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DECISION MAKING IN OPTIMAL PRODUCTION ACROSS FARM / FIRMS

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Often, producing fish and fish products require judicious decision making on how much to produce with the given constraints of resource, capital and time. The decision making in optimal production depend mostly on the cost of resources and price of the output. The production cost includes fixed and variable costs and determining the financial viability of a fish farm or firm (a processing plant) can be discerned through break-even analysis. Break-even analysis technique is used widely in production managements to determine how much production volume is needed to start making a profit.

Basic Cost Concepts

Cost can be defined as the expenditure incurred on the production of a good or service. Total cost (TC) incurred for the production can be divided into Fixed Cost (FC) and Variable Cost (VC).

Total Cost = Fixed Cost + Variable Cost

Fixed cost: Incurred for fixed assets such as land, building, machineries etc. which does not change with the level of output. Rent, depreciation, research and development, marketing costs, administration costs etc. can be cited as examples for fixed costs.

Variable cost or operating cost: Disbursed for the raw materials, wages of labour, etc. which changes with level of production. Variable cost varies directly with the level of output.

Average Costs (AC) is the cost of producing one unit of the output and is determined as follows

AC = TC/Q, Where 'Q' is the total level of output.

Or AC = AFC + AVC,

Where AFC is average fixed cost and AVC is average variable cost.

Average Variable Cost (AVC): Variable cost for producing one unit of output. As production increases, AVC decreases in the initial stage and after a particular point (when MP=0) increases.

AVC = TVC/Q, Where TVC is the total variable cost.

Average Fixed Cost (AFC): Fixed cost required to produce one unit of the output. AFC decreases with increasing output.

AFC = TFC/Q, Where TFC is the total fixed cost.

Marginal Cost (MC): Addition made to total cost as a result of producing one additional unit of the product.

MC = $\frac{\Delta TC}{\Delta Q}$, where ΔTC is change in total cost

ΔQ is change in output

Break-Even Point (BEP)

Break-even point analysis is one of the simplest ways used to highlight areas of economic strength and weakness in a firm. Being one of the main tools of the cost-volume profit (CVP) analysis, it assists in finding out the ways to enhance profitability. The equality point of total cost and total revenue is termed as break-even point. It is the no-profit zone which represents the quantity or revenue required to cover total costs.

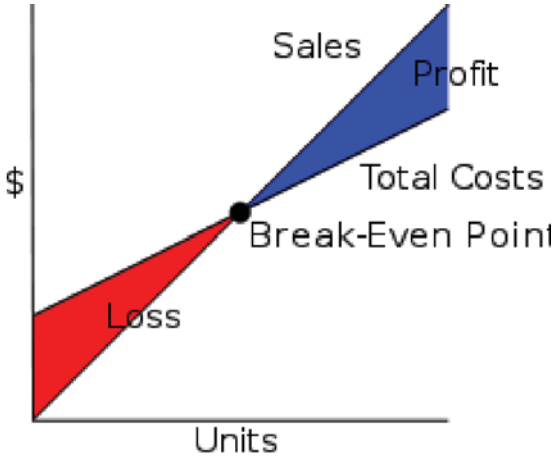

Fig 1: Break-even chart

The break-even chart depicted in figure 1 is a graphical representation of cost at various levels of production where, the break-even point is the neither profit nor loss zone represented by the intersection of the two lines.

Theoretical Background

Major decisions related to safety margin, target profit, sales promotion etc. can be taken by using Break even analysis. The analysis ascertains the extent to which the firm/farm can afford to decline in sales/ production, before it starts incurring losses. The analysis is mainly used to fix the optimum volume of production which could provide increased volume of sales, increased selling price, reduced variable expenses per unit and reduced fixed costs.

Major advantages of BEP analysis can be pointed out as follows;

Profitability: Useful in understanding the relationship between fixed cost, variable cost and the level of profitability at various levels of sales.

