LAW OF VARIABLE PROPORTIONS

Definition

"In a given state of technology, when the units of a variable factor of production (L) are increased with the units of other fixed factors, the marginal productivity increases up to a point, after this point, it will become less and less".

According to Samuelson

"An increase in some inputs relative to other fixed inputs will, in a given state of technology, cause output to increase, but after a point the extra output resulting from the same additions of extra inputs will become less and less"

According to professor Benham,

"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.

Assumptions

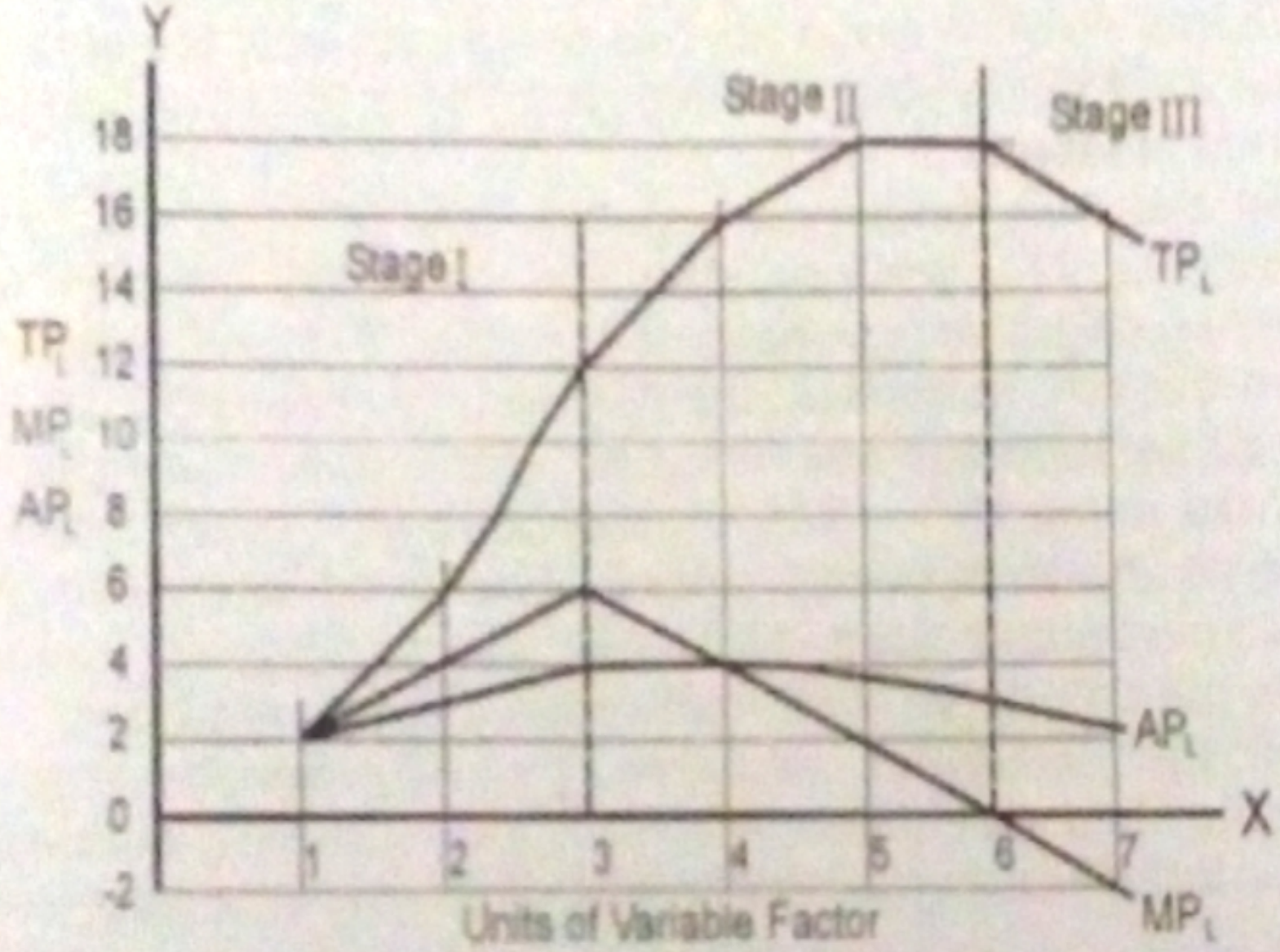
The assumptions of the law of variable proportions are given as below:

