

Production and Production function

Production

- ❖ Production is the process of **transformation of one or more inputs into one or more outputs.**
- ❖ Production is defined as the creation of **utilities** and not matter.
- ❖ In other words, it is the creation of want – satisfying goods and services.
- ❖ Utilities are created in four forms : (i) form utility, (ii) place utility (iii) time utility and (iv) possession utility.

- ❖ A good may be transformed by changing its **physical form** (form utility), transporting it to another place (**place utility**) or being kept in store unit required (**time utility**).
- ❖ Production essentially means transformation of one or more inputs into one or more outputs or one set of goods into another set of goods.
- ❖ Gifts of nature are utilised by man in satisfying his wants and production is not complete unless the product reaches the consumer).

Factors of production

- ❖ **Land, Labour, Capital and Organisation** are the four factors of production. These are required in almost every production process. These are used as basic '*inputs*'.
- ❖ These four essential inputs needed to undertake production are called **factors of production**.
- ❖ The factors of production have a price. They are not free goods and one has to pay for them. The payments made for the use of the four factors of production are known as **rewards**.

Reward for factors of production

Factor

Land

Labour

Capital

Management

Enterprise/Entrepreneurship

Reward

Rent

Wage

Interest

Profit

Characteristics of factors of production

- ❖ The four factors of production have some specific features which influence their use in production.

Substitutability

- ❖ One factor of production, say labour, may be substituted for another factor, say capital.

Complementarity

- ❖ The use of one factor may cause use of another factor. For example, when more labour is used, more capital may be needed.

Specificity

❖ A factor is said to be specific when it can be used for one purpose only. Spare parts of a machine, for example, may be specific for that machine only.

Versatility

When a factor could be used for all purposes, it is said to be versatile. However, in practice, some factors may not be completely versatile. Such factors with low versatility are called *specialised factors*.

Production function

Production Function:

In simple words, production function refers to the functional relationship between the quantity of a good produced (output) and factors of production (inputs)

Production is the result of co-operation of factors of production viz., land, labour, capital, technology and organization etc.

$$Q = f(L, K, T, A, B, \dots Z)$$

Where Q = Quantity of output

L = Labor

K = Capital

T = Technology

A = Land.

Hence, the level of output (Q), depends on the quantities of different inputs (L, K, A) available to the firm. In the simplest case, where there are only two inputs, labour (L) and capital (K) and one output (Q), the production function becomes.

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

Definition

“Production function is the relationship between inputs of productive services per unit of time and outputs of product per unit of time.” **Prof. George J. Stigler**

Defined production function as “the relation between a firm’s physical production (output) and the material factors of production (inputs).” **Prof. Watson**

- All the above said assumptions apply in fisheries, for example aquaculture, as well.
- The land is fixed.
- The other factors of production like labour and capital do vary.
- The technology adopted does not significantly change in the short run.

Types of Production Function

Types

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graph TD; A[Types] --> B["Short - Run  
(Inputs kept constant)  
One input (Labour) is varied"]; A --> C["Long - Run  
(Varying all inputs)"];
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Short - Run

(Inputs kept constant)

One input (**Labour**) is varied)

Long - Run

(Varying all inputs)

Cobb-Douglas production function, 1927

The Cobb-Douglas production function is based on the empirical study of the American manufacturing industry made by Paul Douglas and Charles Cobb. It is a linear homogeneous production function of degree one which takes into account two inputs, labour and capital, for the entire output of the manufacturing industry.

Cobb-Douglas production function

$$Q = AL^{\alpha}K^{\beta}$$

Q = total production (the real value of all goods produced in a year)

L = labour input (the total number of person-hours worked in a year)

K = capital input (the real value of all machinery, equipment, and buildings)

