

# LAW OF DIMINISHING RETURNS

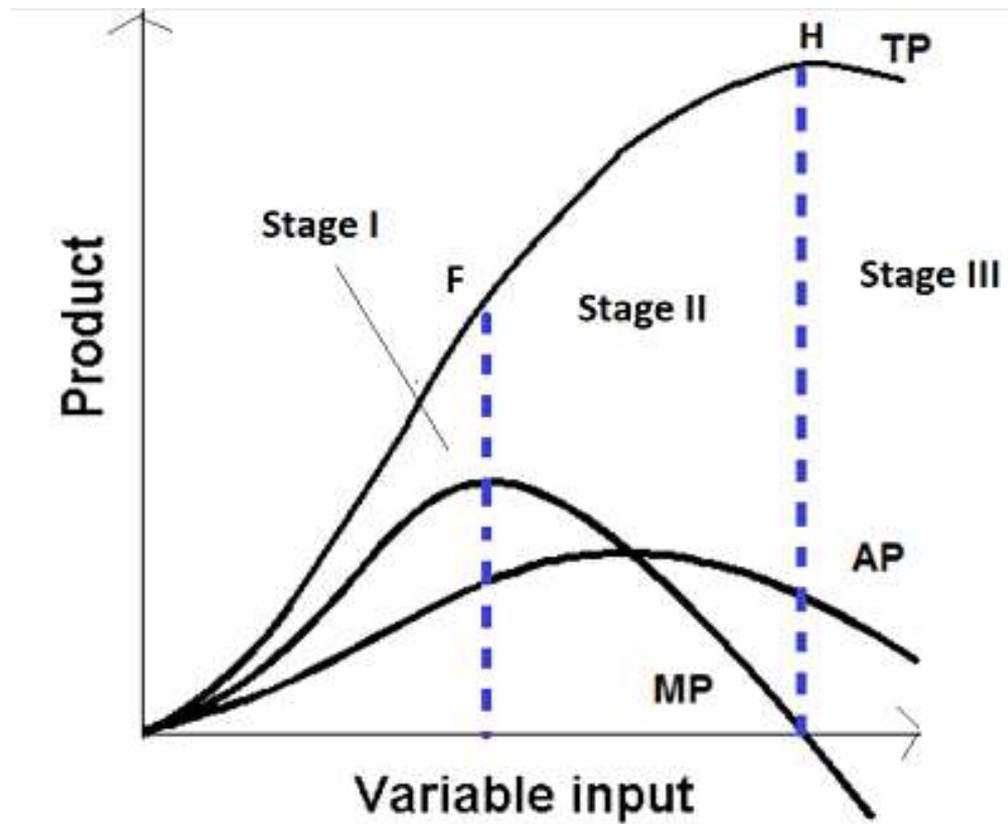
- The law of diminishing returns **operates** in the **short run** when we can't change all the factors of production.
- it studies the **change in output by varying the quantity of one input.**
- Technically, the law states that as we increase **the quantity of one input which is combined with other fixed inputs, the marginal physical productivity of the variable input must eventually decline.**
- In simpler words, the total productivity is bound to increase with an increase in the quantity of a variable input.
- However, as the quantity of the inputs keeps on increasing, **the marginal product rises to a maximum, then starts to decline and eventually becomes negative.**

# Assumptions

The law of diminishing returns comes with some **assumptions**:

- **The state of technology is to be a constant.** Because, A variable state of technology would impact the marginal and average product.
- **Only one input should be variable.** keeping other inputs constant.
- This law does not apply to cases **when all the inputs vary proportionately.**
- The law does not apply to a production scenario where we require **specifically fixed proportions of inputs.**
- **We consider only physical inputs and outputs** and not in monetary terms.

# Diagram



- **Application of the Law in Agriculture:**

In agriculture, nature dominates, so the law of diminishing returns applies quickly. In agriculture, more and more doses of labour and capital can be employed with the fixed factor (i.e. land) to produce more. Land being fixed cannot be increased or reduced as per the choice of the agriculturist. Thus as more and more variable factors are employed with the fixed factors, the marginal product falls and hence the law of diminishing returns apply.

We can divide the behavior of output when varying one input, keeping other inputs fixed in the short run, into three stages.

### **Stage I: Increasing Returns**

In this stage the total **output increasing** at an **increasing rate** with each additional unit of the variable input.

- We get increasing returns in the first stage because initially, the fixed factors are abundant relative to the variable factor.
- The introduction of additional units of the variable factor leads to the effective utilisation of the fixed factors. Thus, **production increases at an increasing rate.**

## Stage II: Diminishing Returns

- Throughout this stage the **total product increases at a diminishing rate**. This happens because the marginal product falls and becomes less than the average product, which also sees a downwards slope.
- Thus, this stage is known as the stage of diminishing returns. The end of this stage is marked by the total product attaining its maximum value and the marginal product becoming zero.
- After the addition of a certain amount of variable inputs which lead to the optimum and efficient utilisation of fixed input, the output starts diminishing.

## Stage III: Negative Returns

- The origin of stage 3 starts from the maximum point of the TP curve. In this stage, the **TP curve now starts to decline**. Moreover, the MP curve becomes negative coupled with a fall in the AP curve.
- The excessive addition of variable inputs leads to negative returns at this stage. This is because of the crowding of the variable factors.
- This brings us to the conclusion that a rational producer would operate in the second stage of production, where both average and marginal products tend to decline.

