chapter12.
Production Economics

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chapter12.

Production Economics

1. Economics Basics
2. The Production Function
3. The Cost Function
4. Resource Substitution
5. Profit Maximization

Scarcity of Resources

- Resources are defined as inputs provided by nature that are transformed by human labor and technology to produce goods and services.

- Because resources themselves are scarce, many goods and services are also scarce -> choices must be made among alternative uses of those scarce resources.

- 1. Alternative uses in production
  2. Alternative uses in consumption
  3. Alternative uses regarding time

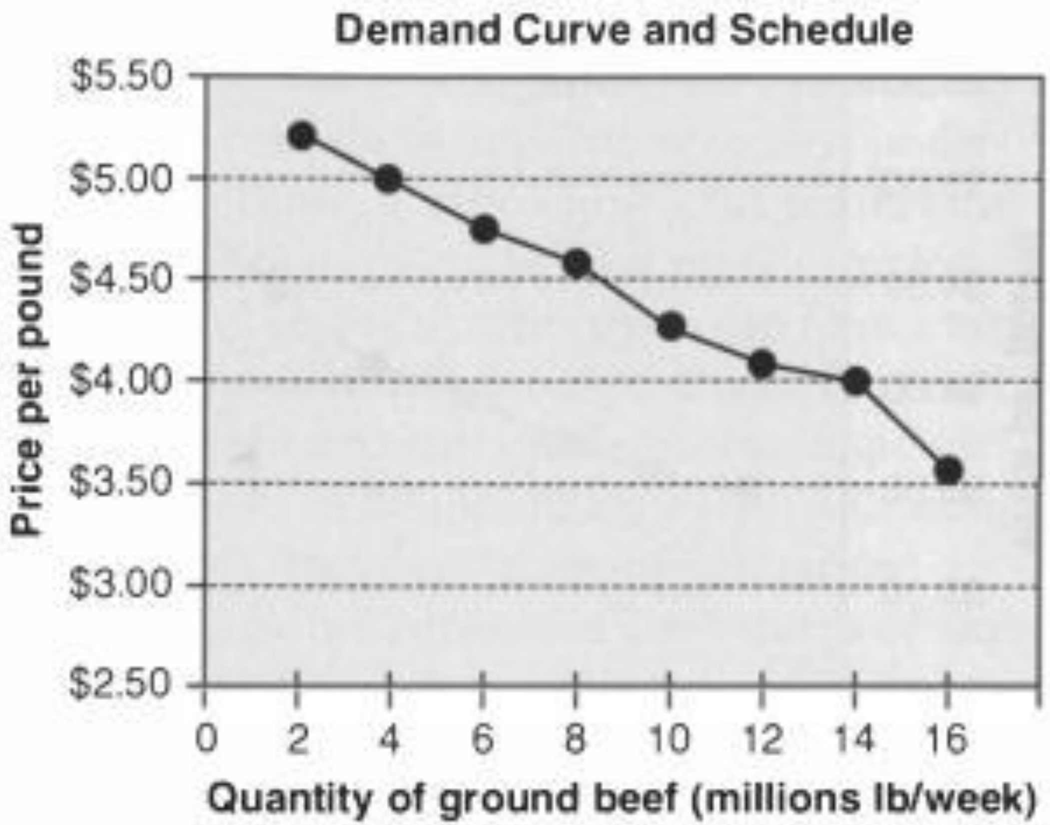
Basic Economic concepts

- Supply and Demand
- Opportunity cost
- Diminishing Returns
- Marginality
- Costs and Returns
- Externalities

Basic Economic concepts – Supply and Demand

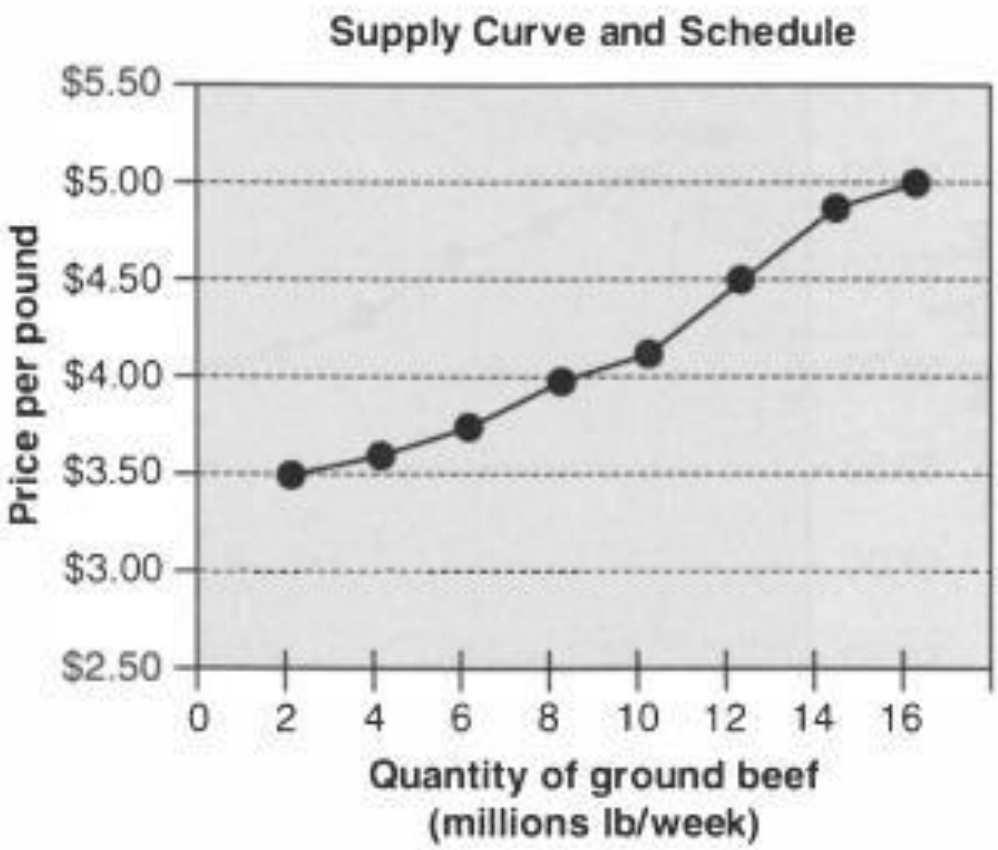
- Supply and demand work to determine price within economic markets
- A market can be defined as "the interaction between potential buyers and potential sellers of a good or service."