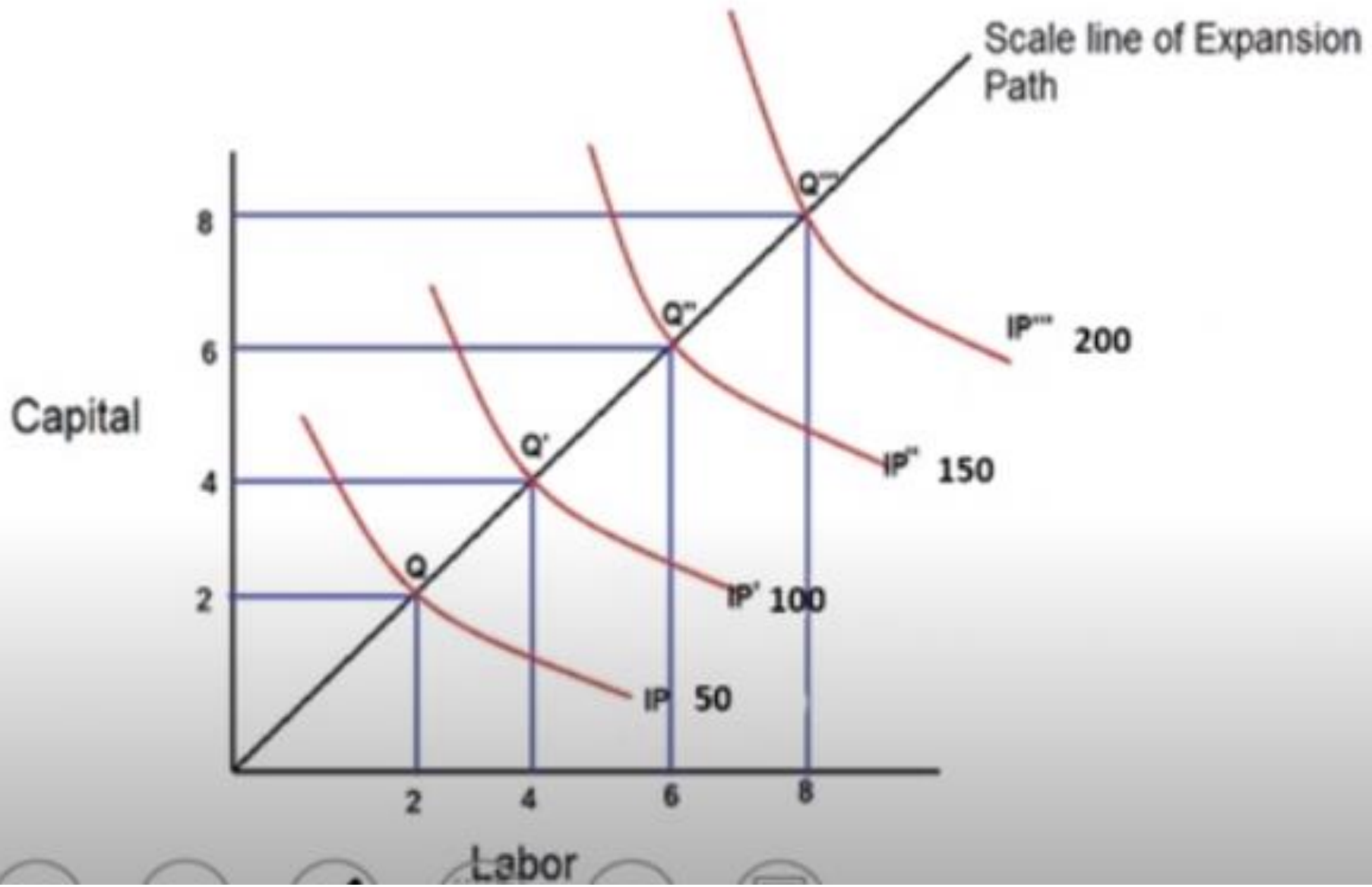
A = The equation tells that output depends directly on L and K, and that part of output which cannot be explained by L and K is explained by A which is the 'residual', often called technical change.

α and β are the output elasticities of capital and labour, respectively. These values are constants determined by available technology.

Properties

- Cobb - Douglas production is *linear homogenous & returns to scale is constant*

The **Linear Homogeneous Production Function** implies that with the proportionate change in all the factors of production, the output also increases in the same proportion. Such as, if the input factors are doubled the output also gets doubled. This is also known as **constant returns to a scale**.



