Indian Journal of Geo Marine Science
Vol. 47 (03), March 2018, pp. 653-659

Economic analysis of marine fishing crafts in Thoothukudi province, Tamil Nadu

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Received 23 February 2016 ; revised 28 November 2016

Marine fisheries contribute considerably to the national economy. Fastest growth rate has observed in marine fish production; is attributed equipment modernization in fishing crafts and advancement of fishing technology. Even though, same level of inputs are exerted; there is a discrepancy in their economic performance and efficiency. Therefore, present study was carried out to analyse the inputs use which will give maximum optimal output. The primary data was collected from the 40 respondents from each sector namely mechanized, motorized and traditional, using a pre-tested interview schedule. The stepwise multiple regression approach was performed to find out the most influential variables in each kinds of the fishing crafts. The mechanized crafts have the greater net profit (₹ 9.12 lakhs) and financial performance (58%) than those of the motorized and traditional crafts. The annual fishing days, labour wages and fuel were positively influenced gross revenue of the all the fishing crafts.

[Key words: fishing crafts, investment analysis, resource use efficiency, constraints]

Introduction

Marine fisheries have shown significant growth in the economy, as well as improving the social status of marine fisher's folk in particular around the coastal areas by providing income, employment opportunities, and livelihood. Today, sum of 194,490 fishing crafts has being operated in India of which 37.3% of mechanized, 36.7% motorized and 26.0% traditional crafts[1]. In this 990,083 marine fisher folk engaged in active fishing, out of which 21.6% of were in Tamil Nadu followed by 16.4% in Odisha and 15.2% in Andhra Pradesh.

Marine fish production has been substantially increased for the past five decades. This fast growth rates is attributed by modernization of fishing equipment and advancement of fishing techniques[2]. Fishing crafts that operated with same level of inputs were found to have discrepancy in their economic performance as well as efficiency. With this context, quite a number of studies were undertaken in Tamil Nadu, by craft and gear combination that also measured the degree of performance and efficiency[3-7]. Most of the studies predominantly focused only the cost and returns[8-11]; but the comparison between fishing crafts on investment, cost benefit, and constraints were still lack for the fishing practice. Furthermore today, no recent studies observed in Thoothukudi region.

So, present study focused on to assess the investment pattern, cost structure, and financial and economic performance of mechanized, motorized, and traditional crafts. The findings of this investigation would provide better insights to understand the baseline status and formulate policy options for sustainable marine fisheries. This study performed with a hypothesis is, there is no significant difference in the economic and

financial performance between among of fishing crafts.

Materials and Methods

The study involved both primary and secondary data. Primary data was collected from 40 fishers each from mechanized, motorized, and traditional fishing crafts of Thoothukudi coast, selected using simple random sampling and with a pre-tested interview schedule. The secondary data of published literature were collected from the organizations like State Fisheries Department, Government of Tamil Nadu, and Research institutes including the Central Marine Fisheries Research Institute.

Henry Garrett Ranking technique was employed to evaluate the problems faced by marine fishers of Thoothukudi coast. The per cent position of each rank thus obtained was converted in to scores by referring to the table given by this method[12].

$$\text{Percentage position} = 100 (R_{ij} - 0.5) / N_j$$

Where

R_{ij}= rank given for i^{th} item individual

N_j= Number of items ranked by j^{th} individual

Financial feasibilities of fishing crafts were assessed through capital budgeting technique. The computation was done with assumption of 14% interest rate and constant gross revenue of fishing craft even though there could be entry of new fishing crafts. Terminal value of fishing craft was added to final annual gross revenue.

a. Net Present Value (NPV)

$$NPV = P_1/(1+i)^1 + P_2/(1+i)^2 + \ldots\ldots\ldots P_n / (1+i)^n - C + \text{salvage value}$$

Where

NPV = Net present value, P_n= Net cash flow in year, N; I = discount rate and C = initial cost of investment

b. Benefit Cost Ratio (BCR)

BCR = discounted stream of benefit / discounted stream of cost

c. Pay Back Period (PBP)

PBP= I / E

Where,

PBP = payback period in years, *I*= amount of investment and *E* = expected annual net revenue

Costs of fishing crafts for marine fish production are grouped into two categories, operating cost and fixed cost. Operating cost consists of running cost, craft cost and labour cost[13]. Running cost includes the cost of fuel, ice, food, bata and other operating expenses. Fixed cost consists of interest rate, depreciation and repairs and maintenances. Cost and returns could be measured by different formulae but present study adopted this method[14].

