The law of variable proportions is explained with the help of following table.

No. of workers	*Total product**	*Marginal product**	*Average product**
1	10	10	10
2	30	20	15
3	60	30	20
4	88	28	44
5	100	12	50
6	110	10	55
7	118	8	16.85
8	118	0	14.75
9	110	–8	12.22
10	100	–10	10

*Products (in kg)

With a given fixed quantity of land, numbers of workers are increased from 1 to 10. When there are 7 workers engaged, the output is maximum, i.e., 118 kgs. Beyond this point, the total product starts diminishing. Up to 3rd unit of worker, the total product increases at an increasing rate and after that at diminishing rate. This is clear from the third (MP) column that marginal product is falling continuously after 3rd unit of worker and even becomes negative beyond 8th unit of worker. Average product increases up to 4th unit of labour and falls through out thereafter. The law can be also explained using Fig. 6.1 shown as under:

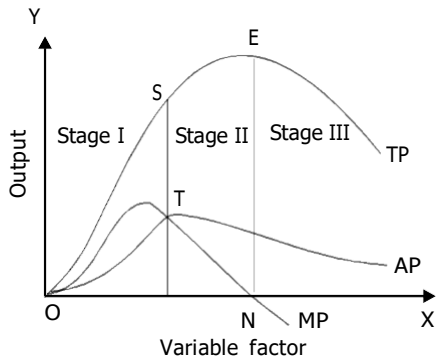

Fig. 6.1

In this figure, OX axis measures units of variable factor and OY axis measures output-total, marginal and average products. We observe three different stages of law of variable proportions as explained below:

1. The **first stage** goes from the origin to point where the average output is the maximum (point S). In this stage, marginal product increases. This stage is known as the stage of increasing returns. The reason for increasing returns is that when more and more units of the variable factor are added to the constant quantity of fixed factor, then fixed

factor is more effectively and intensively used. This causes output to increase at a fast rate.

2. The **second stage** goes from the point where the average output is maximum to the point where marginal output is zero (point N). In this stage, marginal product starts falling. When the fixed factor is most efficiently used, then further increase in the variable factor causes marginal and average products to decline because the fixed factor now is scarce relative to the quantity of variable factor. Therefore, this stage is known as the stage of diminishing returns.
3. The **third stage** starts when the total product is maximum and marginal product is zero. In this stage, marginal product becomes negative. In this stage, the number of variable factors becomes too large relative to the fixed factor so that the total output falls and marginal output becomes negative. This is the reason why this stage is known as the stage of negative returns.

Returns to Scale

Scale of production relates to size of plant. Every entrepreneur has to decide about the size of his plant or business. The question is how large a business should be. Because up to a certain size of plant what is called 'economies of scale' take place. Economies refers to benefits arise due to the expansion of a business. Economies of scale can be broadly divided into two categories-internal and external. Internal economies are caused by some internal factors, which arise within the firm and are not shared by other firms. Use of better technology, purchase of raw materials at cheaper rates and selling the final goods at high price, easy availability of finance from financial institutions etc, are some examples of internal economies/benefits that a firm enjoys. External economies are those advantages which are available to all firms located in an area. Development of transportation, good and fast communication, good banking and insurance facilities, etc are the examples of external economies. Too big or too small size of plant or business is not viable in the economic sense. Optimum scale, which at least covers up cost per unit of output, is more desirable than too small or too large plant.

The study of changes in output as a result of changes (increase or decrease) in the scale is the subject matter of returns to scale. An increase/decrease in the scale refers to increase/ decrease in all inputs in the same proportion. Thus in returns to scale we study the effect of doubling or trebling and so on of all inputs on the total output. The law can be explained with the help of a table shown below :

Scale	*TP*	*MP*	*Stage*
1 lab + 2 units of land	3	3	
2 lab + 4 units of land	7	4	I
3 lab + 6 units of land	12	5	
4 lab + 8 units of land	18	6	II
5 lab + 10 units of land	24	6	
6 lab + 12 units of land	30	6	

Contd....

7 lab + 14 units of land	35	5	
8 lab + 16 units of land	39	4	III
9 lab + 18 units of land	42	3	

Thus we find three phases of returns to scale explained as under. Up to 4th labour, marginal product or returns increases. Returns are constant over the 5th and 6th units of labour and thereafter, returns begin to decline.

Stage I: Output increases in a greater proportion than the increase in inputs. Thus if all inputs are increased by 10%, and as result output increases by 20%, then increasing returns to scale operates. This is also shown in the Fig. 6.2 below. In the beginning when the scale is increased, increased division of labour is possible and is undertaken, as result of which, output increases rapidly.

Stage II: If all inputs are increased in a given proportion and the output increases in the same proportion then returns to scale is constant. More clearly, if all inputs are increased by 10%, and as result output also increases by 10%, then constant returns to scale prevails. Up to a certain point division of labour is possible. After such a point, further increase in scale will make returns to remain constant.

