Analysis of Costs and Returns of Mechanized Fishing Boat Operations in India

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ABSTRACT

This article makes an attempt to analyze the cost and returns of Mechanized Fishing Boat Operators (MFBO's) and the determinants of the selected MFBOs. The study is based on a sample of 180 MFBOs operating from Visakhapatnam fishing harbor in the state of Andhra Pradesh. Visakahapatnam is one of prominent coastal cities in the East coast of India. According to the records of the Visakhapatnam Port Trust and Visakhapatnam fishing harbor, there are 600 mechanized fishing boats. Out of this, 450 are of Sona type and 150 are of Sorra type. For the present study a sample of 120 Sona type and 60 Sorra type MFBOs are selected. Primary data and information on selected variables are collected by means of a well-structured Schedule. The selected variables are Personnel employed, Frequency of voyage, Voyage Period (in days), Voyages per Annum, Area of Fishing, Cost Structure of Marine Fishing Boat Operations (Berth Charges, Fuel Charges, Cost of Lubricants, Cost of Ice, Salaries and Wages, Cost of Food Materials and Water, Cost of Repairs and Replacements), Total Variable Cost (TVC), Total Volume of the Catch, Total Value of the Catch, Annual Total Value of the Catch, and Profit Per Annum. The conclusions arrived at would be useful to formulate constructive policies that enhance the profitability as well as economic status of MFBOs.

I. Introduction

'Fishing Communities' are considered as one of the most backward sections of the Indian society. Data or information on the economics of different fishing boat operations forms a good database for

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effective management of this economically backward sector in India. Mechanized fishing boat operations were first introduced in the late fifties in Andhra Pradesh and developed at a fast pace during late sixties and seventies of this century, when both the central and state governments announced a special scheme to provide boats, which were constructed on subsidy at the state-owned boat building yard at Kakinada for holders of the diploma in Fisheries Technology. This scheme became a great success in the East coast of India.

India has a coastline of 8,041 kms covering 5,06,000 sq. kms continental shelf-area and 3,726 marine villages with 2,333 fish landing centers. Andhra Pradesh has 9 Coastal Districts covering 974 kms of coastline from Srikakulam to Nellore, 31,000 sq. kms continental shelf-area, 508 Landing Centres and 508 Marine Villages. When compared to the all-India level, Andhra Pradesh has 12.11 per cent of Indian coastline, 6.13 per cent of continental shelf-area, 13.28 per cent of villages and 20 per cent of landing centers. Within the Bay of Bengal states in India, Andhra Pradesh occupies the second rank in landing centers and the first position in the number of fishing vessels, freezing plants and peeling sheds. But in terms of production per km of coastline, it is the least among the Bay of Bengal States.

In 1971, the Indian Oil Corporation supplied oil and the Visakhapatnam Port Trust provided water facilities for fishing operations. After that, the Fishing Harbor was constructed in Visakhapatnam during 1976-77 with financial assistance from the World Bank. The minor fishing harbors and major fish landing centers in the State of Andhra Pradesh are Kakinada, Nizampatnam and Bhavanapadu. Recently, one fish-landing centre at Kalingapatnam has been commissioned. According to the government records, there are the 54,000 non-mechanized traditional boats, 4,200 motorized boats and 8,700 mechanized boats in Andhra Pradesh.

Studies on comparative fishing ability and economic performance of 9.15 m (30'), 9.76 m (32') and 10.97 m (36') vessels operating along the Kerala Coast of India were conducted by Krishna Iyer *et al.* (1983). On the basis of data for four consecutive years from 1964 to 1968, they concluded that the bigger size boats are comparatively more efficient in fishing operation. Joseph (1973) analyzed the economics of operation of the 17.5 m indigenous mechanized fishing boat along the Kerala Coast and concluded that these boats are more profitable and they can operate about 250 days per annum. Sathiadhas and Panikkar (1988) conducted studies on costs and earnings of traditional fishing units along Trivandrum Coast of India. The study covered catamarans with hooks and lines, catamarans with gillnets and plank-built cannot be fitted with outboard motor (OBM). The study further indicates that the catamaran units show better input-output and capital efficiencies as compared to out board motor units since the initial investment is relatively less. Pillai *and* Namboodiri (1991) described the stages of development in mechanization of traditional fishing boats and the problems connected with the operational cost of diesel versus kerosene drives. They studied both imported motors using petrol and Kerosene engine and indigenously developed drive units of mechanized traditional boats, and analyzed the comparative merits and demerits of these types of drives. They concluded that the diesel driven units are more economical than petrol-kerosene units.

