# **CHAPTER THREE: THEORY OF COST**

## **3.1. Basic Concepts of Costs**

Cost and revenue are the two major factors that a profit making firm needs to monitor continuously. It is the level of cost relative to revenue that determines the firm’s overall profitability. The term cost generally refers to express on goods and productive services. But in economics cost and expense are different. Expense is moneyincurred in production process, but cost refers to any effort, sacrifice and exertion of human being.

Costs are defined as expenses incurred in organizing and carrying out the production process in business. But in economics the term cost mean the total effort, sacrifice & energy in our production. So managers should be familiar with all of the costs and their classifications and understand which costs are important in decision making at a particular time. Production costs play a great role in decision making process because profit depends on amount of cost. Profit can be maximized either by increasing the output level or decreasing cost of production.

## **3.2. Classification of Costs**

Costs can be classified as:

**1. Explicit and Implicit Costs**

**Explicit or cash cost:** are costs with direct money outlay. Costs paid in cash. Example cash expenditure for fuel, fertilizer, hire worker, repairs, raw materials etc.

**Implicit or non-cash cost:**are costs without direct money outlay. These are costs of the firms owned and self-employed resources in carrying out production activities. Example; the salary of the owner- manager, estimate rent of building, family labour.

**2. Material& Service Costs:**are Cost of production represents many types of materials and services which are partially or totally involved in the production process.

* under crop production: for crop production materials and servicescost includes
1. Land, seed, fertilizer, pesticides, herbicides, bag etc.
2. human labour ( hired, exchange)
3. Building
4. animal power including hired or exchanged
5. machinery, equipment and tools including in both & general purpose
* under livestock production: for livestock productionmaterials and servicescost includes:-
1. cost of building( housing), fencing, electric city, water
2. human labour ( hired, exchange)
3. feeding including concentrate and roughage, pasture & grazing
4. machinery & tools
5. other services such as breeding, veterinary
6. maintenance & depreciation

**3.Opportunity cost**: The economist’s concept of costs is based on the fact that resources are scarce and have alternative uses. Thus, to use a combination of resources in the production of a particular good means that certain alternative products must be forgone. However, this doesn’t rule out using the same resource, such as a tractor or farm labour, in various lines of production.It simply says production of one product entails giving up so much of the opportunity to produce something else. Thus production involves what economists call an opportunity cost.

**4. Fixed and Variable Costs**

**Fixed costs:** are those costs, which do not vary with changes in output. These costs are associated with the very existence of a firm’s plan and therefore, it must be paid even if the firm’s rate of output is zero. Such costs as interest are borrowed capital, rental payments, a portion of depreciation charges are equipment and buildings, and salaries of top management.

**Variable costs:** are those costs, which increase with the level of output. These include payments for raw materials, charges on fuel and electricity, wages and salaries of temporary staff, depreciation charges associated with wear and tear of assets, and sales commission.

**Classifications of Costs Based On the Length of Time of Production;**

Costs divided in two based on the length of time:

 1. Short run cost of production

 2. Long run cost of production

**1. Short run cost of production**

 In the short run: there is one variable and one fixed inputs. The time is too short for the producers to vary all the factors of production.

In the short run costs can be divided in to two; Fixed cost and variable cost. When added up these two costs we get a total cost of production in the short run. From the total cost we derive four types of cost concepts:

1. Average Total Cost
2. Average Fixed Cost
3. Average Variable Cost
4. Marginal Cost

1. Total cost (TC): equal to sum of total fixed cost (TFC) and total variable cost (TVC). The total cost stands even production is zero (TC=TFC). The shape of TC curve depends on the shape of TVC curve; i.e. the shape of TC is the same as the shape of TVC

 TC

TCtttttctttTVC

Quantity

 TTTTTVVVVVVVTTTTTTTTTTTTTTTTTTTTTTFCTFC

Cost

 TVC

2. Average total cost (ATC): refers to the average of all costs (fixed plus variable) per unit of output. . The shape of the curve depends on the type of production function. It has “U” shaped curve.

3. Marginal cost (MC): it is the change in cost associated with an increase of one unit of output.MC depends on TVCand the shape of MC curve is “U” shaped. 

4. Average fixed cost (AFC): is a fixed cost per unit of output, since the total fixed cost is the same at all levels of production the average fixed cost falls continually at a deceasing rate as more output is produced. It is because the fixed cost is divided by increasingly large numbers as output increases. The shape of AFC is rectangular Hyperbola. 

5. Average variable cost (AVC): refers to total variable cost per unit of output. At initial large amount of AVC, because there is small amount of output, then reaches minimum, then after its value increases as output increases. It has “U” shaped curve. The shape of AVC depends on the type of production function.

