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# RATIONALITY OF THE USE OF FACTORS OF PRODUCTION BY SMALL TRAWLERS ALONG CALICUT COAST*

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ABSTRACT

The purpose of the present study is to evaluate the economic rationale of input use by small trawlers in Kerala Coast. In order to estimate the production elasticities of different inputs, a Cobb-Douglas type of production function was fitted to the pooled data on coast and earnings of 50 trawlers for a period of 10 years from 1971-72 to 1980-81, obtained from Kozhikode Regional Fish Marketing Co-operative Society. For functional analysis, vessel-wise gross returns (in rupees) was taken as dependent variable and number of days fished, fuel expenditure (in rupees) and repairing and maintenance charges (in rupees) as independent variables. Marginality analysis was also done to evaluate the efficiency of input use.

The production function as well as the marginality analysis indicated that the increase in the number of days fished would lead to higher gross income. So also increase in oil expenditure from mean level would yield a more than proportionate increase in gross income. However, repairing and maintenance cost had a negative impact on fishing income which indicated that the vessel owner in his own interest should be cautious in the operation to avoid frequent repairs and to reduce the delay in getting the vessels repaired.

## INTRODUCTION

DURNIG the last two decades, consequent to the progressive increase in demand for prawns and the resultant rise in monetary returns of fishing trawlers engaged in the exploitation of prawn fishery, there has been a tremendous increase in the number of trawlers along Kerala Coast. Since each boat owner is concerned only with his return for each unit of effort which is the average revenue for the fishery as a whole, he is not at all bothered about the effect of his boat on the total catch and hence the total revenue of all the vessels. As long as individual boat owners are able to earn profit, more units will be attracted to the fishery till the average revenue per unit of effort equalises with its unit cost which is an open-access equilibrium position. For an unregulated fishery this is a stage at which a bionomic equilibrium is achieved having total cost equal to total revenue. However, for the judicious exploitation of a fishery, the proper goal is to maximise the difference between total cost and revenue. Since the value of fish caught is an added benefit to the society and the costs measure the value of foregone alternatives the maximum spread between the two implies a proper allocation of inputs. So a unit of fish should not be harvested in any period unless its value is at least equal to the cost of obtaining it. Hence it is essential to examine whether the fishermen are rational in the allocation of their limited resources to maximise the profit that the fishery is capable of earning. With this objective an attempt

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is made to evaluate the economic efficiency of input utilisation by trawlers along Calicut Coast.

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## DATA BASE

The data used in this study pertained to 50 trawlers owned by about 200 fishermen families of Calicut and operated under the control of Kozhikode Regional Fish Marketing Cooperative Society. The entire cost and earning data of these trawlers for the period from 1971-72 to 1980-81 were obtained from the society records. All the vessels were 36 footers and the initial investment was same for all.

## METHODOLOGY

Cobb-Douglas production function was used for analysis which is given below.

$Y = a\, x_1^{b1}\, x_2^{b2}\, x_3^{b3}$ where Y is dependent variable, $x_1$, $x_2$ and $x_3$ are explanatory variables, a is constant and $b_1$ $b_2$ and $b_3$ are regression coefficients.

The concepts and definitions of variables used in this study are discussed below.

Y — gross returns in rupees. Since it is difficult to aggregate the physical quantities of different species of prawns and fishes, gross returns was used as dependent variable. Gross returns for each vessel is the value of its total catch.

$X_1$ — number of days fished.

The number of days fished is included in the function as independent variable, because it is an indicator of fishing effort. Gross eturns or fishing income depends on the catch and its value. Catch is a function of effort and stock. Days fished was used as a proxy for effort.

$X_2$ — Fuel expenditure *i.e.* the cost of fuel used for fishing in rupees.

$X_3$ — Repairing and maintenance charges.

This variable is defined as the expenditure (in rupees) incurred for the repairing and maintenance of craft and gear.

Problem of Multicollinearity : It was found that no correlation coefficient between explanatory variables was greater than 0.8 and thus satisfied the criterion for non-seriousness of multi-collinearity.

