

PRODUCTION

Production decision of firms may be understood in three steps:

1. PRODUCTION TECHNOLOGY

- * Firms use inputs to produce output.**
- * A Firm can produce a certain level of output by using different combinations of input factors.**
- * Thus a firm may use one ton of raw material, a machine and two units of labour and produce 20 bags of fertilizer.**

2. COST CONSTRAINTS

- * Any firm is aware that the input factors have a cost.**
- * Thus for labour the cost is wages, and for capital goods the cost is interest and there is a cost for raw material.**
- * All firms have a budget which will be maximized in the production of output i.e. consumer goods.**
- * The cost of inputs will influence revenue and also profits of a firm.**

3. INPUT CHOICES

- * Given that a firm uses production technology and the costs of labour, capital and other input costs a firm has the choice of how much of each input factor to use in the production of outputs.**

- * Thus if a firm is faced with a low cost of labour, it may decide to use more labour than capital in the production of its output.
- * In such a situation the firm may be using a labour intensive rather than capital intensive combination of factor inputs.

THE PRODUCTION FUNCTION

- * The production function shows the highest output that a firm can produce for every specified combination of inputs.
- * The inputs consists of the four factors of production - land, labour, capital and entrepreneurship.
- * The production function could be stated as:

$$q = F (K, L)$$

where **q** = the output
 K = capital
 L = labour

- * The production function = the quantity of goods / output produced, **q**, depends on or is a function of (**F**) of the combination of capital (**K**) and labour (**L**) used.

COSTS OF PRODUCTION

- The use of factor inputs in the production process will cause a firm to incur costs.
- Thus for the use of labour a firm has to pay wages.
- Accountants' view of costs will differ from that of economists.
- **ACCOUNTING COSTS** - will include actual expenses plus depreciation charges for capital goods.
- **Economic cost** - the cost to a firm of utilizing economic resources in production including opportunity cost.
- **Opportunity cost** – the cost associated with the willingness to forego opportunities when a firm's resources are not put to their best alternative use.
- **Opportunity cost** is often hidden but should be taken into consideration when making economic decisions.
- **SUNK COSTS** – expenditure that has been incurred but cannot be recovered.
- Because sunk costs cannot be recovered it should influence a firm's decisions.
- **Example of sunk cost** – a firm buying highly specialized equipment that has only one use and no alternative use.
- The expenditure on such specialized equipment is a sunk cost because it has no alternative use thus it does not have any opportunity cost.

- **A prospective sunk cost occurs when a firm considered whether to acquire highly specialized equipment.**
- **Such prospective sunk cost is considered an investment.**

FIXED AND VARIABLE COSTS

- Some costs vary with the level of output produced through production process.
- Such costs are known as **VARIABLE COST**.
- **VARIABLE COST (VC)** is that cost of inputs that varies as the level of output varies.
- If 10 workers produce 100 tons of fertilizer and the labour cost (= wages) amount to R50 000
- If the firm wants to increase its output to 150 tons of fertilizer and it employs 5 more laborers, its cost of wages will increase. Thus wages is a variable cost.
- Some inputs are held constant. Thus if the fertilizer produces its output using 10 machines even if output is increased to 150 tons, this input is held constant at ten machines.
- **FIXED COST (FC)** = cost that does not vary with the level output and that can be eliminated by shutting down.
- In the short-term more costs are fixed than variable
- In the long-term most costs are variable.
- **FIXED VS SUNK COST** – these two costs are often confused.
- Fixed costs are costs that do not change with the level of output.

- **Fixed costs** are there even if a firm has zero output and include the costs of employing key executives.
- **Sunk costs**- costs that have been incurred and cannot be recovered.
- The distinction is drawn between fixed and sunk costs because fixed costs affect a firm's decisions looking forward whereas sunk costs do not.
- **AMORTISATION SUNK COSTS** = the policy of treating a one-off expenditure as an annual cost spread over a number of years.
- **EXAMPLE:** when a firm spends R500m on a factory which produces highly specialized products e.g. cellphone sim cards and spreads this cost over a five year period.

COSTS OF PRODUCTION

- **TOTAL COSTS = FC + VC**
- **FC = costs that do not vary with output**
- **VC = costs that vary with the level of output e.g. wages, raw material**
- **Average Cost (AC) or Average Total cost (ATC)**

$$\frac{TC}{Q} = \text{Total cost divided by output}$$

- **Average FC (AFC) = Total Fixed Costs divided by output = $\frac{TFC}{Q}$**
 - will decrease as output increases

- **Average Variable Cost (AVC) = Total Variable Cost divided by output**

$$\frac{TVC}{Q}$$

- **Marginal Cost (MC) = the increase in costs resulting from the production of one additional unit of output**

$$MC = \frac{\Delta VC}{\Delta Q} \text{ or } \frac{\Delta TC}{\Delta Q}$$

MC – curve is usually U –shaped because it initially decreases and when diminishing returns set when it increases

- **MC cost and AC curves intersect at the lowest point of AC also known as the technical optimum.**

ISOCOST LINES

- An isocost line is a graph that shows all the possible combinations of labour and capital that could be purchased for a given total cost.
- An isocost line is usually tangent to an isoquant.
- Refer to Pindyck p.237 Fig 7.2
- Like indifference curves, isoquants cannot intersect or touch each other
- The requirements of technical substitution go with isoquants i.e. if less capital is used more labour will be utilized.
- Isoquants are convex to the origin of the graph
- Total cost of production, C , is given by the total cost of labour, wL , plus the total cost of capital, rK .