The study of Balan *et al.* (1989) on the impact of motorization of country craft in Kerala deals with the costs, earnings and key economic indicators for motorized and non-motorized plank-built boats, canoes and catamarans operating hook and lines, boatseines and gillnets. He noted that returns to capital and labour were comparatively more for motorized units. Menon, Bensam and Balachandran (1991) studied the present status of hooks and line fisheries in the coastal waters of India. They analyzed all India, State wise, Centre wise and Season wise hooks and line catch, effort, catch rates, species compression and fishing areas. They observed that hooks and line was operated all along the coastal waters and enjoyed

better catches. Choudhury (1991) analyzed various aspects of small fishing boats for operating gill nets and long lines with respect to size of vessel, material used for construction, engine power and its speed. He recommended a suitable 8.0 m steel vessel fitted with 10hp engine for inshore waters to get more economic value. He concluded that the operation of vessels on an average landing day (for 100 days in a year) should fetch a net return of Rs.1300/ approximately, i.e., an income of Rs.1,30,000 per annum.

Pillai (1991) analyzed the trend of Tuna fishery in India in the small scale-sector and the strategies of development of this sector through low cost fishing techniques. He also studied the impact of modernization of fishing boats. For augmenting production of tunas from the Indian EEZ, he suggested: (a) introduction of 10-20 m OAL (Overall Length) multi-day fishing boats with adequate storage facility, and (b) to realize fuel economy by the introduction and utilization of Chorkor ovens. Panikkar *et al.*(1990) in their studies on comparative economic efficiency of mechanized boats operating at Cochin Fishing Harbor in Kerala suggested a set of key economic indicators to assess the comparative efficiency of purse seiners gillnetters and trawlers. They concluded that the purse seiners are ore efficient than the other two types of mechanized units. Sehara and Karbhari (1989) observed that Out Board Motor (OBM) boats are more popular in Gujarat. Further, they studied the costs and returns of gillnet fisheries by OBM units along northwest coast of India. Fishermen prefer OBM units since the capital investment is lower and the profits are higher. Based on various economic parameters, the gillnet fishing with outboard engine was found to be profitable in northwest coast of India. Datta and Dan (1989) studied the economic efficiency of different craft-gear combinations prevailing along the Orissa Coast. They noted that returns from trawler were considerably higher than other types of fishing units. Balasubramaniamet.al. (2000) conducted a study to identify the extent of adoption of improved practices and the extent of annual fish captures among the

mechanized boat operators and to analyze the variables influencing the annual fish catch of the mechanized fishing boat operators.

The studies relating to economic aspects of the marine fisheries of our country are not many and most of them were concentrated in some selected centers and all centers of importance are not covered. The noteworthy micro level study carried out in our country was the economics of artisanal and mechanized fisheries in Kerala, Tamil Nadu in the South Coast, Maharashtra and Gujarat in the West Coast. Studies relating to Visakhapatnam coast are very limited and coverage is inadequate. Since fisheries economics has emerged as an important subject in recent times in India, an elaborate study is planned to be carried out in Visakhapatnam Fishing Harbor. Problems differ from region to region and there is every need to have more and more micro level studies to understand economic aspects of marine fisheries.

Visakhapatnam has a major fishing harbor in the State of Andhra Pradesh. Initially the fishing harbor was designed to accommodate only 15 large fishing vessels and 200 mechanized boats. At present, it can accommodate around 100 fishing vessels and 600 different varieties of mechanized boats. The fishing fleet of Visakhapatnam is categorized into three types according to the potential distance of their operation. They are: (i) Traditional or Artisan sector operating in the shores water with or without outboard engine, (ii) Small mechanized sector consisting of small trawlers, (32 to 42 footer with 60 to 110 hp engines) and purse seines (40 to 48 footers with 120 HP engines), and (iii) Large vessels designed to operate the high seas. In this study, only the second category of fishing boat operators, i.e., mechanized fishing boats, were selected due to their contribution to this sector in terms of both volume and value of the marine catch.

II. Methodology

Objective of the Study: In Visakhapatnam Fishing Harbor, many types of specialized mechanized fishing boats were famous till the

80's, namely, Pablo, Pomfret, Royya, Sorra, Jalaja, Dolphin, are seen now only in single digit. The only two types, namely, Sona and Sorra type are now in operation. The third category of marine fishing boats are declining and the first category are almost limited to traditional way of fishing. Hence, the study concentrates on SONA and SORRA types of Mechanized Fishing Boat Operators (MFBOs). The main objective of the study is to analyze the cost and returns of Mechanized Fishing Boat Operations.

Selection of the Sample: According to the records of the Visakhapatnam Port Trust and Visakhapatnam fishing harbor, there are 600 mechanized fishing boats. Out of this, 450 are of Sona type and 150 are of Sorra type. For this study, a sample of 120 Sona type and 60 Sorra types of MFBOs were selected randomly in different time periods.

Data Collection: In this study, both the primary and secondary data are used. The secondary data are collected from published and unpublished reports and records of different government organizations. Primary data and information on select variables are collected by means of a well-structured Schedule. The schedule is revised after conducting a test trial of a sample of 30 MFBOs.

Analysis: The entire data is coded and computerized in Excel format and SPSS Package is used to obtain Bivariate Frequency Tables. Further, Chi-Square Tests are used wherever found necessary.