Marginal value productivity (MVP) : MVP of a particular input is the addition to gross returns for the increase in one more unit of that input while other inputs are kept constant. The MVP was computed for all the explanatory variables $X_1$, $X_2$ and $X_3$ by multiplying their regression coefficients with the ratio of geometric mean (GM) of gross returns to geometric mean of given input.

$$MVP\ x_i = b_i = b_i \frac{\bar{Y}}{\bar{X}_i} \quad (i = 1, 2, 3)$$

where $MVPx_i$—marginal value product of $i^{th}$ factor

$b_i$—regression coefficient of $x_i$

$\bar{y}$—the GM of gross returns

$\bar{x}_i$—the GM of factor $x_i$

Economic efficiency of resources.

To answer the question whether the resources are used to the optimum level for maximising profit, the marginal value products of factors were compared with their respective acquisition costs[3]. The acquisition cost per day of operation worked out at Rs. 232. For 'oil expenditure' and 'maintenance and repairing' acquisition cost of one rupee is estimated at Rs. 1.15 on the basis of a 15% rate of interest.

## RESULTS AND DISCUSSION

The functional analysis was mainly aimed to evaluate the economic efficiency of input utilisation in trawler operation.

The estimated production equation is given below

$$Y = 0.68901\ X_1^{\ 1.1026^{**}}\ X_2^{\ 0.7107^{**}}\ X_3^{\ -0.1109\ NS}$$
$R^2 = 87.2\%$

** Significant at 5 per cent level.

N.S. = Non-significant.

It shows that the coefficient of 'days fished' was 1.1026 which was significant at 5% level. This indicates that if the number of days fished is increased by 1% there would be an increase in gross income by 1.1026%. The coefficient of oil expenditure was 0.7017 which was also significant at 5% level indicating that an increase in oil expenditure by 1% would increase the gross income by 0.7107%. The coefficient of repairing and maintenance expenditure was non-significant and negative. This showed excessive expenditure for repairing and maintenance.

The value of $R^2$ indicates that 87.2% of the variation in Y is explained by the estimated function.

It is obvious from the above Table 1 that the MVP of 'days fished' was Rs. 413. The MVPs of 'Fuel expenditure' and 'repair and maintenance expenditure' were Rs. 2 and Rs. 0.5 respectively. The ratios of MVPs to acquisition costs were more than one for both 'days fished' and fuel expenditure. It meant that there was good scope for increasing the fishing days and oil expenditure.

The level of oil expenditure depends on the distance and duration of fishing. Hence a higher ratio of MVP of oil expenditure to its acquisition cost indicates that more intensive fishing would lead to higher returns. The 50 trawlers on an average operated only 113 days per year. The cooperative society, under the control of which all these units were operating, imposed a restriction on them to operate only 180 days. However not a single unit worked on 180 days per year. On the basis of marginality analysis the optimum level of operation was estimated at 201 days per year. The number of fishing days is also determined by the limitations imposed by the availability of prawn/fish and the time required for maintenance and repair. It was observed that non-cooperation among shareholders also reduced the working days of some of these boats.

Maintenance and repairing expenditure had a negative MVP indicating that gross returns can be increased by reducing the maintenance and repairing charges.

TABLE 1. *Regression coefficients, MVP of factors of production, geometric means of output and inputs and ratios of MVPs to their factor costs*

| Variables | Regression coefficient | MVP of inputs (Rs.) | Geometric means | Acquisition cost (Rs.) | Ratio of MVPs to their acquisition costs |
|---|---|---|---|---|---|
| Gross returns (Y) .. | — | — | 42,326 (Rs.) | | |
| No. of days fished ($X_1$) .. | 1.1026 | 413 | 113 (days) | 232 | 1.78 |
| Fuel expenditure ($X_2$) .. | 0.7107 | 2 | 15,041 (Rs.) | 1.15 | 1.74 |
| Repairing and maintenance expenditure ($X_3$) .. | —0.1109 | —0.5 | 9,388 (Rs.) | 1.15 | —0.43 |

## Conclusion

The functional analysis brought out that the resources were not utilised by trawler owners to the optimum level for the maximisation of the fishing surplus. Trawlers could be operated for more number of days and ventured for more intensive fishing for maximising the fishing surplus as MVPs for fishing days and oil expenditure were higher than their acquisition costs.

Repairing and maintenance charges had a negative impact on fishing income indicating that the vessel owner in his own interest should be cautious in the operation to avoid frequent repair and reduce the delay in getting the vessel repaired.

On the whole it appears that the vessel owners were not so rational in the allocation of their resources to the optimum level of profitability.