Basic Economic concepts – Supply and Demand



- Demand : the quantity of a good or service that buyers are willing to purchase at different price points
  - Demand itself refers to buyers' specific desires or intentions

Basic Economic concepts - Supply and Demand



- Supply : the quantity of a good or service that sellers are willing to offer, also at various price points

Supply can also be detailed through supply schedules and supply curves, both of which illustrate individual correlating points of quantity and price within the supply relationship

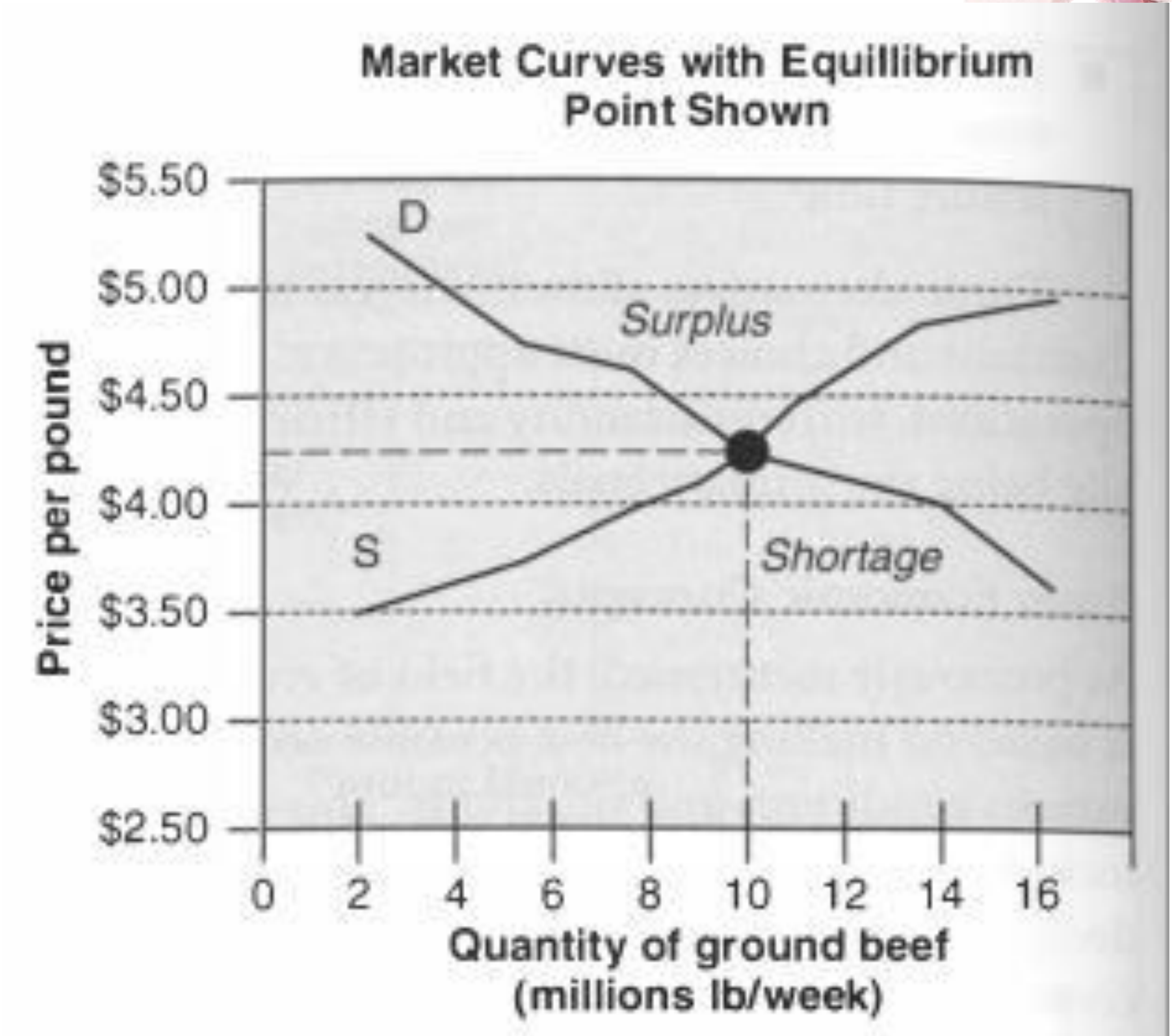
Basic Economic concepts - Supply and Demand

- Price determination : A perfectly competitive market is allowed to operate under no controls or regulation.

- the price will adjust to the point where quantity demanded equals quantity supplied – the equilibrium price

At the point of equilibrium, the amount supplied equals the amount demanded

Basic Economic concepts - Supply and Demand



Basic Economic concepts - Supply and Demand

- Elasticity: the price responsiveness of an item
- When supply of or demand for a good is very price responsive– elastic
- A large change in price will bring about a relatively small response in the quantity supplied or demanded

– inelastic

Basic Economic concepts - Opportunity cost

- A measure of how much of an earning opportunity is relinquished by using a resource in its current employment.

Basic Economic concepts - Diminishing Returns

- The added benefit received from each additional unit input will eventually begin to decline.
- When the benefits begin to decrease, you have reached the point of diminishing returns.

Basic Economic concepts - Marginality

- In economics, the margin is an additional or incremental unit of something.

Basic Economic concepts - costs and Returns

- Determining costs in a given situation is relatively straightforward.

