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Economics of Operation of Fishing Vessels (Trawlers)

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The economics of operation of fishing trawlers of 9.75 m and 10.97 m overall length is reported on the basis of a case study. There is a significant positive correlation between the number of fishing trips and the average receipts per trip. The profits of the 9.75 m and 10.97 m trawlers for the fishing season were 26.9% and 21.7% respectively on the basis of 225 fishing trips in a year. The break even point for the trawlers lies between 175 and 185 fishing trips. Fuel cost contributes nearly 45% of the cost of operation of the boat. Subsidy to diesel oil was suggested to improve the profitability of the fishing trawlers.

Introduction of mechanized trawlers to exploit the prawn beds along Kerala coast in 15 to 30 m depth has had a great impact on the fish processing industry and export of marine products from India for the past 22 years. Since the introduction of trawling in Indian coastal waters in 1960, there was a steady progress in trawling operations in all the maritime states in India, especially in Kerala. At present there are about 750 trawlers mostly built as per CIFT designs, operating along Kerala coast, mostly of 9.75 m (32') and 10.97 m (36') and a few 9.15 m (30') OAL. In view of the rising trend in the cost of fish production due to the increase in cost of fuel, hull, engine, wages of the crew etc. it is felt necessary to evaluate the economics of operation of these trawlers, especially those of 9.75 m and 10.97 m. Iyer *et al.* (1968) had studied the comparative fishing ability of these trawlers based on the data for 1964–68 fishing seasons. In this communication, the authors have made an attempt to work out the profitability of these two classes of fishing trawlers on the basis of a mathematical model and the minimum number of fishing trips to be conducted by these two classes of trawlers to attain the break even point.

Materials and Methods

Out of the 2630 trawlers operating along Kerala coast, 24 trawlers of 9.75 m and 50 trawlers of 10.97 m overall length were selected for the study. The selected vessels were operated through co-operative societies located in the various parts of Kerala.

The boats were engaged in stern trawling and the fishing season accounted was generally extended from July to June (of the next year). Data on the cost of construction of the hull, engine, gear and accessories, crew wages and commissions, fuel consumption including engine oil and lubricating oil, the number of trips performed, the quantity of prawn and fish catch, the total receipts, insurance charges, repairs and maintenance of the boat including spare parts were collected from the selected boats for 1978–'79 fishing season.

For working out the profitability of the trawlers of 32' and 36' overall length, a mathematical model was employed. The model and explanation of the symbols used in the model are as follows.

Symbols used

A = Capital cost
B = Berthing charges
C = Total expenditure
F = Fixed cost
G = Quantity of fish (in kg.) per trip
K1 = Price of prawn in Rs./Kg.
K2 = Price of fish in Rs./Kg.
L = Expected life of the boat in years
P = Profit
Q = Quantity of prawns per trip in kg.
R = Revenue, Rs.
R1 = Receipt per trip, Rs.
S = Scrap value, Rs.
V = Variable cost, Rs.
a = Amount of instalment towards capital cost = A/L, Rs.
g = Cost of gear, Rs.
i = Interest on borrowed capital, Rs.
d = Depreciation = $\frac{A-S}{L}$, Rs.
P = Insurance premium, Rs.
r = Repairs and mantenance including cost of implements, Rs.
n = Number of trips in a year
q = Quantity of HSD oil per trip, l
q = Quantity of HSD oil per trip, l
e = Quantity of engine oil per trip, l
p1 = Price per litre of HSD oil, Rs.
p2 = Price per litre of engine oil, Rs.
x = Cost of fuel per trip = qp1 + ep2, Rs.
s = Share percentage of crew
y = Wages and commissions = $(R_1 - x)$ s, Rs.
j = Quantity of ice per trip, kg.
p3 = Price of ice/kg, Rs.
z = Cost of ice in Rs./trip – j.p

v = Variable cost trip = x+y+z, Rs.
v = nv = n (x+y+z), Rs.
F = a+g+i+p+r+B, Rs.
C = Q.K1 + G.Ks, Rs.
R = n.R1, Rs.
P = R–C = n.R1- (F + V), Rs.
∴ $P = n(Q.K1 + G.K2) - \frac{A+g+i+d+p+r+B+n=}{L} + n(qpl+cp2+(R1-x)+jp3)$

