e. Minimum Loss Principle

There can be two decision situations: 1) when selling price covers the average total cost and 2) when selling price is less than average total cost but more than average variable cost. In short run, only variable costs are important in decision-making. In short-run, if price falls below short-run average cost, the firm has no choice but to incur losses. The firm will shut down production, if price falls below average variable cost. So the minimum of average variable cost is the shut down point. This minimum price at which shutting down becomes the preferred alternative is the shut down price.

While production should be maintained in the short run if selling price is above variable cost, it cannot be continued indefinitely unless selling price exceeds average total costs. Unless all fixed costs are returned over long period, the farmer must either switch over to other occupations or experience a continuous decline in living standards. Thus, if the total returns are more than the total costs, the objective of the producer is to maximize the profit. If the MR is less than the ATC, but more than AVC, the objective of the producer is to minimize the loss in short run. When price of output is at P0, there is profit as the equilibrium (MC = MR) is above the minimum of ATC. When price is at P_2,
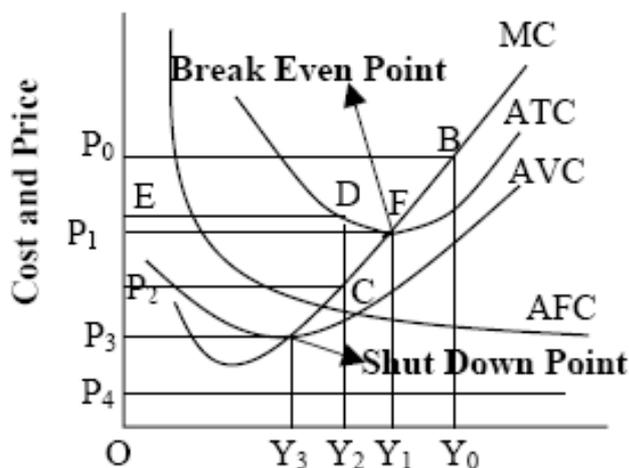
Fig.10.9 Break-Even and Shut Down
Points

the loss in short run, is EP2 or CD or EP2CD. The price P3is the shut down price. When price of output is at P4, the farm would incur loss, as it does not cover even the minimum of AVC.

When price is at minimum of ATC (P_1), there is neither profit nor loss. Hence, minimum of ATC isthe break-even point where both fixed andvariable costs are covered.

f) Factor - Product Price Changes and Production Decisions

The decision-maker or farmer has to expect changes in optimum output, if either the price of output (Py) or the price of factor (Px) changes.

Fig.10.10 (a) Effect of Changes in Output Prices   *Fig. 10.10 (b) Effect of Changes in Input Prices*
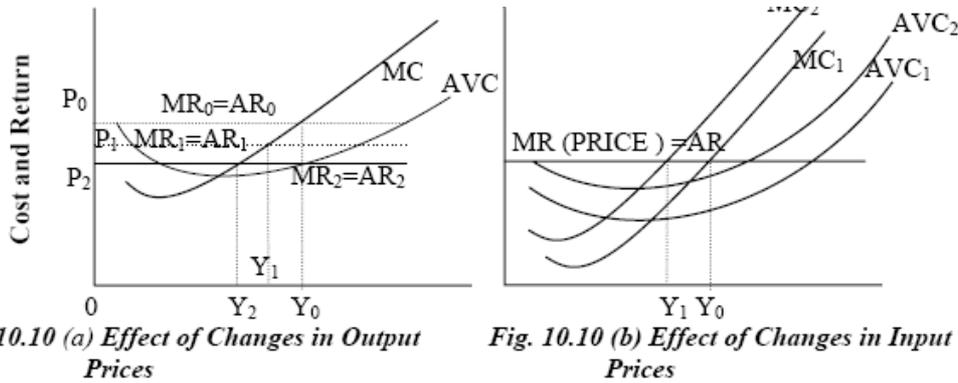
1) Effect of changes in output prices: A decrease in product price would result in decrease of marginal revenue for each level of output. Thus, the optimum output level would decrease from Y_0 to Y_1, if output price decreases from P_0 to P_1 and this would indicate a direct relationship between product price and optimum output levels (Fig. 10.10 (a)).