- Determining the returns in the same situation can e a bit more complex.

Basic Economic concepts - Externalities

- Externalities must be considered, but generally cannot be captured or realized.

Factors of Production

- Land –the physical earth and its mineral deposits
- Labor –the services or physical energy provided by workers
- Capital –the machinery, equipment, buildings, inventories, and financial assets invested in production
- Management –the entrepreneurial and decision-making skills necessary for effective production

Inputs & Outputs

Inputs

- An input is a material or good used in creating a final product.

- Fixed inputs exist regardless of production

- Variable inputs are inputs over which the farm operator has control; they change according to the amount of production

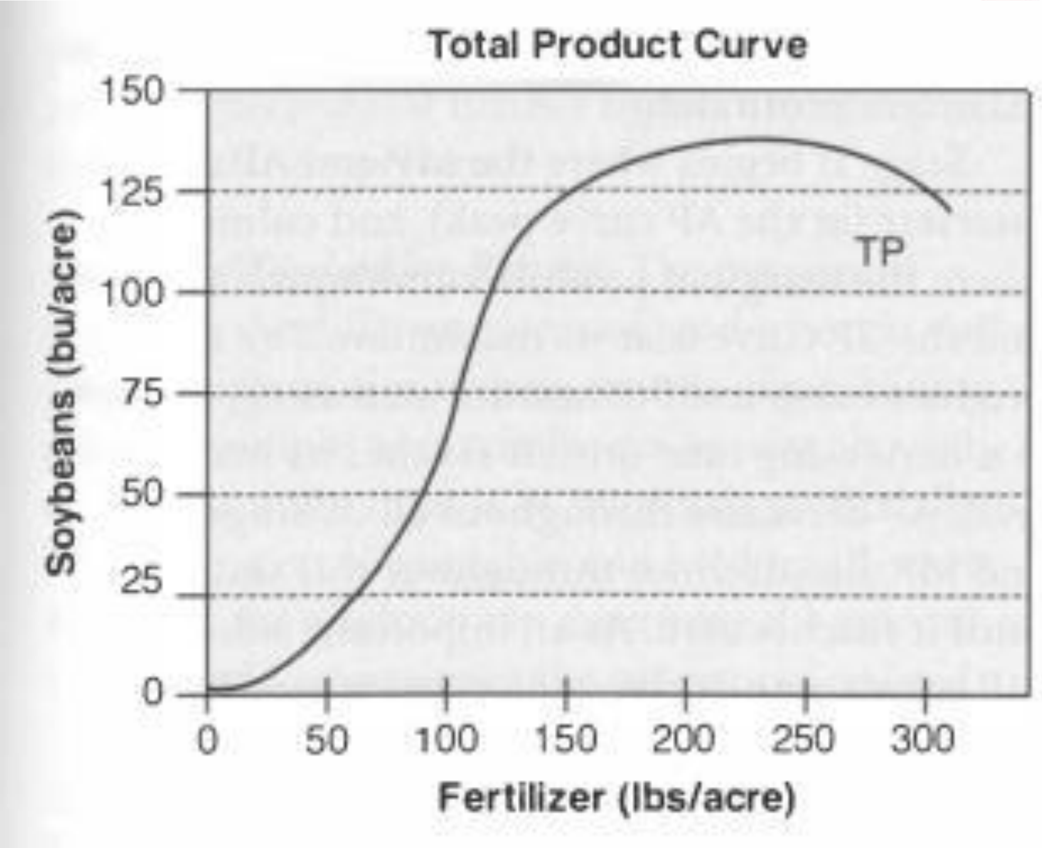
Outputs

- The output is the good or service produced

- To determine the cost of production, use the following generalized equation:

Fixed Costs + Variable Costs = Total Output Costs

Production Equations



- Total Product(TP) : the level of output produced within the production process corresponding to mount of the variable input added

Production Equations

- Average Product(AP) : the amount of output produced by each individual unit of the variable input in the production process

AP= TP/#input units

- Marginal Product(MP) : the added production associated with each unit increase in variable input