$$\% \text{ profit} = \frac{P \times 100}{A}$$

For working out the profitability of the boats the cost of construction as during 1978–79 of a 10.97 m fishing boat including all accessories were taken as Rs. 0.225 million and that of a 9.7 m as Rs. 0.165 million. The expected life of the boat was taken as 12 years and the rate of depreciation as 8.33%. The scrap value realised at the end of 12 years was deducted from the capital cost of the boat and the average of this amount for 12 years was taken as depreciation amount. The interest was taken as 12.5% simple interest per year. The amount repaid as capital cost was deducted from each year's outstanding loan amount. The average of the total interest for 12 years was taken as the interest for each year and this worked out to be approximately 7.5% of the capital cost of the boat. The repairs and maintenance charges were calculated for each size of trawlers by taking the average of all the selected trawlers of a particular size for the year. The percentage of this to the capital cost of the boat worked out to be 7.5% per annum. The insurance premium was taken as 5% of the capital cost of the boat. The wages and commissions of the boat crew were worked out by taking 35% of the difference between total receipt and cost of fuel per trip. The berthing charges included that for all 365 days in a year @ of Rs. 5/ day. The cost of ice was worked out by taking 50 kg of ice/trip. @ Rs. 0.20/kg. The percentage profit of boats was worked out by dividing the net profit by the capital cost of the boat.

Results and Discussion

The percentage profitability of the boats worked out by using the model described elsewhere is presented in Table 1 for 9.75 m and 10.97 m fishing boats for 1978–'79. The receipts per day for 225 days of fishing were estimated using the regression equations:

$Y = 3.96 X + 36.26$ for 9.75 m boats and
$Y = 4.88 X + 29.48$ for 10.97 m boats,

where X represents the number of fishing trips by each of the selected boats during the year and Y represents the average receipt per trip of a boat, as there was significant positive correlation between the number of trips and the average receipt per trip. It is evident from Table 1 that the percentage profit of 10.97 boat was 21.7 and that of a 9.75 m boat, 26.9 if the boats operate for 225 trips in a year.

Table 2 gives the profit in relation to number of days of operation of a 10.97 m boat. It is clear that as the number of trips in a year decreases, the profit also decreases. For 225 days of operation,

Table 1. *Economics of operation of fishing trawlers for 225 days of operation*

	10.97 m (Rs.)	9.75 m (Rs.)
Fixed cost (A)		
Bank interest	16,500	12,000
Insurance	11,000	8,000
Loan repayment	18,300	13,300
Repair and maintenance (including cost of implements)	16,500	12,000
Depreciation	11,600	8,400
Cost of gear	1,250	1,000
Berthing charges	2,000	2,000
Sub-total	77,150	56,700
Variable cost (B)		
Fuel	56,250	49,500
Wages, commission and batta for crew	69,066	55,676
Cost of ice	2,250	2,250
Sub-total	1,27,566	1,07,426
Totable expenditure (A + B)	2,04,716	1,64,126
Net profit	48,864	44,449
Profit%	21.7	26.9

Table 2. *Profit in relation to number of days of operation for 10.97 m*

No. of trips	Receipt in Rs./ trip	Total receipt in Rs.	Expenditure in Rs.	Profit in Rs.	Profit %
225	1127	2,53,580	2,04,716	48,864	21.70
200	1005	2,01,000	1,82,250	18,750	8.33
185	932	1,72,402	1,69,803	2,599	1.15
180	908	1,63,353	1,65,823	–2,470	–1.09

Table 3. *Profit in relation to number of days of operation for 9.75 m*

No. of trips	Receipt in Rs./ trip	Total receipt Rs.	Expenditure	Profit Rs.	Profit %
225	927	2,08,575	1,64,126	44,448	26.90
200	828	1,65,652	1,45,528	20,125	12.20
180	749	1,34,831	1,31,881	2,950	2.78
175	729	1,27,621	1,28,642	–1,019	–0.60

the profit was 21.7% and as the number of trips decreased to 200, the profit also decreased to 8.33%, a fall of nearly 13%. When the number of trips further decreased to 185, the profit decreased to 1.15% and a negative profit was observed against 180 trips. Thus, for 10.97 m boats the break-even point lies between 180 and 185 trips per year.

Table 3 gives the profit in relation to the number of days of operation of a 9.75 m boat. If the boat performs 225 trips in a year, the estimated profit it can attain is 26.9% and if it is decreased to 200 trips in a year, the profit falls down to 12.2% and at 180 trips, it has further decreased to 1.78%. The break even point for a 9.75 m boat, therefore, lies between 175 and 180 trips in a year.

From the foregoing, it is evident that the profit of smaller classes of trawlers of sizes 9.75 and 10.97 m depends on the number of trips they perform during a year. The boats were observed to be at a loss for less than 180 trips. This is mainly due to the high cost of operation of the boats. Out of the total expenditure, fuel cost alone contributes about 45%. Most of the boats were unable to cross the break even point of fishing trips in a year owing to unsteady catch and the high cost of fuel. This can be avoided to a certain extent by extending the subsidy on diesel oil to the smaller class of fishing boats.

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