

**Dr.SNS RAJALAKSHMI COLLEGE OF ARTS AND SCIENCE
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University) Coimbatore- 49



**DEPARTMENT OF COMMERCE WITH
INFORMATION TECHNOLOGY**

**MANAGERIAL ECONOMICS
Production Function**

Dr. R.Arthi, M.Com (IB), M.Phil., MBA., M.Com., Ph.D.,
Assistant Professor,
Department of Commerce with Information Technology

What is Production Function?

Definition

A production function explains the functional relationship between physical inputs and physical output of a good.

It describes the technological knowledge of a firm, defining the maximum output feasible for a given set of inputs.

Mathematical Expression

$$Q = f(L, K)$$

Q: Physical Output

L: Labor (Variable Factor)

K: Capital (Fixed Factor)

The Production Process

Input to Output Transformation

Production is not just creation, but the transformation of resources into usable goods.

19-11-2025

Professor

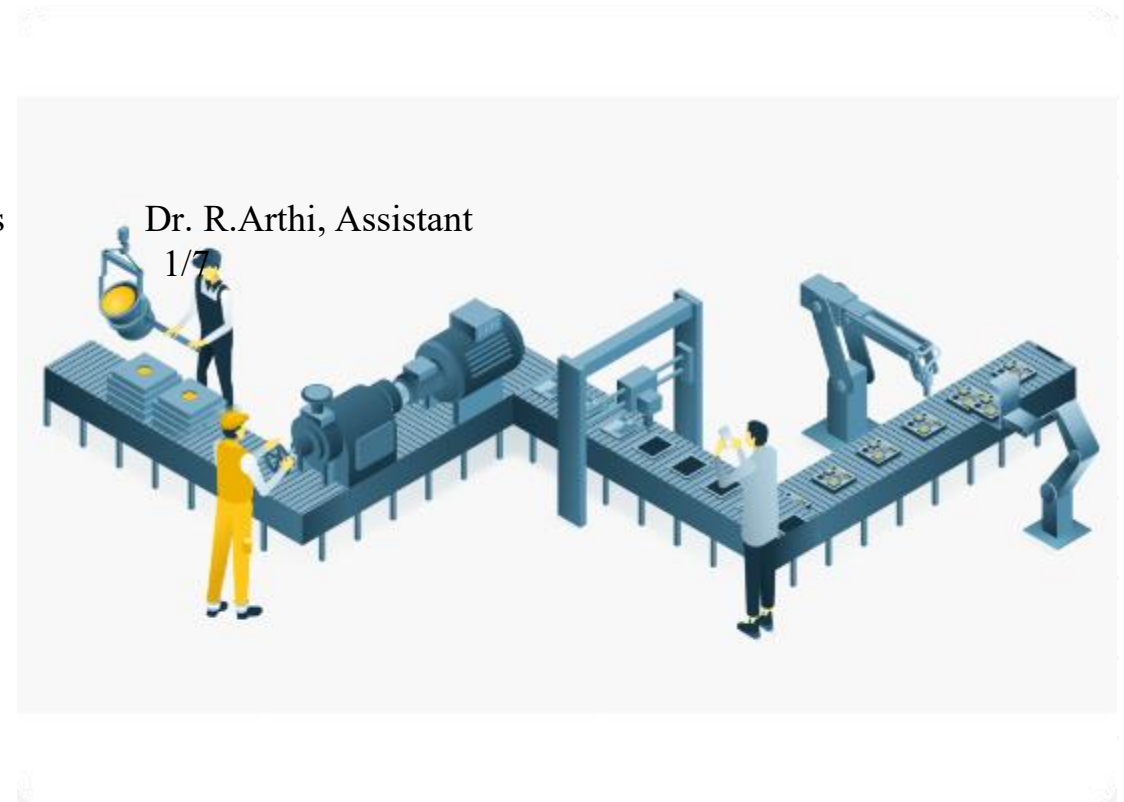
Managerial Economics

Commerce with IT

Inputs: Raw materials, labor, machinery, land.

Process: The technological combination of these inputs.

Output: Final goods or services ready for consumption.



Characteristics



Technological Relationship

It is strictly an engineering or technical relationship, independent of prices or financial costs.



Flow Concept

Production is measured as a flow variable (e.g., units produced per day or per month).



Specific Technology

The function assumes a constant state of technology. If technology improves, the function shifts.

Short Run vs. Long Run

Short Run

A period where at least one factor of production remains fixed (usually capital or land).

Analysis: Law of Variable Proportions.

Output can only be changed by adjusting variable inputs.

Long Run

A period sufficient to change all factors of production. No factors are fixed.

Analysis: Returns to Scale.

Scale of operation can be expanded or contracted.

Fixed vs. Variable Factors



Fixed Factors: Inputs that cannot be altered in the short run (e.g., Heavy Machinery, Factory Buildings). Their cost is a "sunk cost" in the short run.

