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Law
of
Diminishing
Return

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Law of Diminishing Return (LDR)

❖ This is a factor-product relationship.

❖ This relationship help the producer in deciding the solve the trap question "how much to produce".

❖ The Law of Diminishing Return is also known as the law of increasing cost, law of Variable Proportion, factor-product relationship, input-output relationship.

❖ It is concerned with resource use and resource use efficiency and also an important in the fixing price.

❖ Determination of most profitable level of input use.

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- Law of Diminishing return stated that when the amount of variable factor of production is increased and the amount of fixed factor is kept constant at a same specific level.

- The output first increase at increasing rate, increase at diminishing rate and constant and finally declines.

- The law explain how the product output with change when only one factor of production is varied.

- The discussion on factor product relationship confined to a single variable input and output.

$$Y=f(X1/X2,X3, ………Xn)$$
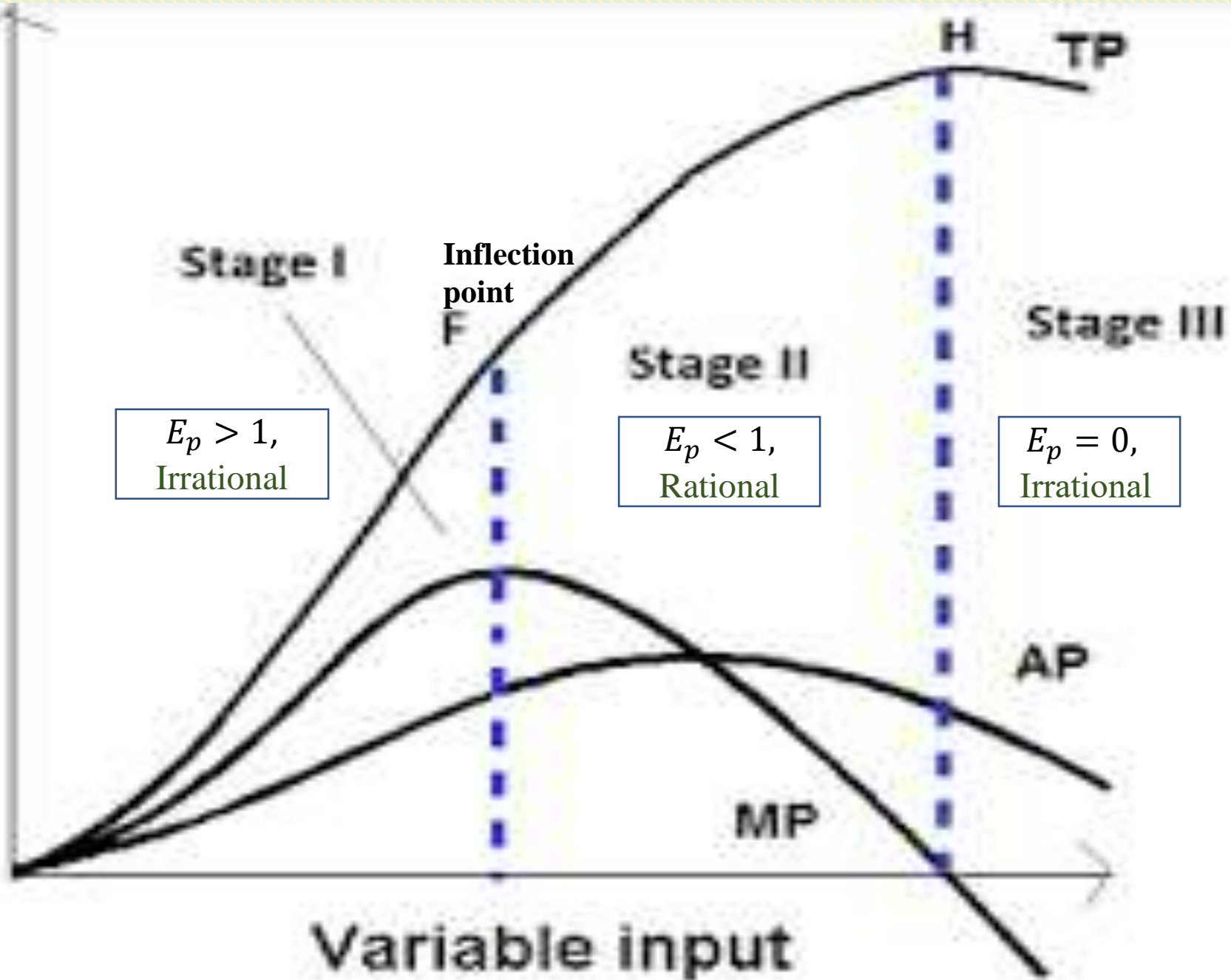
Analysis of Relationship

Total Product: It is the total amount of output obtained by using of different units of inputs measuring in physical unit like quintal, kgs. etc.