Production / Sales level: Analysis is suitable to calculate the volume of production / sales necessary to achieve a maximize profit/ minimize loses . It provides the farm/ business with a minimum production/ sales level which the farm/ firm needs to achieve to avoid losses.

Break-even Quantity (BEQ) determines the quantity required to cover fixed costs. BEV = Fixed costs/ (revenue per unit – variable cost per unit) = Fixed cost/ Unit margin.

Computation Techniques - Algebraic Method:

BEP in Units: BEP (Qty) = F/ (P-V),

Where F= Fixed cost in Rs.
P = Price per unit of the product
V = Variable cost per unit of the product

BEP in monetary value: BEP = F/ (1-(V/P))

Margin of Safety (MoS)

The margin between the actual/budgeted sales and breakeven point is termed as margin of safety. It is the difference between total output and output at BEP. Margin of Safety measures risk while BEP is a measure of sustenance. Breakeven quantity at lower level is desirable while Margin of Safety is better for a business.

Margin of Safety = Total Output – Output at BEP

= Total Revenue – Revenue at BEP

Percentage margin of safety (Qty) = BEP output / Volume of output * 100

Percentage margin of safety (In money) = BEP in monetary value/ Total revenue * 100

Example:

Estimate the profits of two fish processing plants.

Sl.No.	Fixed Cost (lakhs)	Variable Cost (lakhs)	Total Cost (lakhs)	Price per ton (lakhs)	Volume of Output (Qty in ton)	Total Revenue (lakhs)	Variable Cost Fund (lakhs)
Plant I	120	125	245	3.00	120	360	1.041
Plant II	90	135	225	3.00	100	300	1.35

Plant 1:

BEP (Qty) $= \frac{F}{(P-V)}$

$= \frac{120}{(3.00-1.04)}$

= 61.28

BEP (Monetary Value) $= \frac{F}{(1-\frac{V}{P})}$

$= \frac{120}{(1-\frac{1.04}{3.00})}$

= 40.56 lakhs

Margin of Safety = Total Output – Output at BEP

= 120 – 61.28

= 58.72

Percentage margin of safety (Qty) $= \frac{\text{BEP Output}}{\text{Volume of output}} X\ 100$

$= \frac{61.28}{3600} X100$

= 51.06 percent

Percentage margin of safety (In money) $= \frac{\text{BEP in monetary value}}{\text{Total revenue}} X\ 100$

$= \frac{40.56}{360} \text{ X } 100$

= 11.27 percent

Plant 2:

BEP (Qty) = $\frac{F}{(P-V)}$

$= \frac{90}{(3.00-1.35)}$

= 54.55

BEP (Monetary Value) = $\frac{F}{(1-\frac{V}{P})}$

$= \frac{90}{(1-\frac{1.35}{3.00})}$

= 33.96 lakhs

Margin of Safety = Total Output – Output at BEP

= 100 – 54.55

= 45.45

Percentage margin of safety (Qty) = $\frac{\text{BEP Output}}{\text{Volume of output}} \text{X } 100$

$= \frac{54.55}{100} \text{ X}100$

= 54.55 percent

Percentage margin of safety (In money) = $\frac{\text{BEP in monetary value}}{\text{Total revenue}} \text{ X } 100$

$= \frac{33.96}{300} \text{ X } 100$

= 11.32 percent

Interpretation

Between the two fish processing plants analyzed, it was found that Plant II had a lesser breakeven quantity when compared to Plant I with higher the margin of safety and higher break even points in terms of monetary value.

Breakeven quantity is desirable at a lower level for the betterment of the firm. BEP provides a minimum production/ sales level which the farms/ firm needs to achieve to avoid losses. Whereas margin of safety is desired at a higher level since it represents the shock absorbing capacity of the farm/ firm in the event of unexpected risks and uncertainties and also allows the farm/ firm to undertake diversify production / sales promotion activities. BEP assists a farm/ firm in taking production decisions and also considers the impact of revenue/ sales in profitability.