Production Equations

Other Production Equation

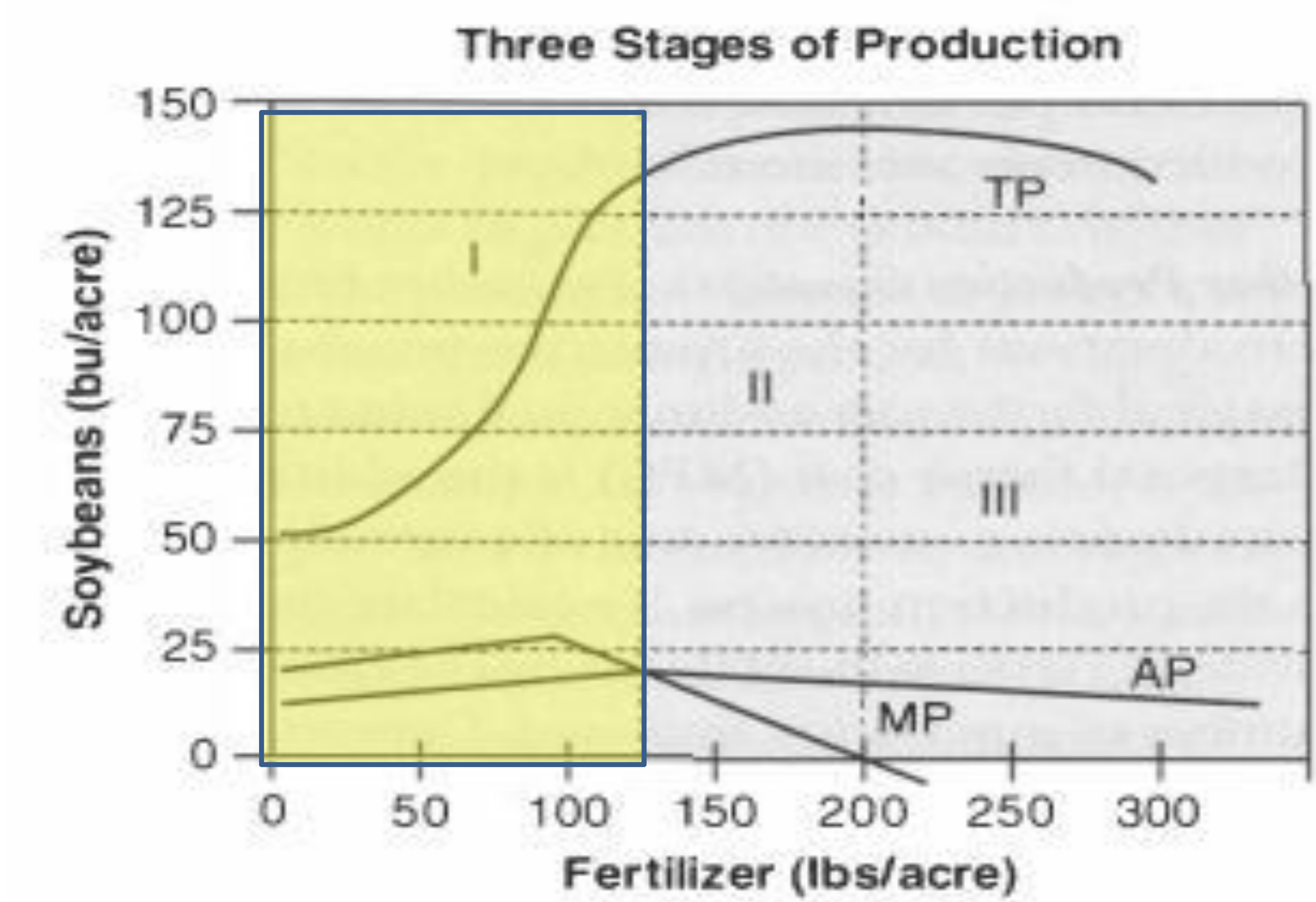
- Marginal factor cost(MFC) : the additional cost of adding one more unit of a variable input to the production process
- Marginal value product(MVP) : the change in total returns received through adding one more unit of input
- MFC = △TC / △#input units
- MVP = △total revenue / △#input units

Three Stages of Production

- Stage Ⅰ = Increasing marginal returns
- Stage Ⅱ = Decreasing marginal returns
- Stage Ⅲ = Negative marginal returns

Three Stages of Production

Stage Ⅰ



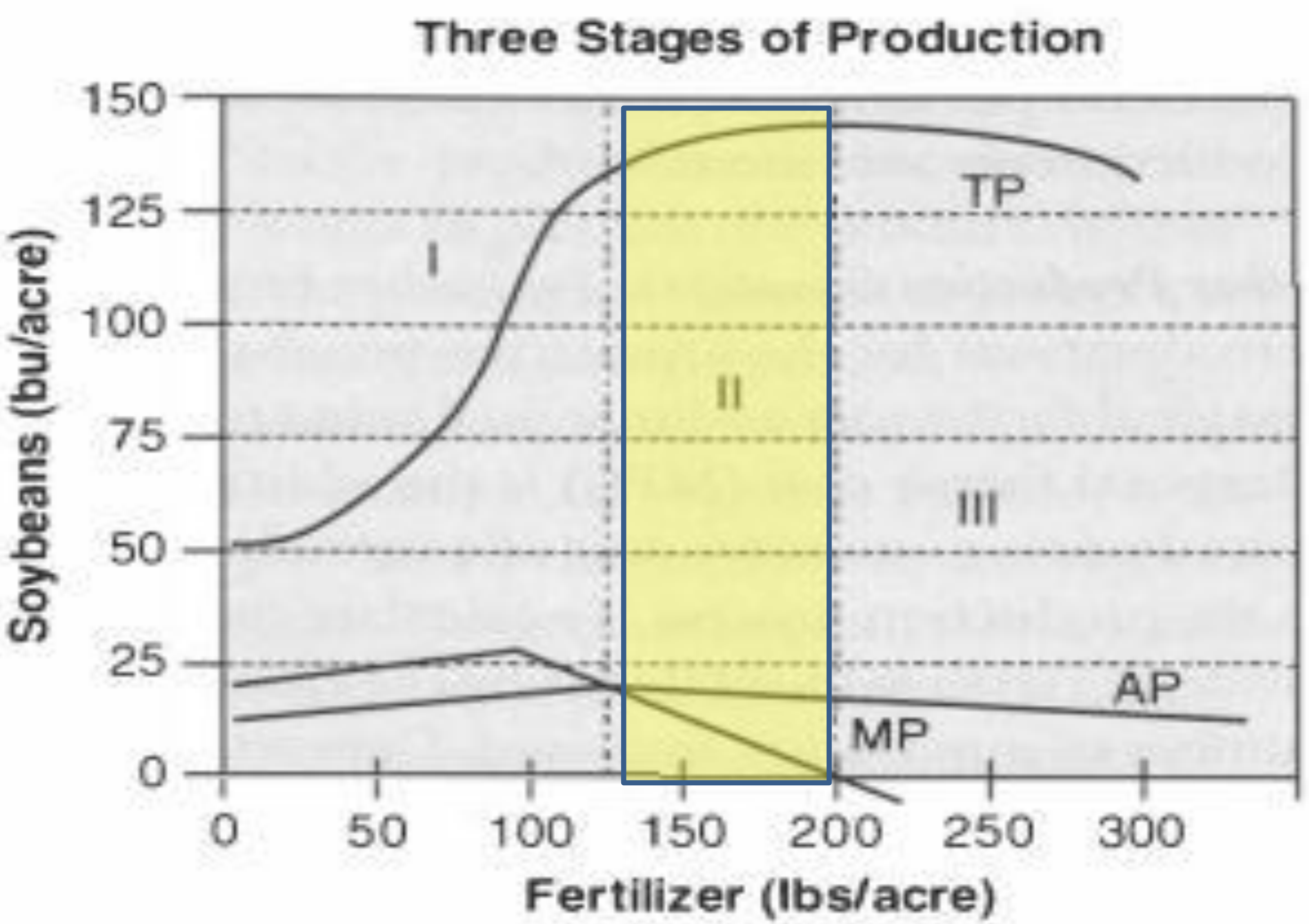
Three Stages of Production

Stage Ⅰ

- This stage is considered an irrational stage of production
- It begins where zero units of the variable input are added and extends to the point where the AP curve reaches its maximum