Variable Factors: Inputs that change directly with the level of output (e.g., Raw Materials, Daily Wage Labor, Power Fuel).

The Function Equation

General Form

The standard notation used in economic analysis is:

$$Q = f (x_1 , x_2 , \dots x_n)$$

Where x represents various inputs. In simplified models, we focus on:

Assumptions

L (Labor): Represents human effort.

Considered variable in the short run.

K (Capital): Represents machinery and equipment. Considered fixed in the short run.

$$Q = f (L , \bar{K})$$

The bar over K usually denotes it is fixed:

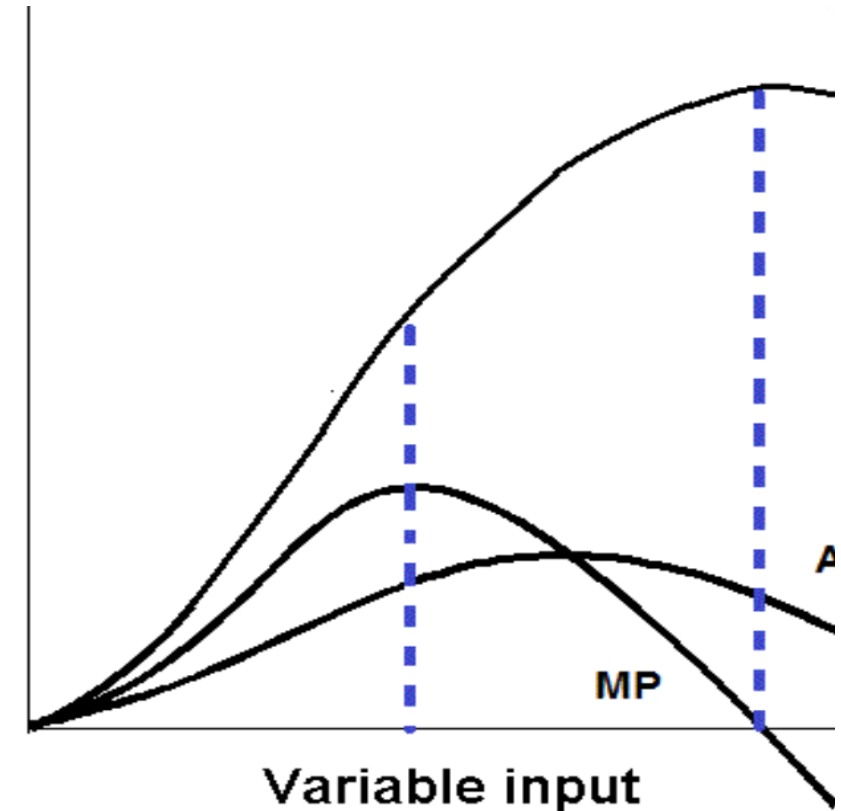
Law of Variable Proportions

Short Run Analysis

Also known as the Law of Diminishing Returns. It states that as more units of a variable factor are applied to a fixed factor, the Marginal Product (MP) of the variable factor eventually declines.

Key Metrics:

- TP: Total Product
- AP: Average Product
- MP: Marginal Product



Three Stages of Production

Stage	Name	Behavior of MP	Rationality
Stage I	Increasing Returns	MP increases and then starts to fall (but AP is rising).	Irrational to stop (Underutilization).
Stage II	Diminishing Returns	MP is falling but Positive. TP increases at decreasing rate.	Rational Zone (Ideal operation).
Stage III	Negative Returns	MP becomes Negative. TP starts falling.	Irrational (Overutilization).

Returns to Scale (Long Run)



Increasing

Output increases by a *larger* proportion than the increase in inputs.

(e.g., Inputs double \rightarrow Output triples)



Constant

Output increases by the *same* proportion as the increase in inputs.

(e.g., Inputs double \rightarrow Output doubles)



Decreasing

Output increases by a *smaller* proportion than the increase in inputs.

(e.g., Inputs double \rightarrow Output +50%)

Q & A

1. The production function shows the relationship between:

- A. Cost and output
- B. Inputs and output
- C. Price and quantity
- D. Revenue and profit

Answer: B

2. In a production function, inputs are also called:

- A. Utilities
- B. Factors of production
- C. Margins
- D. Outputs

Answer: B

3. The law of diminishing returns occurs in the:

- A. Long run
- B. Short run
- C. Medium run
- D. Neither run

Answer: B

4. In the long run, all factors of production are:

- A. Fixed
- B. Variable
- C. Mixed
- D. Non-productive

Answer: B

5. The production function $Q = f(L, K)$ means:

- A. Quality depends on labour
- B. Output depends on labour and capital
- C. Labour equals capital
- D. Cost depends on capital

Answer: B

6. The point where marginal product becomes zero is called:

- A. Stage of increasing returns
- B. Stage of diminishing returns
- C. Stage of negative returns
- D. Stage of maximum efficiency

Answer: C