III. Results and Discussion

1. Organization of Voyages

The Sona type of boat is well fitted with a high capacity engine and equipped with more facilities to stay for longer period during a voyage than Sorra type. The voyage frequency is usually less in Sona type than the Sorra type. This implies that Sona type boats stay for a

longer period in the sea per voyage for the catchments than the Sorra type of boats. When the boat operators were questioned about the minimum and maximum frequency of voyages during a month, they responded that, Sona type of boats go at minimum once (1) and maximum twice (2) into the sea while the sorra type of boats go at minimum once (1) and maximum thrice (3).

a)Personnel Employed: The average cost of Sona type boat is about Rs.7.63 lakhs while that of Sorra type boat is that of Rs.5.68 lakhs. The cost difference is mainly due to size and capacity of the engine installed, and other equipment like Gear, VHFset, Sonarsets, etc. Out of this, the average cost of nets and equipment is about Rs. 43,000/- and Rs.33,000/- in Sona type boat and Rs.40,000/- and Rs.24,0000 in Sorra type of boats, respectively. Thus not only the actual cost of the boat but also that of the equipment is higher for Sona type than that of Sorra type boats. Size of the boat and the equipment are the major factors which influence the employment potential, marine catch, voyage period and profit levels. The average number of personnel employed is 8 (eight) in Sona type and 7 (seven) in Sorra type of boats (see table 1 for more details).

Further, the number of people employed varies between 7 to 10 people in Sona type and between 6 to 9 in Sorra type of boats. It can be noted from table 1 that the number of personnel employed is 8 or above in 70% of the Sona type while 7 or 8 in 65% of the Sorra type of boats. This clearly shows that Sona type of boats, though costly, provide more employment potential in the mechanized fishing boat operations. The calculated chi-square value (with Yates correction) is 16.28 and is found to be statistically significant at 1 percent level. The co-efficient of association is 0.59 and this clearly shows that employment is associated with the type of boat and employment is higher in Sona type than in Sorra type of boat.

b)Frequency of voyage: Generally, all mechanized fishing boats are suitable for voyage for more than a day. Low voyage period is usually followed by high frequency of voyages and high voyage

period is usually followed by low frequency of voyages. Hence, voyage period should be interpreted carefully.

Table 1. Organization of voyages

Determinant	Sona	Sorra	Total*
Number of personnel employed**			
Above 8	34(28.33)	0(0.00)	34(18.89)
Eight	51(42.50)	23(38.33)	74(41.11)
Seven	34(28.33)	16(26.67)	50(27.78)
Below 7	1(0.83)	21(35.00)	22(12.22)
Total	**120(100.00)**	**60(100.00)**	**180(100.00)**
Frequency of voyage**			
Above 16 days	58(48.33)	1(1.67)	59(32.78)
15 days to 14 days	24(20.00)	19(31.68)	38(21.11)
13 to 11 days	14(11.67)	3(5.00)	33(18.33)
10 days and below	24(20.00)	26(43.33)	50(27.78)
Total	**120(100.00)**	**60(100.00)**	**180(100.00)**
Factors determining the Voyage Period**			
Quantum of catch	120(100.00)	57(95.00)	177(98.33)
Weather Conditions	100(83.33)	53(88.33)	153(85.00)
Health conditions of the crew	35(29.17)	21(35.00)	56(31.11)
Health conditions of the fishermen	55(45.83)	34(56.67)	89(49.44)
Boat condition	120(100.00)	60(100.00)	180(100.00)
Scarcity of raw materials	120(100.00)	60(100.00)	180(100.00)
Total	**120(100.00)**	**60(100.00)**	**180(100.00)**
Area of Fishing ***			
Visakhapatnam	116(96.67)	58(96.67)	174(96.67)
Kakinada region	12(10.00)	6(10.00)	18(10.00)
Machilipatnam region	11(9.17)	6(10.00)	17(9.44)
Nellore region	11(9.17)	6(10.00)	17(9.44)
Tamilnadu region	11(9.17)	6(10.00)	17(9.44)
Kalingapatnam region	112(93.33)	55(91.67)	167(92.78)
Orrissa region	86(71.66)	39(65.00)	125(69.44)
West Bengal region	14(11.66)	1(1.67)	15(8.33)

Paradeep	109(90.83)	39(65.00)	148(82.22)
Total	**120(100.00)**	**60(100.00)**	**180(100.00)**

Table 1. *Cont'd.*

Voyages per Annum* **			
31 and above	0(0.00)	5(8.33)	5(2.78)
30-25	4(3.33)	9(15.00)	13(7.22)
24-19	32(26.67)	30(50.00)	62(34.44)
18-12	49(40.83)	16(26.67)	65(36.11)
Below 12	35(29.17)	0(0.00)	35(19.44)
Total	**120(100.00)**	**60(100.00)**	**180(100.00)**

Notes: * Figures in the brackets are percentage to row totals.