Three Stages of Production

Stage Ⅱ



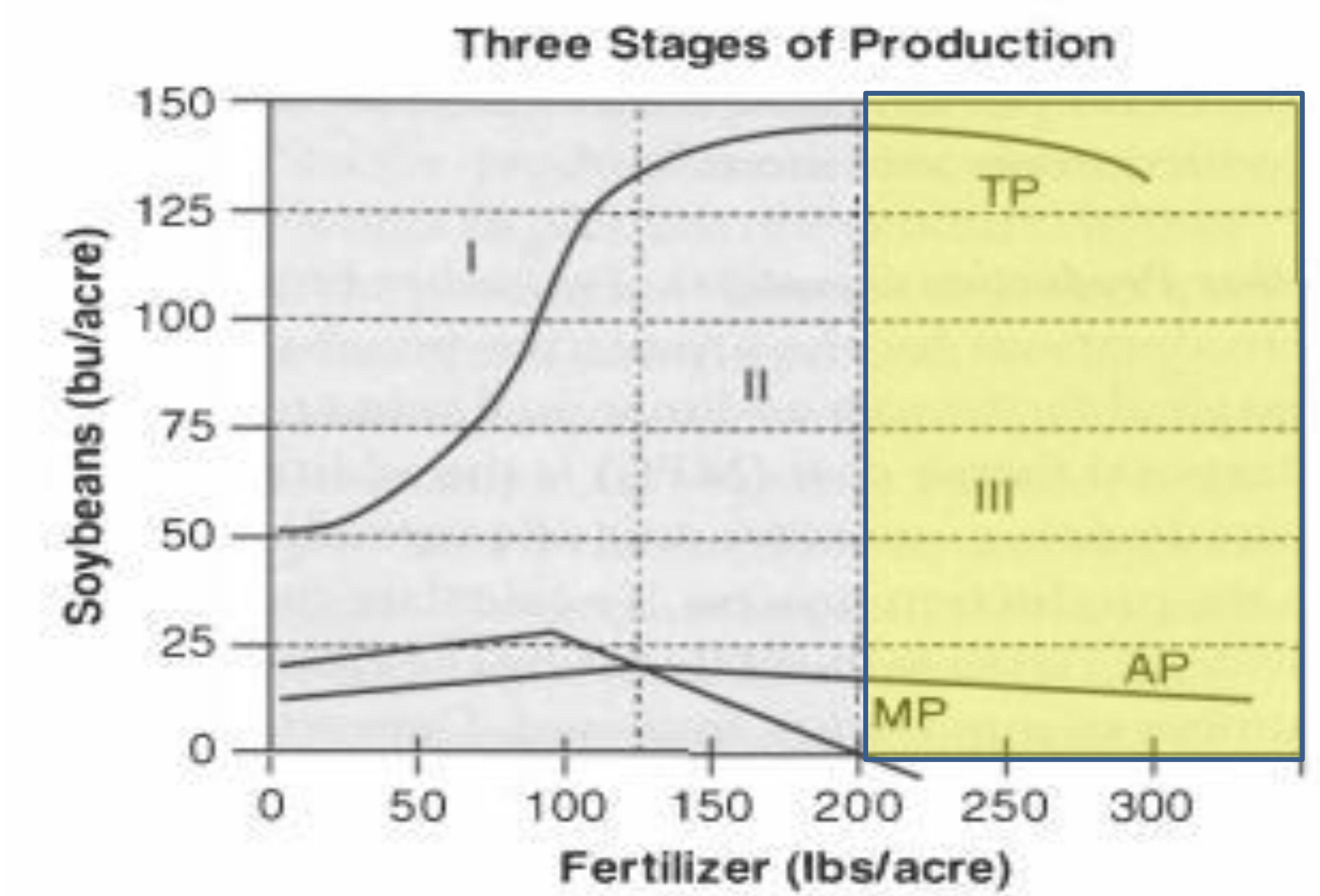
Three Stages of Production

Stage Ⅱ

- During this stage, the producer decides how much of the variable input to add in order to maximize profitability
- It begins where the MP and AP curves intersect, and culminates where the marginal product curve equals zero and the Tpcurve is at its maximum

Three Stages of Production

Stage Ⅲ



Three Stages of Production

Stage Ⅲ

- The output (TP) has reached its maximum level and begins to decrease
- It begins where the MP curve is zero and becomes negative, and the Tpcurve peaks and begins decreasing – negative marginal returns

Principle of Diminishing Returns - Input Basis

- The relationship among product curves, and assists producers in determining the most effective production level for their operations
- This principle is concerned with varying the amount of one input while keeping all other inputs constant within the production process

Principle of Diminishing Returns
- Input Basis

⇒Purpose of Diminishing Returns

- To maximize returns above the cost of the input
- Decision Rule : MVP ≥ MFC

Returns to Scale

- 1. Increasing returns to scale
- 2. Decreasing returns to scale
- 3. Constant returns to scale

Returns to Scale

Production Efficiency

- Efficiency is defined as this ration of output per unit of input
- With constant returns to scale, both large and small agribusinesses are equally efficient and can peacefully coexist

Resource Subtitution

- In reality, All inputs are variable.

- If we have two variable inputs (X_1 and X_2)

  Use all of X_1

  Use all of X_2

  Use more of X_1, and less of X_2

  Use more of X_2, and less of X_1

- "What combination of inputs would be most useful within the production process?"