Gross revenue = Quantum of selling x market price

Income = Gross revenue – variable cost, except labour wages

Gross value added = Income – Fixed cost

Gross cash flow = Gross value added – labour cost

Net profit = Gross cash flow – Depreciation – interest on loan payment

Economic performance was measured by Net Cash Flow (NCF), which is equal to the net profit[15]. Economic performance which is also referred as profit margin is the ratio of net profit to gross revenue. If the ratio is more than 10%, it is considered as good economic performance[15].

$$\text{Profit margin} = (\text{net profit} / \text{gross revenue}) \times 100$$

Financial performance or return on owner's capital was calculated as the rate of profit to total owner's capital of the craft. If it is more than 10% it is considered as good financial performance[15].

$$\text{Return on owners capital} = (\text{net profit} / \text{total owners capital}) \times 100$$

Multiple linear regression analysis was done to measure relative contribution of each factor of input to the marine fish production.

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots\ldots\ldots + \beta_n X_n + \varepsilon$$

Where,

Y is the dependent variable, $\beta_0$is the constant, X_n is the independent variable and ε is the error term.

Results and Discussion

Fishing characteristics and constraints

Technical and operational characteristics of traditional, motorized and mechanized fishing crafts are presented in Table 1. It enhances the fish catch with existing inputs. Table 1 showed that, craft size ranged from 4.6 to 15.7 m, having an individual and joint ownership. In mechanized sector, fishing is practiced with inboard engine and the major problem they encountered was lack of adequate supply of diesel. Motorized craft practices with Out Board Engine (OBE)**,** and traditional crafts performed with sail (Table 2). Reduction in catch composition was reported as the major constraint in motorized crafts, second in mechanized and third in traditional craft. The similar kinds of observations were reported in Andhra Pradesh[16].

The average crews per trip was of 3 for traditional, 6 for motorized and 8 for mechanized fishing craft and high wage problem noticed in mechanized fishing craft than those of motorized

and traditional crafts[17].Annual fishing days was found to be higher with 227 days in traditional, 210 days in motorized and 195 days in mechanized fishing crafts. The mechanized fishing crafts had the annual fishing days of 240[18], which higher when compared to present study.

Financial feasibility

The comparative analysis of financial feasibilities of mechanized, motorized and traditional fishing crafts details are presented in Table 3. The NPV had higher in mechanized of ₹ 33.84 lakhs than those of motorized ₹ 1.13 lakhs and traditional sector of ₹ 0.02 lakhs. All the fishing crafts had benefit over the cost, which was conformed from the BCR. It was found higher in traditional sector (1.16%) than mechanized (1.13%) and motorized sector (1.11%). Nevertheless, present finding of BCR was disparate with the result of other study[19]; found that mechanized fishing crafts had higher benefit over the cost than motorized and traditional sector. This could be because of greater discounted stream of benefit than cost in mechanized and motorized craft. Pay Back Period (PBP) of mechanized sector was lower than motorized and traditional craft. The result of payback periods, were similar to that of other findings[7,18] payback period of 1.5 years for mechanized fishing crafts.

Table 1. Technical-economic and operational characteristics of different fishing sector

Sl.no	Criteria	Traditional (M ± SE)	Motorized (M ± SE)	Mechanized (M ± SE)
1.	Craft size (Meter)	4.65 ± 0.36	12.03 ± 1.88	15.71 ± 1.87
2.	Types of engine (horse power)	-	Outboard	Inboard
3.	Ownership	Individual and joint	Individual and joint	Individual and joint
4.	Tonnage (tonnes)	-	5.01 ± 1.86	6.73 ± 1.36
5.	Speed (Knots)	-	8.35 ± 1.78	8.575 ± 1.22
6.	Fishing gear (names)	Gillnet	Gillnet, long line and hook and line	Fish trawling and shrimp trawling
7.	Crew size (numbers)	3.0 ± 0.4	6.0 ± 0.8	8.0 ± 0.59
8.	Annual fishing days (days)	227 ± 9.6	210 ± 19.21	195 ± 7.44
9.	Distance from shore (km)	-	48.87 ± 13.7	117.63 ± 17.28
10.	Craft life (years)	15 ± 0.49	14.33 ± 0.94	10 ± 0.25
11.	Gear life (years)	-	3 ± 0.59	2.9 ± 0.25

Table 2. Problems encountered by different fishing sector

Sl.no	Constraints	Traditional		Motorized		Mechanized	
		Mean (%)	Rank	Mean (%)	Rank	Mean (%)	Rank
1	Lack of adequate supply of diesel	0	0	38.75	5	63.75	1
2	High wage rate for crew	0	0	0	0	33.75	7
3	Reduction in catch composition	58.75	3	66.25	1	61.25	2
4	Inadequate market	41.25	5	46.25	4	0	0
5	Poor landing and berthing facilities	46.25	4	21.25	7	51.25	4
6	Lack of institutional finance	68.75	2	48.75	3	46.25	5
7	Low price for fish	76.25	1	56.25	2	56.25	3
8	Fishing area restriction	36.25	6	36.25	6	31.25	8
9	Absence of extra navigational equipment	0	0	0	0	36.25	6