** Figures in the brackets are percentage to total sample size.

******* Figures in the brackets are percentage to total number of sampled MFBO'S -120 in Sona and 60 in Sorra-Total 180 - total percentages do not add to hundred as most of the MFBO's gave more than one seasons.

However, given the type of boat, days of voyage are also important since they determine the quality and quantity of the marine catch and its value in important seasons. The average number of voyage days is 11 in the case of Sorra boat and 16 in the case of Sona boat. Further, it is observed that voyage days are less (31%) even in Sona type of MFBOs and more in Sorra type (25%). However, voyage period in Sona boat operators is more than that of Sorra type. When respondents were asked about the major factors that influence the voyage period, the majority of them replied that the quantity of catch (98.33%), weather conditions in the sea (85%), boat conditions and scarcity of raw materials are the major factors (100%).

c) Area of Fishing: The MFBOs are permitted to operate their boats up to Chennai, formerly known as Madras, towards the South and to Kolkota, formerly known as Calcutta, towards North. Depending on their experiences, they usually move either towards

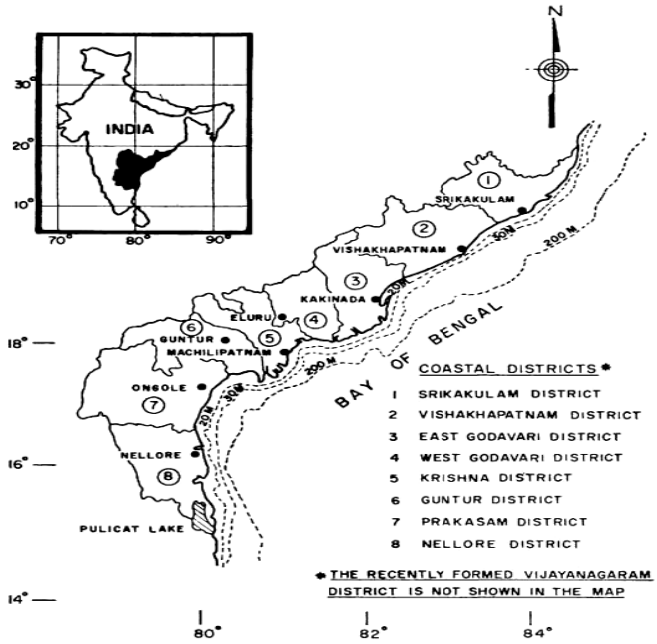
the south or north. However, the main concentration will be in and around Visakhapatnam coast only (see Fig. 1). The major fishing grounds in and around Visakhapatnam are Pentakota, Pudi Madika, Visakhapatnam, Bhimunipatnam, Konada, Chintapalli, Kalingapatnam, Bhavanapadu, Poondi and Bharuva. When asked about their preferred fishing zones, more than 90% of both types of boat operators expressed that they concentrate in Visakhapatnam, Kalingapatnam and Paradweep fishing zones (Kalingapatnam is about 130 km to Visakhapatnam city towards the North).

d)Voyages per Annum: The average number of voyages per year comes to 16 in the case of Sona type and 21 in the case of Sorra type of boats. It can be seen from table 1 that, the number of voyages per annum exceeding 25 is 3% in the case of Sona type, and 23% in the case of Sorra type of boats. Similarly the number of voyages per annum undertaken by the boat operators below 18 is about 70% in the case of Sona while it is 27% in the case of Sorra. These differences may be mainly due to the better facilities available to carry fuel, ice and food in Sona type of boat than in Sorra type of boat. Besides this, Sona type of boat contains more technical know-how facility such as VHF, Sonar systems, etc., in the boat.

2. Cost Structure of Marine Fishing Boat Operations

The expenses incurred for a voyage are considered as s variable or operating cost. This consists of Berth Charges, Fuel Charges, Cost of Lubricants, Cost of Ice, Salaries, Cost of Food and Water and Cost of Repairs. These costs are analyzed initially on per voyage basis and later computed the cost per annum, taking into account the average number of voyages per year so as to determine the profit and loss of the fishing boat operations (see table 2).

Fig. 1. Coastal map of Andhra Pradesh, India



(*Note:* Presently, there is another district, i.e., Vizaiyanagaram, which has been bifurcated between the Srikakulam and Visakahapatnam districts of Andhra Pradesh.)

a)Berth Charges: Berth charges are fixed by the port/fishing harbor governing authorities towards the anchoring, reloading and unloading activities of the fishing boat operations. Berth charge is constant and it is fixed at Rs.500/- per month by port authorities in Visakhapatnam fishing harbor irrespective of the type of the boat. It is observed that the average berth charge per voyage comes to

Rs.406/- for Sona type of boat and Rs.295/- for Sorra type of boat. This is due to the higher frequency of voyages in Sorra than Sona.

Table 2. Cost structure of Mechanized fishing boat operation (Indian Rupees =Rs.)