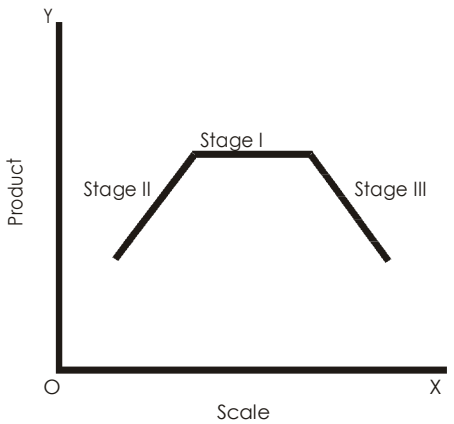

Fig. 6.2

Stage III: If all inputs are increased in a given proportion and the output increases in less than that proportion then returns to scale is diminishing. That is, if all inputs are increased by 10%, and as result output also increases by 6%, then diminishing returns to scale prevails. When scale is increased to a point when division of labour is not possible, returns begins to decline.

Questions for Review

1. What are returns to scale?
2. Give two reasons for the operation of the law of increasing returns to scale.
3. Distinguish between 'Returns to scale' and 'Returns to a variable factor.'
4. How can the scale of production be raised in the long run?

5. Define the following:
   (a) Production function
   (b) Returns to factor
   (c) Returns to scale
   (d) Marginal product

6. Explain the law of diminishing returns. Draw an imaginary production schedule to depict the operation of this law. How can the law be kept in check?

7. Why do diminishing returns to a factor operate?

8. Complete the following table:

Units of capital	*Total product*	*Average product*	*Marginal product*
1			20
2			16
3			12
4			8
5			4
6			0
7			–4

9. List any three inputs used in production.

10. What is meant by total physical product?

11. What is the general shape of the MPP?

12. What is meant by marginal physical product?

13. Give the meaning of increasing returns to scale.

14. Give the meaning of constant returns to scale.

15. Give the meaning of decreasing returns to scale.

16. What is meant by law of variable proportions?

7 SUPPLY AND ITS DETERMINANTS

UNIT-3

MEANING OF SUPPLY

Supply refers to the amount of good offered for sale in the market at a given price. Supply should be distinguished from stock. Stock is the amount of good which can be brought into the market for sale at a short notice. Thus supply is the quantity actually brought in the market but stock is a potential supply. Let us substantiate with an example. A farmer produces 1000 kg of rice and at a particular price he is willing to offer for sale about 500 kg in the market. Here, the quantity offered for sale i.e., 500 kg is the supply whereas 1000 kg is the stock.

SUPPLY SCHEDULE

Supply schedule represents the relation between prices and the quantities of good supplied. It is a list of quantity supplied by producers at different prices. This is shown as under:

Price (in Rs.)	*Quantity supplied (in units)*
1	10
2	15
3	18
4	24
5	28
6	35

It is seen that when price is Re 1/-, quantity supplied is 10 units and as price increases, supply also increases. This shows that supply and price of the commodity are directly related.

SUPPLY CURVE

Supply curve is the graphical representation of the supply schedule. A supply curve is shown in the figure below.

In the Fig. 7.1, x-axis measures quantities of good supplied and y-axis measures price of the commodity. SS is the supply curve sloping upwards to the right, indicating that when price of the

commodity increases supply also increase. It should be noted here that if price of the product falls too much, producers refuse to supply any good. Thus the price below which the seller will refuse to sell is called the **reserve price**.

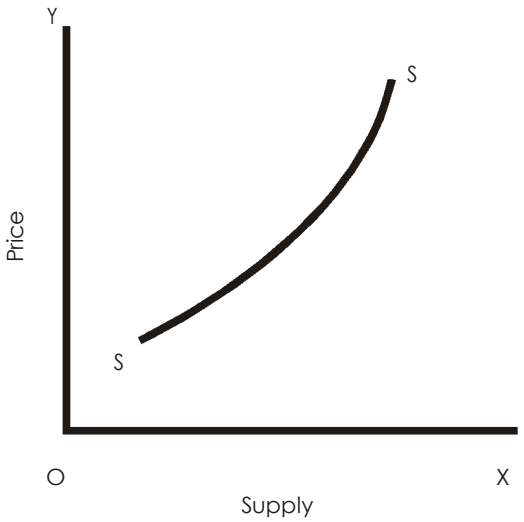

Fig. 7.1

MARKET SUPPLY

The total amount of goods supplied at various prices by all producers/sellers in a market is called market supply. A market supply schedule is shown as under. Let us assume that there are three sellers—A, B and C. Their individual supply schedule is shown in 2nd, 3rd and 4th columns respectively. Market supply is the sum of A's, B's and C's supply of a commodity. We find that the market supply schedule also behaves in the same way as an individual's supply of a commodity. That is, at higher price, supply is greater and vice versa.

Price (per unit)	*A's supply*	*B's supply*	*C's supply*	*Market supply (A + B + C)*
1	3	5	8	16
2	5	7	9	21
4	7	8	10	25
6	9	10	12	31
8	12	14	16	42
10	15	16	18	49

A market supply curve is the graphical representation of market supply and is derived by the lateral/horizontal summation of all individual sellers' supply curve in the market as shown in the Fig. 7.2.