Marginal Rate of Substitution

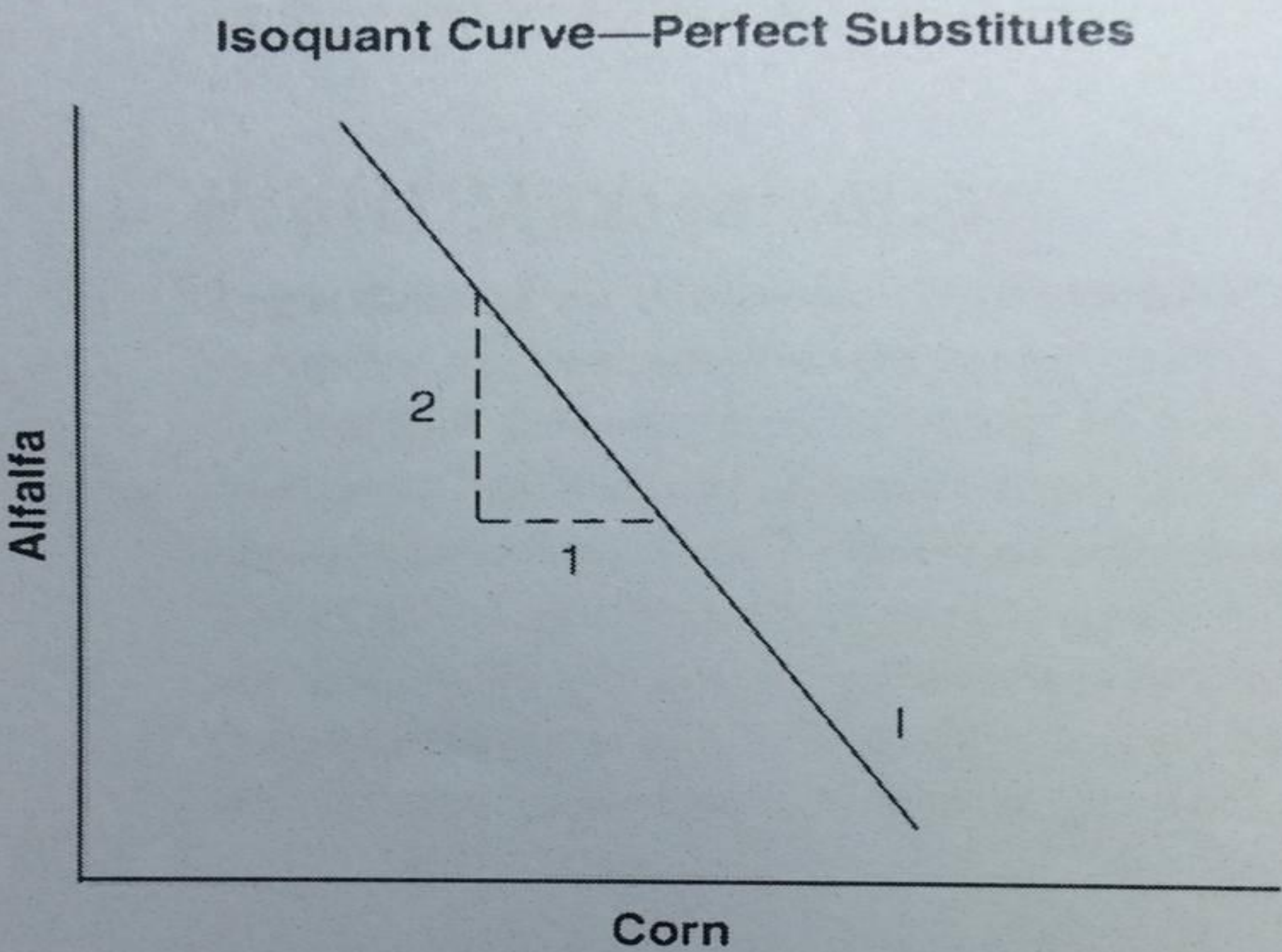
- MRS : the amount of one input that is replaced by an additional unit of another input.

- This can be illustrated through the following equation.