Thus:

$$C = wL + rK$$

- The total cost equation may be rewritten for a straight line as:

$$K = \left(\frac{C}{r} - \frac{w}{r} \right) L$$

- For each different level of total cost, describes a different isocost line.

- The total cost equation as an equation for a straight line could be stated as:

$$K = \frac{C}{r} - \left(\frac{w}{r}\right) L$$

- The isocost graph will have a slope of

$$\frac{\Delta K}{\Delta L} = -\left(\frac{w}{r}\right)$$

Which is the ratio of the wage rate to the rental cost of capital.

- **NB.** This slope is similar to the slope of a budget line faced by a consumer.
- It tells us that if a firm gives up a unit of labour to buy w units of capital at a cost of r Rand per units, its total cost of production would remain the same.

QUESTION:

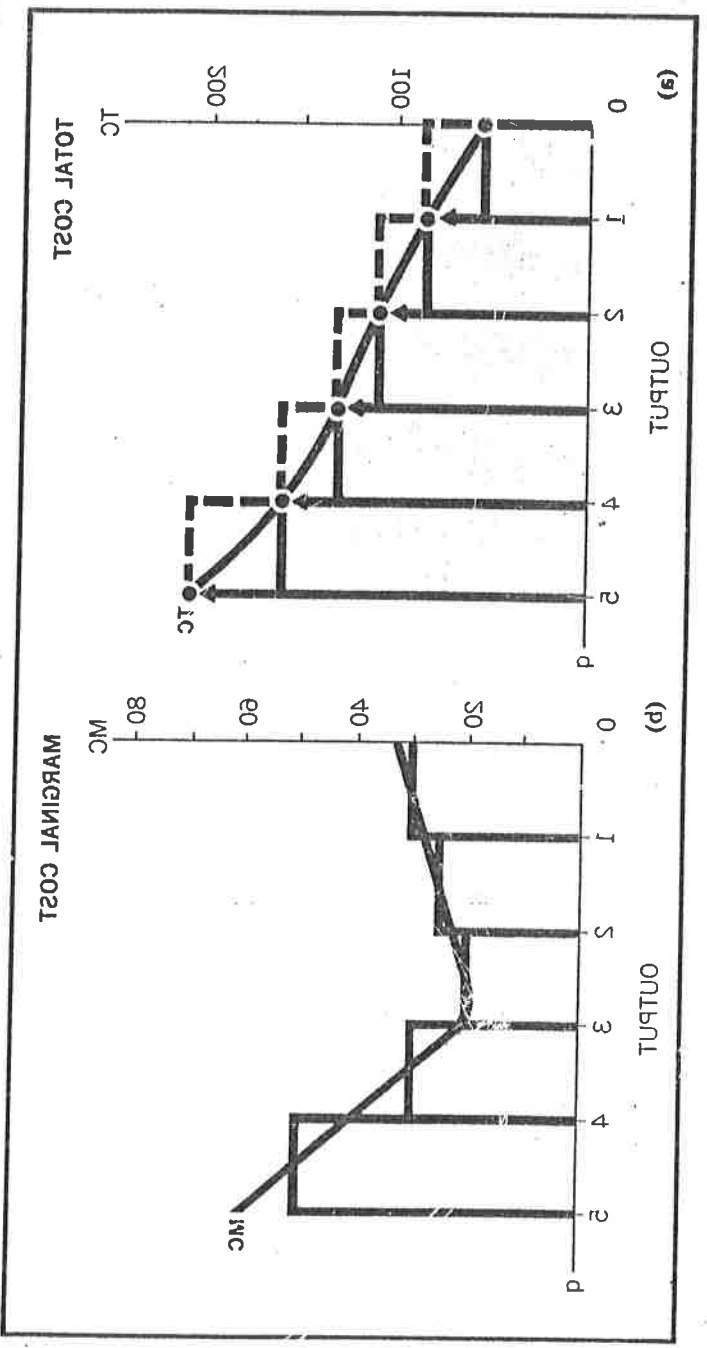
- At which level will a firm produce and with which quantity of labour and capital?

ANSWER:

- At the point where the isocost line is tangential to (just touches) the isoquant.
- Refer to Fig 7.3 Pindyck.
- At point A the isocost line is tangential to isoquant C_1 .

Marginal (or extra) cost can be shown numerically by subtraction of successive items

CALCULATION OF MARGINAL COST		
(1) QUANTITY PRODUCED q	(2) TOTAL COST TC	(3) MARGINAL COST MC
399	\$15,960.05	
400	16,000.00	\$39.95
401	16,040.05	40.05



Output (1)	LC (2)	MC (3)
0	\$ 22	\$30
1	32	52
2	110	50
3	130	30
4	160	20
5	510	

Marginal Cost is to Total Cost as marginal utility is to total utility.