I	SONA	SORRA	TOTAL
Average Variable Costs per Voyage (In INR)			
a) Berth Charges	406	295	-
b) Fuel charges	53,258	36,632	47,500
c) Cost of lubricants	403	119	375
d) Cost of Ice	4,858	4,190	4,636
e) Salaries of crew	2,361	1,592	2,104
f) Cost of food, water	4,640	3,517	4,266
g) Cost of Repairs	931	565	809
h) Depreciation	1,846	834	-
i) Others	853	548	-
Total	**120(100.00)**	**60(100.00)**	**180(100.00)**
Fuel Charges			
Above 53258	59(49.17)	3(5.00)	62(34.44)
53257 to 47717	19(15.83)	8(13.33)	27(15.00)
47716 to 36633	12(10.00)	19(31.67)	31(17.22)
36632and below	30(25.00)	30(50.00)	60(33.33)
Total	**120(100.00)**	**60(100.00)**	**180(100.00)**
Cost of Lubricants			
Above 403	56(46.67)	16(26.67)	72(40.00)
402 to 375	14(11.67)	3(5.00)	17(9.44)
374 to 320	0(0.00)	1(1.67)	1(0.56)
319 and Below	50(91.67)	40(66.67)	90(50.00)
Total	**120(100.00)**	**60(100.00)**	**180(100.00)**
Cost of Ice			
Above 4858	65(54.17)	19(31.67)	89(46.67)
4857 to 4636	0(0.00)	0(0.00)	0(0.00)
4635 to 4190	8(6.67)	6(10.00)	14(7.78)
4189 and below	47(39.17)	34(58.33)	82(45.56)

Total	**120(100.00)**	**60(100.00)**	**180(100.00)**

Table 2. *Cont'd.*

Salaries and Wages			
Above 2361	54(45.00)	8(13.33)	62(34.44)
2360 to 2104	3(2.50)	2(3.33)	5(2.78)
2103 to 1592	28(23.33)	16(26.67)	44(24.44)
1591and below	35(29.17)	34(56.67)	69(38.33)
Total	**120(100.00)**	**60(100.00)**	**180(100.00)**
Cost of Food materials and water			
Above 1640	64(53.33)	10(16.67)	74(41.11)
1639 to 4266	8(6.67)	3(5.00)	11(6.11)
4265 to 3517	17(14.17)	12(20.00)	29(16.11)
3616 and below	31(25.83)	35(58.33)	66(36.67)
Total	**120(100.00)**	**60(100.00)**	**180(100.00)**
Cost of Repairs and Replacements			
Above 931	61(50.83)	8(13.33)	69(38.33)
930 to 809	0(0.00)	0(0.00)	0(0.00)
808 to 565	6(15.00)	2(3.33)	8(4.44)
564 and below	53(44.17)	50(83.33)	103(57.22)
Total	**120(100.00)**	**60(100.00)**	**180(100.00)**
Total Variable Cost (TVC)			
Above 69435	59(49.17)	4(6.67)	63(35.00)
69434 to 62456	17(14.17)	7(11.67)	24(13.33)
62455 to 48498	15(12.50)	19(31.67)	34(18.89
48497 and below	29(24.17)	30(50.00)	59(32.78)
Total	**120(100.00)**	**60(100.00)**	**180(100.00)**

b)Fuel Charges: "Diesel" is the fuel used to propel the engine of any type of mechanized fishing boat. Fuel is the major variable cost and

the average cost of fuel per voyage comes to Rs.53258/- in Sona type and Rs.36,633/- in Sorra type of boats. It can be seen from table 2 that 25% of the Sona type of boat operators incurred less than the average expenditure of Sorra boat operators, i.e., les than Rs.36,633/- ,while 5% of the Sorra boat operators incurred more than the average expenditure of Sona boat operators, i.e., more than Rs.53, 258/-. The calculated chi-square value (with Yates correction) of 33.0068 is found to be statistically significant at 1 per cent level. Further, the coefficient of association is 0.78. This clearly shows that fuel charges are associated with the type of boat. Fuel charges are higher in Sona type of boat than in Sorra type of boat. These differences may be due to the number of voyage days, i.e., period of stay in the sea for the catch. Fuel consumption of the boat depends on some other factors like engine capacity, condition of the sea waves, wind flow and also experience of the crew, etc.

c)Cost of Lubricants: Lubricants or engine oils are used in the fishing boat as a coolant for the boat engine. The average cost of lubricants per voyage varies between Rs.403/- in Sona type and Rs.319/- in Sorra type of boats. It can be seen that about 42% of the Sona type of MFBO'S incurred less than the average expenditure of Sorra type of boat operators (Rs.319/-), and about 27% of the Sorra type of MFBOs incurred more than the average cost of lubricants of Sona type MFBO'S(Rs.403/-). The calculated chi-square value (with Yates correction) is 10.3373, which is found to be statistically significant at 1% level. Furthermore, the coefficient of association is 0.50. This clearly shows that the cost of lubricants per voyage is associated with the type of boat and is higher in Sona type of boats than in Sorra type of boats. These differences may also be due to the number of voyage days, the condition of the engine, type of fishing gears and condition of the sea, etc.