2) Effect of changes in input prices: An increase in price of variable input causes the cost curves to move upward Fig. 10.10 (b). The intersection of MC_2

with MR will be at a lower output point and production will be reduced from Y_0 to Y_1 in order to maximize the profit. There is an inverse relationship between the factor price and optimum output, i.e., the optimum output level decreases if input price increases.

g) Importance of cost study: The cost study is useful: 1) to calculate profit or loss of an enterprise; 2) to determine the relative profitability of various enterprises; 3) to identify the causes for variations in the unit cost of production; 4) to determine the efficiency and intensity of input-use; and 5) to determine the optimum requirements of variable inputs for each enterprises.

i) Cost of Production and Cost of Cultivation: Cost of production is referred to the expenses incurred per unit of output whereas cost of cultivation is referred to the expenditure incurred per unit area. Cost of production for major crops is often discussed for government's policy formulation in price fixation. Moreover, farmers often lodge complaints on the ground that the price does not cover the cost of production. Hence, the need to study the cost components and cost of production of various crops is evident. Better understanding of various cost components would be useful to control and manage different cultivation practices.

ii) Cost Concepts: Some of the cost concepts used in farm management studies by the Commission on Agricultural Costs and Prices (CACP) of Government of India are A_1, A_2, B_1, B_2, C_1 and C_2, which are defined as follows:

Cost A1 includes:

1. Value of human labour (casual and permanent).

2. Value of bullock power (owned and hired).

3. Value of machine power (owned and hired).

4. Value of seeds.

5. Value of manures and fertilizers.

6. Value of plant protection chemicals.

7. Value of weedicides.

8. Irrigation charges.

9. Land revenue and other taxes.

10. Depreciation on farm implement and farm buildings.

11. Interest on working capital.

12. Other miscellaneous expenses.

The following concepts can be used for easy calculation of the cost of cultivation.

1) Depreciation for buildings: 2 per cent for *pucca* building; 5 per cent for tiled building and 10 per cent for *katcha* building.

2) Depreciation for implements: 10 per cent for major implements and 20 per cent for minor implements.

3) Depreciation for cattle: Appreciation in the value of animals during the first 3 years would be at the ratio of 1:3:5. It remains constant during 4th and 5th year. Then it is assumed that the value of animal depreciates @ 12.5 per cent per year from 6th to 14th year in straight-line method.

4) Interest on working capital: 12 per cent per annum or opportunity cost of capital.

Cost A2 = Cost A1 + Rent paid for leased in land.

Cost B1 = Cost A1 + Interest on the value of owned capital assets (excluding land).

Interest rate of long - term government floated loans or securities: 10 per cent.

Cost B2 = Cost B1 + Rental value of owned land (less land revenue) and Rent paid for leased in land.

Cost C1 = Cost B1 + Imputed value of family labour.

Cost C2 = Cost B2 + Imputed value of family labour.

iii) Income measures in relation to different cost concepts

1. Farm Business Income = Gross Return - Cost A1.

2. Owned Farm Business Income = Gross Return - Cost A2.

3. Family Labour Income = Gross Return - Cost B2.

4. Net Income = Gross Return - Cost C2.

5. Farm Investment Income = Net Income + Imputed rental value of owned land + Interest on fixed capital.

iv) Opportunity Cost

Every resource used in the production process has but one true cost; its opportunity cost. The opportunity cost of a resource is the return, the resource can earn when put to its best alternative use. Suppose, a farmer applies fertilizer (50 kgs) to paddy will add Rs.500 and application of fertilizer (50 kgs) to sugarcane would add Rs.600. Now, if he fertilizes sugarcane, the opportunity cost of fertilizer is Rs.500; he has foregone Rs.500 to earn Rs.600. Every resource used in the production process, thus, has but one true cost; opportunity cost, the next best alternative foregone.