Table 3. Financial feasibility of mechanized, motorized and traditional sector

Sl.no	Criteria	Traditional	Motorized	Mechanized
1.	NPV (₹)	1941	113362	3384339
2.	BCR (%)	1.16	1.11	1.13
3.	PBP(yrs.)	4.08	3.39	2.76

Cost structure

Cost for marine fish production are grouped into two categories as operating cost and fixed cost[13]. The cost of fuel was the major factor contributing to the high running cost in mechanized sector than motorized sector. Running cost is the largest portion accounting to the operating cost as well as total cost which excludes the traditional fishing crafts[17,20]. This too, confirmed by Figure 1 and 2.

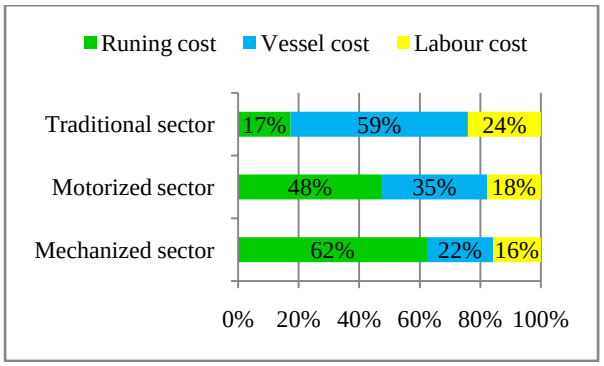

Fig.1. Operating cost of the traditional, motorized and mechanized fishing craft

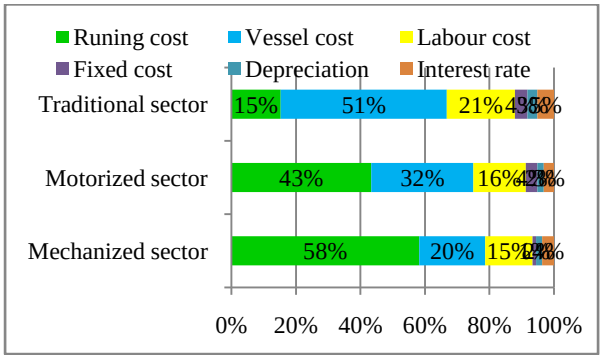

Fig. 2. Total cost of the traditional, motorized and mechanized fishing craft

Higher running cost accounted in mechanized craft (62%) than motorized (48%) and traditional craft (17%). But, crafts cost and labour cost was found to be higher in traditional fishing craft (59% and 24% respectively) than those of motorized and mechanized craft. The average operating cost of trawler for the east coast of India was about 47% and 50% in west coast of India. Operating cost was accounted around 59% for hook and line in motorized and 37% for gillnet in traditional fishing crafts[17]. A comparative analysis of cost and returns structure for the mechanized, motorized and traditional fishing crafts is presented in Table 4. Annual gross revenue was found to be lower in traditional (₹ 0.85 lakhs) than those of motorized (₹ 6.10 lakhs) and mechanized craft (₹ 88.19lakhs).

Net profit is the sum of difference between annual gross revenue and total cost. Annual net profit was found of ₹ 9.12 lakhs, ₹ 0.85 lakhs and ₹ 0.17 lakhs in mechanized, motorized, and traditional sectors respectively. Mechanized sector having higher returns, this may be attributed due to better technical efficiency[21].

The existing results are more or less similar to the results of other studies concerning net return and not greatly deviated from the previous findings[13,22].

Table 4. Cost and returns of marine fisheries in Thoothukudi district (Values in ₹)

Content	Mechanized	Motorized	Traditional
Gross revenue	8819883	610998	85418
Variable cost except labour cost	5783477	333513	21247
Income	3036406	277485	64170
Fixed cost	113000	28000	5360
Gross value added	2923406	249485	58810
Labour cost	1461703	124742	29405
Gross cash flow	1461703	124742	29405
Depreciation	182925	15241	4331
Interest loan payment	365850	24209	7160
Profit	912928	85291	17913

Economic and financial performance

The economic and financial performance of mechanized, motorized and traditional crafts is presented in Figure 3. Economic performance is not same of net benefit. The economic performance of traditional sector was higher of 21% than those of motorized of 14% and mechanized sector of 10 %. All type of fishing crafts had good economic performance, as crafts margin ratio more than 10%[18]. Present results were toeing the line with main discoveries[16,17] and profit margin of mechanized sector was highly associated with long liner fisheries profit margin of 12.1 per cent[23]. The net difference between the inflow and outflow cost was lower in traditional sector, it attributed higher economic performance than mechanized and motorized crafts.