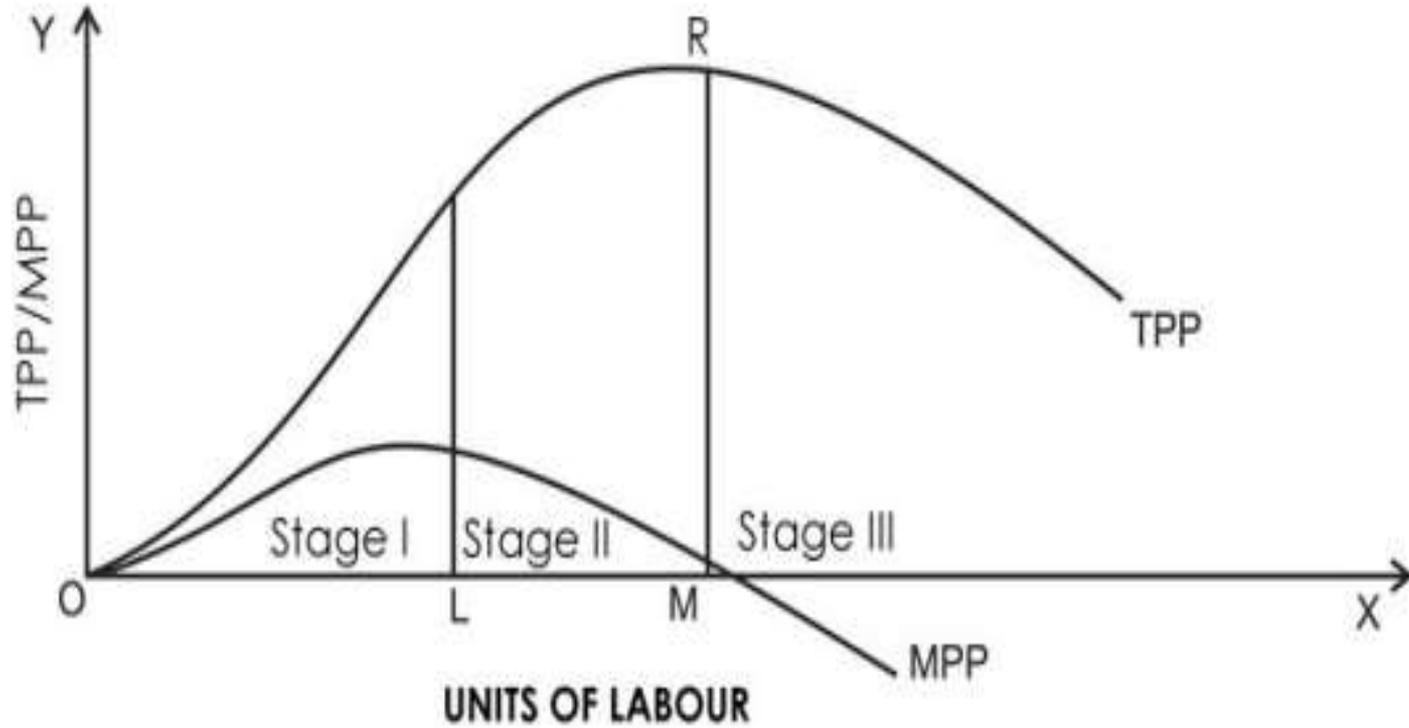
# The law of Variable proportions

- This law exhibits the short-run production functions in which one factor varies while the others are fixed.
- In other words, the law exhibits the relationship between the units of a variable factor and the amount of output in the short-term. This is assuming that all other factors are constant.
- The law states that keeping other factors constant, when you increase the variable factor, then the total product initially increases at an increasing rate, then increases at a diminishing rate, and eventually starts declining.
- Let's say if we have 10 acres of land and 1 unit of labour for production. Therefore, the land-labour ratio is 10:1. Now, if you keep the land constant but increase the units of labour to 2, the land-labour ratio becomes 5:1.

# SCHEDULE

Fixed Factor : Land (Acres)	Variable Factor: Land (Units)	TPP (Total Physical Product) (Quantity)	MPP (Marginal Physical Product) (Quantity)	
1	0	0	-	] Stage I
1	1	2	2	
1	2	6	4	
1	3	12	6	
1	4	16	4	] Stage II
1	5	18	2	
1	6	18	0	] Stage III
1	7	14	-4	
1	8	8	-6	

# Diagram



Production Functions

# III Stages of the law

- **Stage I** – The TPP increases at an increasing rate and the MPP increases too. The MPP increases with an increase in the units of the variable factor. Therefore, it is also called the stage of increasing returns. In this example, the Stage I of the law runs up to three units of labour (between the points O and L).
- **Stage II** – The TPP continues to increase but at a diminishing rate. However, the increase is positive. Further, the MPP decreases with an increase in the number of units of the variable factor. Hence, it is called the stage of diminishing returns. In this example, Stage II runs between four to six units of labour (between the points L and M). This stage reaches a point where TPP is maximum (18 in the above example) and MPP becomes zero (point R).
- **Stage III** – Now, the TPP starts declining, MPP decreases and becomes negative. Therefore, it is called the stage of negative returns. In this example, Stage III runs between seven to eight units of labour (from the point M onwards).