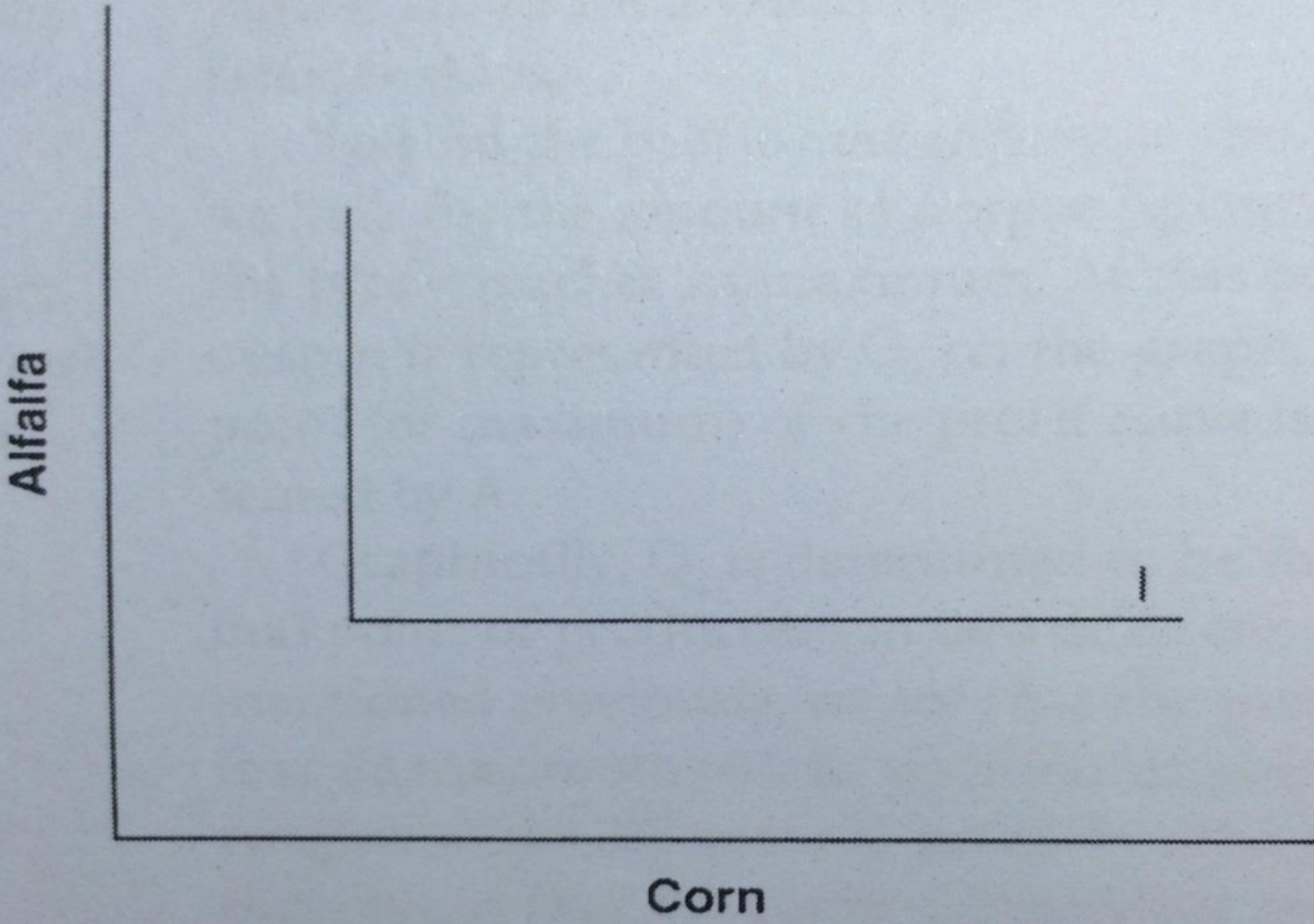
- MRS=$\frac{\Delta X2}{\Delta X1} = \frac{\Delta input\ replaced}{\Delta input\ added}$

Isoquant curve

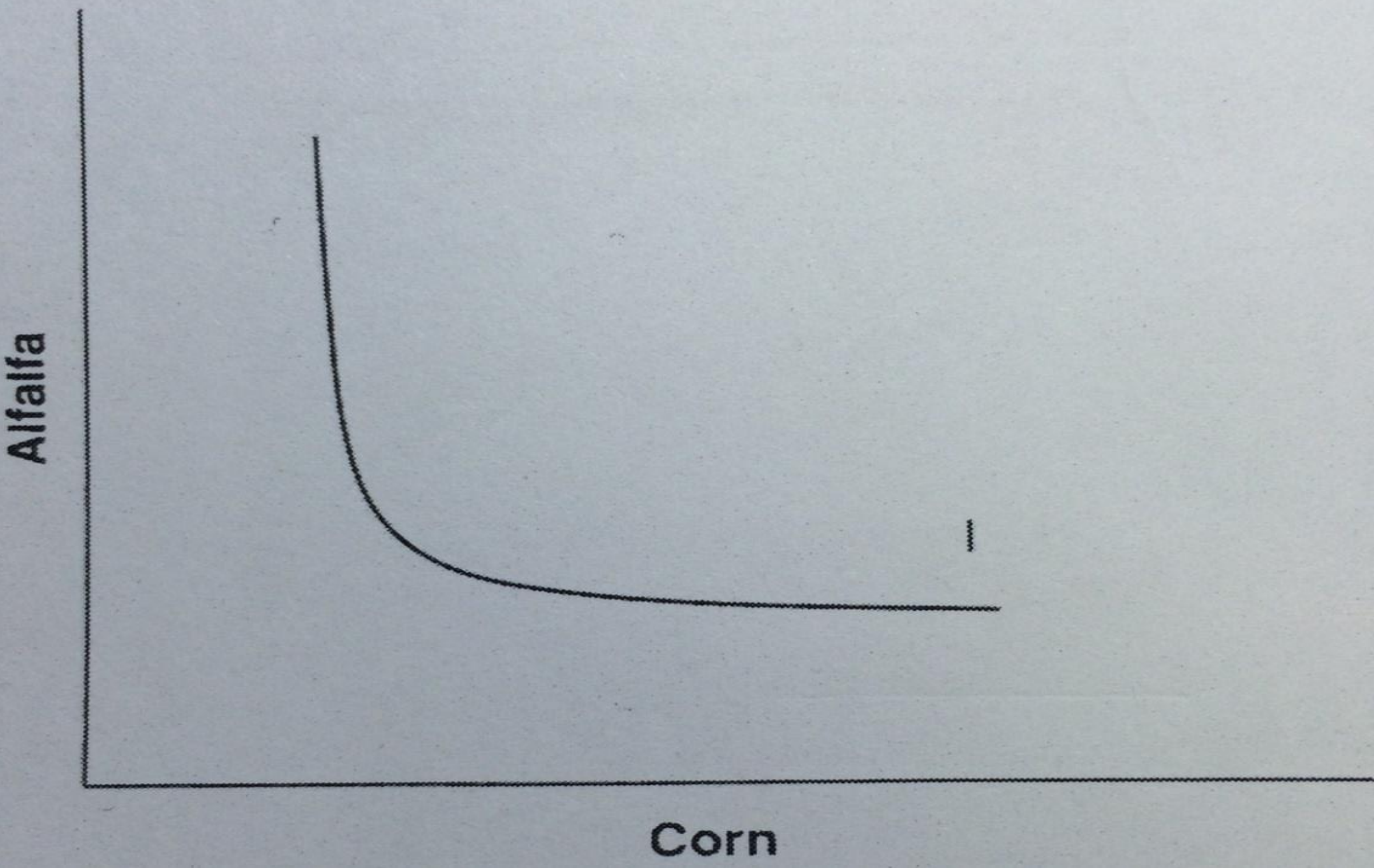
- illustrates the set of all pairs of input(X_1, X_2)
  - It indicates the amount of one input that can be replaced by another input, while sustaining the same level of output.
- The further an isoquant curve is from the origin, the higher the level of production.