d)Cost of Ice: Since the fish is perishable, the catch has to be stored throughout the voyage period in the ice. The average cost incurred for Ice is Rs.4,858/- in Sona type and Rs.4,190 /- in Sorra type of

boat operations. It is observed that, about 39% of the Sona type of MFBOs incurred less than the average expenditure of Sorra type of MFBOs, that is less than Rs.4,190/- and about 32% of Sorra type of boat operators incurred above the average expenditure per voyage of Sona type, i.e., Rs.4,858/-. Voyage period is a major factor in determining the difference in variation in the average cost of ice per voyage. If the planned voyage period is more, automatically they have to carry more and if the planned voyage period is low they carry less ice. The calculated chi-square value (with Yates correction) is 7.25, which is found to be statistically significant at 1% level. Further, the co-efficient of association is 0.43. This clearly shows that cost of ice per voyage is associated with the type of boat. Cost of ice spent per voyage is higher in Sona type of boats than in Sorra type of boats.

e) Salaries and Wages: Salaries and wages are paid to the crew and fishermen of the fishing boat for rendering their services in the fishing boat operations. In this sector, apart from the salary, the personnel also get about 10% as commission on the catch value and also receive low variety of fish (trash fish) for their own. The average salary of an employee varies between Rs.2361/- in Sona type of boat and Rs.1,592/- for Sorra type of boat. It is noted that, about 30% of the Sona type of boat crew are getting less than the average salaries of Sorra boat personnel (Rs.1,592/-) and about 14% of Sorra boat crew are getting a salary above the average salary of the Sona type boat crew (Rs.2,361/-). These variations are mainly due to the variations in the number of crew and fishermen and number of days per voyage. The calculated chi-square value (with Yates correction) is 14.98, which is found to be statistically significant at 1% level. Further, the coefficient of association is 0.63. This shows that a cost towards salaries per voyage is associated with type of boat. Salaries are higher in Sona type of boat than in Sorra type of boats.

f)Cost of Food Materials and Water: The cost of food materials and drinking water constitutes a significant part of the operating

cost. Mechanized fishing boat operators will load the boat with sufficient food materials like rice, wheat flour, grains, oils, vegetables and drinking water for their crew and fishermen. The study reveals that the average cost incurred for food material and drinking water per voyage is Rs.4,640/- in Sona type and Rs.3,517/- in Sorra type of boats. The total average cost incurred for these items are Rs.4, 266. It can be seen from the table 2 that, about 26 per cent of the Sona boat operators incurred less than the average expenditure of Sorra boat operators (Rs.3,517/-) and about 17 per cent of Sorra boat operators incurred above the average expenditure of Sona boat operators (Rs.4640/-). These variations are mainly due to the variations in days per voyage. The calculated chi-square value (with Yates correction) is 22.07, which is found to be statistically significant at 1% level. Further, the coefficient of association is 0.68. This clearly shows that the cost of food material and water per voyage is associated with the type of boat. Costs spent on food material per voyage are higher in Sona type of boats than in Sorra type of boats.

g)Cost of Repairs and Replacements: Once the boat reaches the berth after voyage, the entire boat is checked thoroughly and gets repaired immediately, if required. The study reveals that the average cost incurred for repairs and replacements per voyage is Rs.931/- in the case of Sona type and Rs.565/- in the case of Sorra type of boat. The average cost of both types of boat is Rs.809. It is observed that about 44% of the Sona type of MFBO'S incurred less than the average expenditure of Sorra type (Rs.565/-) and about 13% of the Sorra type of MFBOs incurred above the average expenditure of Sona type of MFBOs (with Rs.931/-). These variations depend mainly on the boat age, condition of the engine, condition of the other equipment like fishing gear unit, fish nets, etc. The calculated chi-square value (with Yates correction) is 22.23, which is found to be statistically significant at 1% level. Further, the coefficient of association is 0.74. This clearly shows that the cost towards repairs and replacements are associated with

the type of boat. Costs towards repairs and replacements per voyage are higher in Sona type of boats than in Sorra type of boats.

h)Total Variable Cost (TVC): The total variable cost per voyage refers to the total operational costs incurred per voyage, which includes the berth charges, fuel cost, cost of ice, salaries of the crew, cost of food and water and other miscellaneous expenditure. The average total variable cost per voyage comes to Rs.69, 435/- in Sona boat operations and Rs.48,498/- in Sorra boat operations. The average of both types comes to Rs.62, 456. It can be seen from table 2 that about 24% of the Sona type of MFBOs incurred below the average expenditure of Sorra type of MFBOs, i.e., less than Rs.48, 498/-, while 7% of the Sorra type of MFBOs incurred more than the average total variable cost per voyage of Sorra type of MFBOs, i.e., above Rs.69,435/-. These variations may be due to the number of voyage days. The calculated chi-square value (with Yates correction) is 30.65 which is found to be statistically significant at 1% level. Further, the coefficient of association is 0.76. This clearly shows that the total variable cost per voyage is associated with the type of boat. Total variable cost per voyage is higher in Sona type of boats than in Sorra type of boats.