Hypothetical data showing the relationship among the various cost concepts:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Y(output) | TFC | TVC | TC | ATC | MC | AFC | AVC |
| 0 | 125 | 0 | 125 | 0 | 0 | 0 | 0 |
| 1 | 125 | 30 | 155 | 155.0 | 30 | 125.0 | 30.0 |
| 2 | 125 | 45 | 170 | 85.0 | 15 | 62.5 | 22.5 |
| 3 | 125 | 56 | 181 | 60.3 | 11 | 41.7 | 18.7 |
| 4 | 125 | 58 | 183 | 45.8 | 2 | 31.3 | 14.5 |
| 5 | 125 | 62 | 187 | 37.4 | 4 | 25.0 | 12.4 |

## **3.3. Nature and Relations among ATC, AVC, AFC and MC**

## A. Marginal *cost and average variable cost*

* when AVC is declining, MC<AVC
* when AVC is increasing, MC>AVC
* when AVC =MC, AVC is at its minimum

B. Marginal cost and average total cost

* when ATC is declining, MC<ATC
* when ATC is increasing, MC>ATC
* when ATC =MC, ATC is at its minimum

C. *Marginal cost and average fixed cost*

* there is no relationship between MC and AFC

**3.8. Long Run Cost of Production**

In the long run: all inputs (factors) are varied. Cost constitutes only variable costs. The long run cost of production are use ful to decide whether the optimum size of the input is to be changed or not.

* The log run cost curves are derived from short run cost curves. Like, the long run average cost curve is derived from short run average cost curves and each point on the long run average cost curve corresponds to a point in a short run average cost curve, which is tangent to the long run at that point.

**Long Run Average Costs (LAC):**

LAC derived from SAC (short run average cost) curves. Each point in the LAC curve is a point of tangency of SAC, curve to LAC curve. So, LAC is “U” Shaped curve. For any output level LAC is lower than short run cost because in the long run all the adjustments can be made to minimize the cost, no point on SAC curves can ever be below LAC curve. The Minimum cost point of the LAC curve shows the optimum production level and the optimum plant size.

**Long Run Total Cost (LTC):**

LRTC starts from the origin zero because there is no fixed cost.

**Long Run Marginal Cost (LMC)**

Long run marginal cost is defined at the additional cost of producing an extra unit of the output in the long-run i.e. when all inputs are variable. The LMC curve is derived by the points of tangency between LAC and SAC.

Note an important [relation](https://www.toppr.com/guides/%2Bmaths/relations-and-functions/relations/) between LMC and SAC here. When LMC lies below LAC, LAC is falling, while when LMC is above LAC, LAC is rising. At the point where LMC = LAC, LAC is constant and minimum.

**3.9. Cost Function:**

The concept of production and costs are inseparable. Production can not take place with out incurring costs and costs without production are economically meaningless.

**Cost function:** show the relationship between a firm’s cost of production & its output with the given technology and resource price. Cost functions are derived from production function, which describes the available efficient methods of production at any time.

**Cost function** is mathematical relationship between firm’s cost of production and its output level.

 Where, Q= output, T=technology, RP=resource price

* cost of production( relationship) can be expressed as
* tabular
* graphic
* Mathematically

Mathematically: the cost function is given as: C=a+bQ + bQ2+bQ3

 Where:

* C= total cost
* Q= the output level
* a= the fixed cost
* b= the marginal cost/average variable cost
* bQ= total variable cost

**3.10. The Relation Ship between Cost Function and Production Function:**

* **Average Physical Product(APP) &Average Variable Cost(AVC)**





 But TVC=Px\*X------------------------------------------------------------------------------(3)

Substitute equation (3) to equation (2) we get



But (X/Q=1/APPx), there fore



This is the reason why the cots function is a derived function from production function. Thus, there is an inverse relationship between AVC and APP.

 From the graph we infer that:

* As APP increases , the AVC declines
* As APP gets its maximum, the AVC is at its minimum
* AS APP declines, the AVC is rising

a). Marginal physical product(MPP) & marginal cost(MC)





 But TVC=Px\*X------------------------------------------------------------------------------(3)

Substitute equation (3) to equation (2) we get



But there fore



Therefore, there is an inverse relationship between MC and MPP.

 From the graph we infer that:

* As MPP increases , the MC declines
* As MPP gets its maximum, the MC is at its minimum
* AS MPP declines, the MC is rising

Graphically

This also implies that MC and MP are inversely related. As MP first increases, reaches a maximum and then declines, MC first decreases, reaches a minimum and then increases.

MC

AVC

MP

AP

Cost

AP and

MP

Labor

Output

Generally, falling marginal cost reflects rising marginal product and rising MC reflects falling MP. Falling AVC indicates rising AP, and rising AVC indicates falling AP. AP equal to MP at the point where MC is equal to AVC. At these equality points, average product is at its maximum and AVC is at its minimum. The marginal product curve lies above the average product curve in the region, where the MC lies below AVC. The marginal product curve lies below average product curve in the region, where the AVC curve lies below the MC curve.

* 1. **Economic Optimum**

 When economic optimum is Lies? Economic optimum is found when added return is equal to added cost. (i.e. MR=MC) this a point where a firm maximizes its profit. we can also calculate economic optimum, at which the total gross margin(TGM)is at its maximum in its production process.

 TGM= TR-TVC--- when this difference is at maximum, there is an economic optimum.