v) Economic Efficiency

Economic efficiency refers to the combinations of inputs that maximize an individual's objectives. Economic efficiency is defined in terms of two conditions, namely, necessary and sufficient.

a) Necessary condition: This condition is met in a production process where there is (1) no possibility of producing the same amount of product with fewer inputs (reducing one or more resources) and (2) no possibility of producing more product with the same amount of inputs. In production function analysis, this condition is met in stage II; that is, when the elasticity of production is equal to or greater than zero and is equal to or less than one ($0 \leq \varepsilon p \leq 1$). The necessary condition refers only to the physical relationship. It is universal because it is applicable in any economic system. No one would knowingly produce in stage III because the same or larger output could be obtained by moving to stage II with lesser input. In a given input-output relationship, many input-output combinations will satisfy the necessary condition. For this reason, an additional condition is needed to single out one alternative from the many that meet the necessary condition.

b) Sufficient Condition: Unlike the necessary condition, which is objective, the sufficient condition for efficiency encompasses individual or social goals and values. In abstract theory, the sufficient condition is often called a choice indicator. The choice indicator helps the manager determine input-use compatible with his objectives. The sufficient condition for an individual striving for high yields per acre will be different from that of an individual whose objective is maximization of profits per acre. In either of these cases, while the choice indicators satisfying the sufficient condition vary, economic efficiency is met because the manager is achieving his goals. Thus, the above elementary variations consider all the possible inter and intra planning period, rate of transformation, technical substitution and product transformation for the input-output, input-input and product-product relationships. The set of necessary and sufficient conditions for profit maximization, corresponding to the above three elementary operations is in Table 10.6 below:

Table 10.6 Necessary and Sufficient Conditions

Necessary condition	Sufficient condition
1. The marginal product of any factor with respect to any product must equal the ratio of their prices. $$\frac{\Delta Y}{\Delta X} = \frac{Px}{Py}$$ 2. The rate of technical substitution between any two inputs must equal the ratio of their prices. $$\frac{\Delta X_1}{\Delta X_2} = -\frac{Px_2}{Px_1}$$ 2. The rate of product transformation for every pair of products must equal the ratio of their prices: $$\frac{\Delta Y_1}{\Delta Y_2} = -\frac{Py_2}{Py_1}$$	1. There must be a diminishing marginal product of a factor with respect to a product. 2. The rate of technical substitution between inputs must be diminishing (Iso quant is convex towards origin). 3. The rate of transformation between products must be increasing (product transformation curve is concave towards origin).

vi) A Choice Indicator: A choice indicator is a yard stick or an index or a criterion indicating which of the two or more alternatives is optimum or will maximize a given objective or end. E.g. Price ratio, substitution ratio, etc. A product can be produced in many ways through different combinations of resources and techniques. The most desirable combination of products or factors cannot be determined without a choice indicator.

a) Optimum Input: P_y MPP = P_x (or) VMP = P_x

b) Optimum Output: P_y = MC

c) Least Cost Combination: $\dfrac{\Delta X_1}{\Delta X_2} = \dfrac{Px_2}{Px_1} = \dfrac{MPPx_2y}{MPPx_1y}$

d) Maximum Revenue Yielding Combination: $\dfrac{\Delta Y_1}{\Delta Y_2} = \dfrac{Py_2}{Py_1} = \dfrac{MPPxy_1}{MPPxy_2}$

A choice must be made with the help of an indicator listed above. It is usually expressed in monetary terms, but could be any other index that reflects likes and dislikes of the farmers. For example, while making a decision, a farmer might ask himself whether paddy is yielding the return twice as much or one-half as much as a competing crop, say irrigated ground-nut. In the study of production economics, the commonly assumed goal of the farm manager is economic efficiency, which would subsume the narrower goal of profit maximization.