1. **Constant technology**
   It is assumed that the technique of production should remain constant during production.
2. **Short-run**:
   It operates in the short-run because in the long run, fixed inputs become variable.
3. **Some constant factors**:
   - Some factors of production are assumed to be constant.
4. **Varying proportions**::
   The various factors are not to be used in rigidly fixed proportions but the law is based upon the possibility of varying proportions. It is also called the law of proportionality.
5. **Homogeneous units**:
   It is assumed that all the units of variable factor of production are homogeneous in amount and quality.
6. **Single Variable Factor**
   It is assumed that labour is a single variable factor.
   This law is explained with the help of following schedule.

Units of variable factors (L)	Marginal Product. (MP_L)	Total product. (TP_L)	Average Product. (AP_L)	Stages.
1	2	2	2	I
2	4	6	3	
3	6	12	4	
4	4	16	4	II
5	2	18	3 6	
6	0	18	3	
7	-2	16	2 28	III

In the above schedule, units of variable factor (labour L) are employed with the other fixed factors of production. The marginal productivity of

labour goes on increasing up to the 3rd worker. This is so because the proportion of workers to other fixed factors was at first insufficient. After the 3rd worker the marginal productivity goes on falling onwards till it drops down to zero at the 6th unit of labour. The 7th worker is only a cause of obstruction to the others and is responsible in making the marginal productivity negative. The marginal productivity (MP_L) and the average productivity (AP_L) equalize at 4th worker. Then the MP_L falls more sharply.



The number of workers are measured on X-axis while TP_L, AP_L and MP_L on Y-axis. The diagram shows the three stages also obtained from the schedule.

STAGES

Stage I In this stage MP_L increases up to 3rd worker and its curve is higher than the average product, so that total product is increasing at increasing rate.

Stage II In this stage, MP_L decreases up to 6th unit of labour where MP_L curve intersects the X-axis. At 4th unit of labour $MP_L = AP_L$, after this MP_L curve is lower than the AP_L. The TP_L increases at decreasing rate.

Stage III After 6th unit of labour the MP_L becomes negative, the AP_L continues falling but remains positive. After the 6th unit, TP_L declines with the employment of more units of variable factor (L).

Relationship among Total, Average and Marginal Product

The relationship among total, average and marginal product of labour in the light of law of variable proportions is explained as under.

1. The marginal productivity of labour increases, the TP_L also increases at increasing rate. It is shown in the schedule up till 3rd unit of labour. The MP_L curve has positive slope and TP_L curve has rising tendency towards Y-axis.
2. When the MP_L decreases onwards till it drops to zero, the TP_L increases at decreasing rate as shown in the stage II and the TP_L curve has positive slope but has rising tendency towards X-axis.
3. When the MP_L is equal to zero, the TP_L is maximum as shown on the 6th unit of labour.
4. When the MP_L becomes negative, the MP_L curves falls below the X-axis, the TP_L declines from its maximum position and its slope becomes negative, as shown in the stage III in the diagram.
5. When the MP_L increases, the AP_L also increases but at slow rate. The MP_L curve becomes above the AP_L curve. Both have positive slopes.
6. At some point, $MP_L = AP_L$. At this point MP_L curve intersects the AP_L curve as shown at the 4th unit of labour in the above diagram.
7. After intersecting point, MP_L falls sharply. The MP_L curve becomes below the AP_L curve. Both curves have negative slope.
8. When MP_L becomes negative, the AP_L never becomes negative because it is calculated from the TP_L. So MP_L curve is below the X-axis but AP_L curve is above the X-axis, having negative slope.