Average Product: It is the average amount of output produced by each corresponding unit of input.

$$AP = \frac{Y}{X}$$

Marginal Product: It is the additional quantity of output, added by an additional unit of input i.e., change in output as a result of change in the variable input.

$$MP = \frac{\Delta Y}{\Delta X}$$

Elasticity of Production: It is the percentage change in output as a result of percentage change in input.

$$Ep = \frac{\% \Delta Y}{\% \Delta X} \qquad \boxed{or \qquad E_p = \frac{MPP}{APP}}$$

Relationship between Total product (TP) and Marginal Product (MP)

a) When the total product (T. P.) is increasing, the marginal product will be positive,

b) When the total product remains constant, the marginal product will be zero, and

c) If the total product decreases, the marginal product will be negative.

d) MP move upward or increase, TP increase at increasing rate.

e) MP is remains constant, TP increase at constant rate.

f) MP start declining or slop downward, TP will be increasing at decreasing rate.

g) At the point MP become zero or MP curve intersect at X-axis the TP will be at maximum

Relationship between Marginal Product (MP) and Average Product (AP)

➤ When the MP keeps increasing or is moving upward right from the beginning the AP curve also keeps moving upward. It mean AP is increasing, the MP must be greater than the AP.

➤ When AP is decreasing, the MP always less than the AP.

➤ When Ap is equal to MP, this point AP will be at maximum.

❑ The relationship between average product and marginal products can be summarized as:

a)   When MP> AP, AP is increasing.

b)   When MP< AP, AP is decreasing.

c)   When MP= AP, AP is at a maximum

Determination of optimum level of input (MVP= MIC)

1. **Marginal Value Product (MVP) of Input:**

It is the additional income received from using an additional unit of input.

$$MVP = \frac{Chnage\ in\ the\ total\ value\ product\ (\Delta TR)}{Change\ in\ input\ level\ (\Delta X)} = \text{MPP} \times P_Q$$

2. **Marginal Input cost (MIC):**

It is the change in the total input cost by using an additional unit of input.

$$MIC = \frac{Chnage\ in\ the\ total\ value\ product\ (\Delta TC)}{Change\ in\ input\ level\ (\Delta X)} = \text{Price per unit of input}$$

Determination of optimum level of output (MC= MR)

1. Marginal Cost:

It is the additional cost incurred from producing an additional unit of output.

$$MVP = \frac{Chnage\ in\ total\ input\ cost(\Delta TC)}{Change\ in\ input\ physical\ product(\Delta Q)}$$

2. Marginal Revenue (MR):

It is the additional income obtained from producing one more unit of output.

$$MIC = \frac{Chnage\ in\ total\ income\ (\Delta TR)}{Change\ in\ input\ physical\ product(\Delta Q)}$$

Properties of TP, MP and AP under each of three stages:

Particular	TP	MP	AP
Stage-I	It increases first at increasing rate and then decreasing rate	It is also increase to maximum and then being to decrease.	It is also increase.
Stage-II	It continuous to increase at decreasing rate after reaching maximum, it being to decrease.	It continuous to decrease till it reaches zero	It increases to maximum and then being to decrease and continuous diminishing.
Stage-II	It continuous decreasing	It is negative	It continuous decrease.

Comparison of three stage of production

Stage-I	Stage-II	Stage-III
Start from origin and end at MPP=APP	Start at APP=Maximum and end at MPP=00	Start at MPP=0 or TPP maximum
Irrational	Rational	Irrational
TPP increase at increasing rate up to point of inflection	TPP increase at decreasing rate	TPP decrease at increasing rate
MPP>APP	MPP<APP	MPP<APP
$E_p > 1$	$E_p < 1$	$E_p = 0$
MR>MR	MR=MC	MR<MC
MVP>MIC	MVP=MIC	MVP<MIC
Fixed factor>Variable factor	Fixed factor=Variable factor	Fixed factor<Variable factor

THANK YOU