Isoquant Curve—Perfect Substitutes
Alfalfa
2
1
I
Corn

Isoquant Curve—Perfect Complements



Isoquant Curve—Imperfect Substitutes



Isocost Line

- The price or cost of the inputs added and replaced.
- Secifically, it illustrates the different combinations of two inputs that can be purchased with a specific amount of money.

- Price Ratio: $\frac{\textit{Price Input Added}}{\textit{Price Input Replaced}} = \frac{P_1}{P_2}$

Isocost Line

Example :-)

The price of alfalfa(P_2) is \$75/ton(3.7cents/lb)

the price of corn (P_1) is \$60/ton(3cents/lb)

- Corn Cost Price Ratio$=\frac{P_1}{P_2}=\frac{0.03}{0.037}=0.81$
- Alfalfa Cost Price Ratio$=\frac{P_2}{P_1}=\frac{0.037}{0.03}=1.23$

Least cost combination of Inputs

- The least-cost combination of inputs provides **the Decision Rule** for producers to work with:

  - MRS Price ≥ Ratio

    (= Cost of Input Replaced ≥ Cost of Input Added)

    $$(= \frac{\Delta X_2}{\Delta X_1} \geq \frac{\Delta P_1}{\Delta P_2})$$

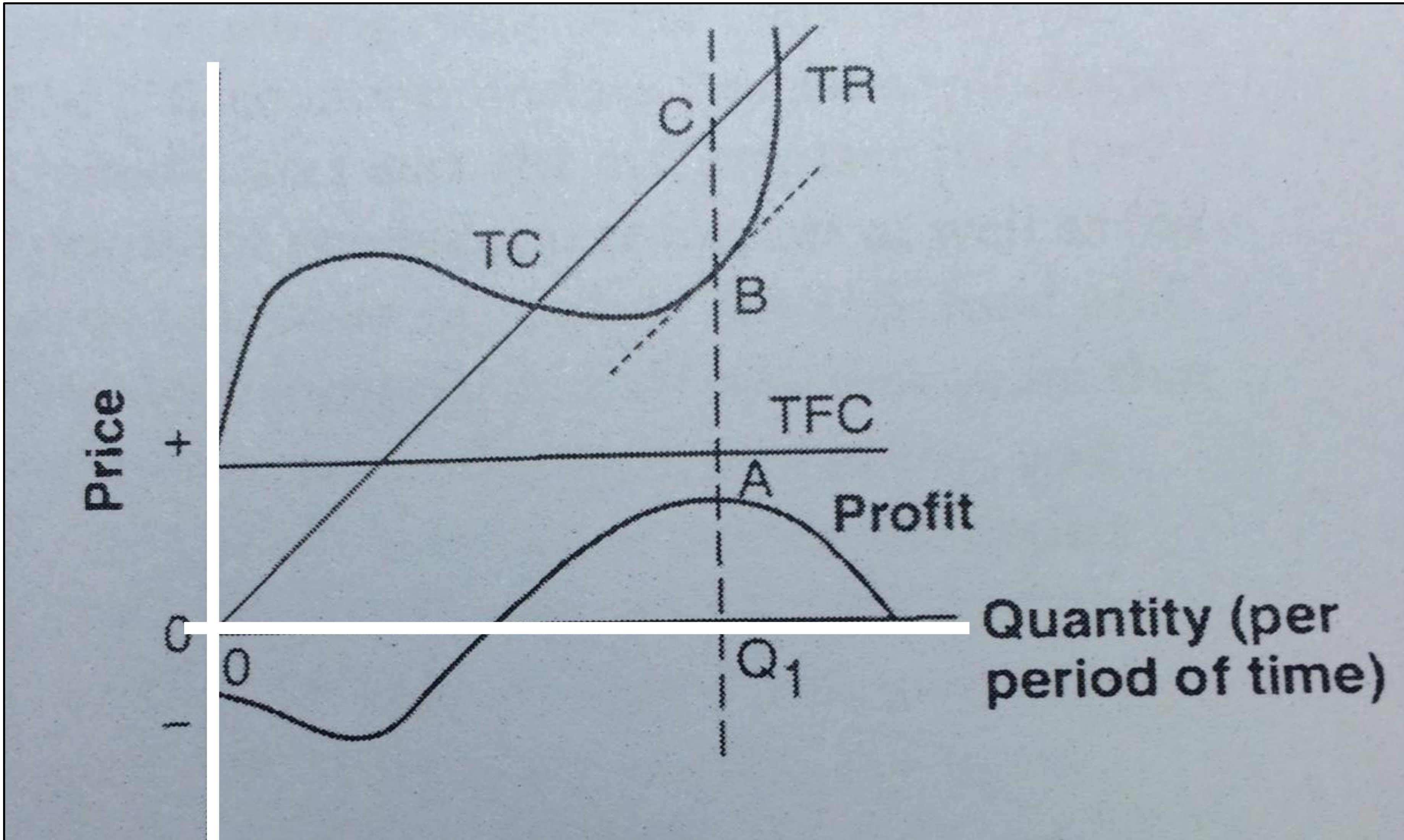
- According to this rule, the producer should continue to add more of one input(X_1) to replace another input(X_2) as long as the cost of the input being replaced(cost saved by replaced X_2) is greater than or equal to the cost of the input being added(cost added by adding X_1)

Profit Maximization

- Profit Maximization is the process by which a firm determines the price and output level that returns the greatest profit.

- Total revenue-total cost method
- Marginal revenue-marginal cost method

The Totals Approach



marginal revenue-cost method