3. Revenue of Mechanized Fishing Boat Operation

a)Classification of Marine Fish Catch: The marine catch of Andhra Pradesh was divided broadly into two main groups: (a) Pelagic, the type of fish that are found on the surface or in the upper layers of the open sea; (b) Demersal, the types of fish that live near the bottom of the sea. The important pelagic group of fish in Andhra coast comprise of Chiro-Centrus, Oil Sardine, other Sardines, Hilsa, Anchovies, White Bait, other Clupeodids, Robbin fish, Carangids, Mackerel and Seer Fish, etc. The important Demersal group of fish in Andhra Coast comprises Elasmobranchs (sharks, skates and rays), eels, Cat fishes, Per Ches, Polynemids, Sciaenids, Silver bellies, Pomfrets, Prawns, DecapterusSp, NemipterusSp, PsenesSP, Lizard fish, Bombay Duck and Flat fish. On the basis of the pelagic

group and demersal group of marine fishes, the entire fishing catch (Product mix) of the MFBO' in the Visakhapatnam fishing harbor is divided into four broad categories, namely, P1, P2, P3, and P4.

b)Revenue Calculation: The first two product categories, P1 and P2, are exportable products which have high commercial value in the domestic as well as international markets. The third category, P3, has good commercial value in the domestic market and is also exported to different towns and cities in India. Sometimes this is reprocessed and exported to different international markets also. The final category, P4, is called `Trash fish', which has low commercial value and is mainly used as fish meal in the preparation of feed for poultry and livestock. The analysis of data relating to the volume, price and value received for the first three product categories (P1, P2 and P3) of marine fish are presented in table 3. The Fourth category (P4) has not been considered as it is of low commercial value.

c)Product Line – 1 (P1): This category of marine fishes mainly consists of demersal group of fish, namely, Prawns (White, Brown, Tiger, Flower, Scampy and Shrimps).

P1 Volume: The average P1 volume per voyage is 143 kgs in Sona type and 96 kgs in Sorra type of boat operations. The average P1 volume for both types of boats comes to 127 kgs The value of catch of 28% of the Sona type of MFBOs is less than the average volume of catch of Sorra type of boat operators (less than 96 kgs), while the volume of catch of 12% of Sorra type of MFBOs is above the average volume of catch of Sona type of MFBOs (143 kgs). These differences are mainly due to the period of the voyage and availability of the marine catch in the fishing grounds. The calculated chi-square value (with Yates correction) is 16.52 and is found to be statistically significant at 1% level. Further, the coefficient of association is 0.65. This clearly shows that **P1** volume in the total catch is associated with the type of boat.

Table 3. Revenue of mechanized fishing boat operation

Determinant	**Sona**	**Sorra**	Total
P1 Volume (in kgs)			
Above 143	52(43.33)	7(11.67)	59(32.78)
142 to 127	7(5.83)	3(5.00)	10(5.56)
126 to 96	27(22.50)	16(26.67)	43(23.89)
95 and below	34(28.33)	34(56.67)	68(37.78)
Total	**120(100.00)**	**60(100.00)**	**180(100.00)**
P1 Price (in Inr)			
Above 335	59(49.17)	17(28.33)	76(42.22)
334 to 329	4(3.33)	1(1.67)	5(2.78)
328 to 317	26(21.67)	14(23.33)	40(22.22)
316 and below	31(25.83)	28(46.57)	59(32.78)
Total	**120(100.00)**	**60(100.00)**	**180(100.00)**
P1 Value (in Inr)			
Above 47483	53(44.17)	7(11.67)	60(33.33)
47482 to 41727	10(8.33)	3(5.00)	13(7.22)
41726 to 30215	29(24.17)	21(35.00)	50(27.78)
30215 and below	28(23.33)	29(48.33)	57(31.67)
Total	**120(100.00)**	**60(100.00)**	180(100.00)
P2 Volume(in kgs)			
Above 433	58(48.33)	11(18.33)	69(38.33)
432 to 400	18(15.00)	5(8.33)	23(12.78)
399 to 331	18(15.00)	9(15.00)	27(15.00)
330 and below	26(21.67)	35(58.33)	61(33.89)
Total	**120(100.00)**	**60(100.00)**	**180(100.00)**
P2 Price (in Inr)			
Between 54 and 56	**120(100.00)**	**60(100.00)**	180(100.00)
Total	**120(100.00)**	**60(100.00)**	**180(100.00)**
P2 Value (in Inr)			
Above 24017	52(43.33)	12(20.00)	64(35.56)
24013 to 22076	18(15.00)	3(5.00)	21(11.67)
22075 to 18193	27(22.50)	8(13.33)	35(19.47)
18192 and below	23(19.17)	37(61.67)	60(33.33)
Total	**120(100.00)**	**60(100.00)**	**180(100.00)**

