production factors. In the long run, all factors are changeable. However, the production factors are increased simultaneously. Demand is active in price determination in the short run since supply cannot be raised quickly with a rise in demand. However, in the long run, both demand and supply play equal roles in the determination of price because both may be increased.