Law of Diminishing Returns

Law of Diminishing Marginal Returns

Principle of Diminishing Marginal
Productivity

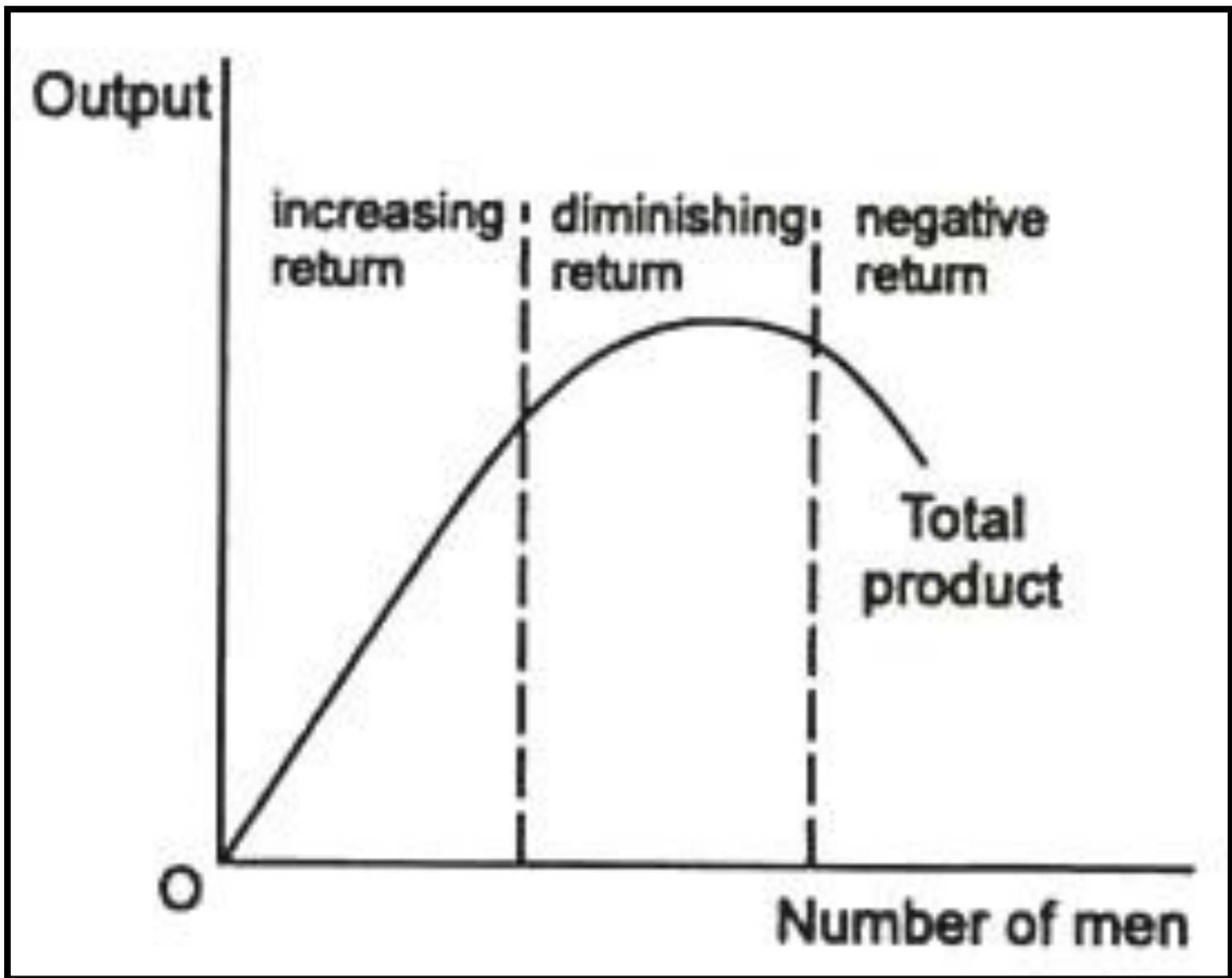
In economics, diminishing returns is the decrease in the marginal (incremental) output of a production process as the amount of a single factor of production is incrementally increased, while the amounts of all other factors of production stay constant.

Increases in one factor of production



Lower additional returns





Restaurant





Table 1. A Production function

| Units of fertilizers used | Total Corn Yield (Bushels) | Additional Corn for Each Additional Unit of Fertilizers (Bushels) |
|---------------------------|----------------------------|---|
| 0 | 26.0 | — |
| 1 | 38.0 | 12.0 |
| 2 | 47.0 | 9.0 |
| 3 | 52.5 | 5.5 |
| 4 | 54.0 | 1.5 |