Financial performance was measured by the returns on owner's capital (Simple Rate of Return). It was good in all type of fishing crafts, higher record had in mechanized crafts of 58%, followed by the motorized of 40%and lastly recorded in traditional crafts of 26%. The investment analysis of trawler, rate of return found to be around 66%[18]. The financial performance of motorized fishing crafts in Vellapatti fishing village Thoothukudi, rate of return was found that of 46% and 35% for FRP boat and Vallam respectively[22].

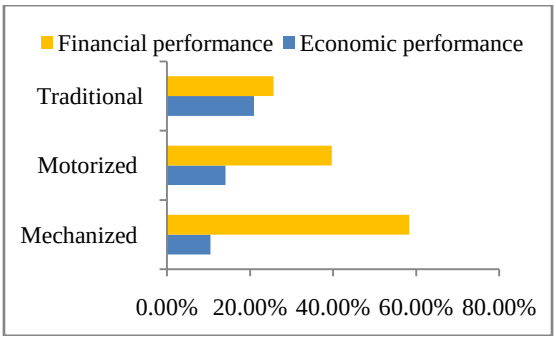

Fig. 3. Performance of the different fishing crafts

Table 5. Econometric results of different marine fishing craft

Sl. No	sector	Independent variable	Coefficients ± SE	"t" value	r square vale
1.	Traditional sector	Labour wages	0.008 ± 0.002*	5.054	0.993
		Annual fishing days	0.624 ± 0.2*	3.063	
2.	Motorized sector	Annual fishing days	430.85± 130.41*	3.304	0.994
		Other operating cost	1.07 ± 0.04*	25.840	
		Fuel	1.194 ± 0.07*	17.197	
		Labour wages	1.974 ± 0.14*	13.909	
3.	Mechanized sector	Annual fishing days	118.35 ± 74.41	1.590	0.996
		Craft length	753.47 ± 123.4	.606	
		Labour charges	0.023 ± 0.006*	3.941	
		Fuel	0.011± 0.003*	3.145	

Multiple regression approach

The regression analysis was done to find out the possible way to improve the fishing practice which determinants of increase the fish catch. For motorized craft, the coefficients of the independent variables are (Table 5) suggested that output statistically influenced by labour wages, annual fishing days, fuel and other operating expenses (purchasing bait). Which implies that with increasing 1% of fuel output will increase by 1.2% and vice versa. Similarly annual fishing days, labour wages and other operating costs (bait cost) influenced fish catch and are significant at P< 0.05 level of significance. The positive relationship was noticed between the annual fishing days and gross revenue[23]. But, some other studies[24,25] were observed appositive association between annual fishing days and length of the crafts to the total fish production. In present investigation, among all independent variable only the labour wages, annual fishing days and fuel were generally influenced the fish catch of all fishing crafts; except fuel in traditional craft and remaining variable too influenced but not significant statistically.

Conclusions

Any investment activity creates income, without profit no one invest which too, no exception in marine capture fisheries sector. The traditional, motorized and mechanized fishing crafts were found profitable and economically viable. Economic performance of traditional craft was higher (21%) with less capital investment than those of motorized (14%) and mechanized sector (10 %). It observed that, all the fishing crafts have been operating in optimal profit margin. This investigation concludes that traditional fishing craft sector has emerged as an economically more viable option than other two sectors. Mechanized craft has optimum economic performance and higher financial performance than those of motorized and traditional craft. Hence, this study concludes that, overall performance and efficiency was found to be in mechanized sector than motorized and traditional fishing crafts. This could be attributed due reach of mechanized crafts to high potential fishing grounds of Gulf of Mannar which has rich species diversity. The optimum yield is being attained through the strict implementation of the Tamil Nadu Marine Fisheries Regulation Act.

Therefore, the mechanized fishing crafts need to be regulated and managed properly as it could be used to generate a good amount of profit. However, the motorized and traditional sectors would also need a management system, which would help them to improve their profit margin through adoption of improved and sustainable fishing methods.

Acknowledgement

Author would like to thank the Director, ICAR – Central Institute of Fisheries Education, Mumbai for providing the necessary facilities and financial support during the course of this study. Authors are thankful to the department of fisheries and marine fishers of the Thoothukudi district of Tamil Nadu. Authors also acknowledge Dr. I. Sivaraman, CIFA and anonymous reviewer for the value comments to improve this manuscript.

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