Table 3. *Cont'd.*

P3 Volume (in kgs)			
Above 557	58(48.33)	13(21.67)	71(39.44)
556 to 525	8(6.67)	4(6.67)	12(60.67)
524 to 461	18(15.00)	5(8.33)	23(12.78)
460 and below	36(30.00)	38(63.33)	74(41.11)
Total	**120(100.00)**	**60(100.00)**	**180(100.00)**
P3 Price (in Inr)			
Between 10 and 12	**120(100.00)**	**60(100.00)**	180(100.00)
Total	**120(100.00)**	**60(100.00)**	**180(100.00)**
P3 Value (in Inr)			
Above 6557	56(46.670	4(6.67)	60(33.33)
6556 to 5839	14(11.67)	2(3.33)	16(8.89)
5838 to 4405	26(21.67)	24(40.00)	50(27.78)
4404 and below	24(20.00)	30(50.00)	54(30.00)
Total	**120(100.00)**	**60(100.00)**	**180(100.00)**
Total Value of the Catch (in Inr)			
Above 78056	51(42.50)	6(10.00)	57(31.67)
78055 to 69642	15(12.50)	6(10.00)	21(11.67)
69641 to 52813	35(29.17)	17(28.33)	52(28.89)
52812 and below	19(15.830	31(51.67)	50(27.78)
Total	**120(100.00)**	**60(100.00)**	**180(100.00)**
Annual Total Value of the Catch (in Inr)			
Above 1167362	47(39.17)	16(26.67)	63(35.00)
1167361 to 1130378	6(5.00)	6(10.00)	12(6.67)
1130377 to 1056410	18(15.00)	4(6.67)	22(12.22)
1056409 and below	49(59.04)	34(56.67)	83(46.11)
Total	**120(100.00)**	**60(100.00)**	**180(100.00)**
Profit Per annum (in Inr)			
Above 140970	38(31.66)	14(23.33)	52(28.88)
79,722 to 1,40,970	9(7.50)	5(8.33)	14(7.77)
Less than 79,722	73(60.83)	41(68.33)	114(63.33)
Total	**120(100.00)**	**60(100.00)**	**180(100.00)**

P1 Price: Average price of **P1** received by Sona MFBOs is Rs.335 per kg and Sorra MFBOs is Rs.317/-. Both received an average price of Rs.329/- per kg. It is found that about 26% of the Sona type of MFBOs received a price below the average **P1** price of Sorra type of MFBOs (Below Rs.316/- per kg.) while about 28% of Sorra type of MFBOs received a price above the average price of Sona type of MFBOs, (Rs.335/- per kg). The calculated Chi-square value (with Yates correction) is 7.29 and is found to be statistically significant at 1% level. Further, the coefficient of association is 0.44. This clearly shows that the price of **P1** variety of marine catch is associated with the type of boat and Sona type of MFBOs received on an average, a higher price than the Sorra type of MFBOs.

P1 Value: Here, the value of the marine catch is derived by two major components. They are: (a) volume of the catch, and (b) price of the catch. The average total value of the **P1** variety of marine catch per voyage is Rs.47,483/- by Sona type of MFBOs and Rs.30,215/- by Sorra type of MFBOs. Both put together the average value is Rs.41,727/-. It can be seen from table 3 that about 23% of Sona type of MFBOs obtained below the average value of Sorra type of MFBOs (Rs.30,215/-) and about 12% of Sorra type of MFBOs received above the average value of Sona type of MFBOs (Rs.47,483/-). These differences in the value of **P1** are mainly due to the voyage period and also availability of good quality of marine species. The calculated chi-square value (with Yates correction) is 19.84 and is found to be statistically significant at 1% level. Further, the coefficient of association is 0.69. This clearly shows that the value of **P1** variety of catch is associated with the type of boat and is higher in Sona type of boat than in Sorra type of boat operators.

d)Product Line – 2 (P2): This category of marine fishes consists of different varieties both the pelagic and demersal groups, viz., Tuna, Sheerfish, Pomfrets, Sharks, Sardinella gibbosa, caranx, cuttlefish,

white-bats, Hilsakelee, Bombay duck, Flatfish, Perches and Mackerel, etc.

P2 Volume: The average **P2** volume per voyage is 433 kgs in Sona type of boat and 331 kgs. in Sorra type of boat. Both put together, the total average of **P2** volume per voyage comes to 400 kgs. It is observed that about 22% of the Sona type of MFBOs received below average **P2** volume of Sorra type of MFBOs (331 kg.), while about 18 per cent of Sorra type of boat operators received above the **P2** volume of Sona type of MFBOs (331 kgs). The calculated chi-square value (with Yates correction) is 20.07 and is found to be statistically significant at 1% level. Further, the coefficient of association is 0.65. This clearly shows that the **P2** volume in the total catch is associated with the type of boat and volume of catch is higher in Sona type than in Sorra type of MFBOs.

P_2 Price: Irrespective of type of boat, all the sampled MFBOs sell their **P2** variety of marine catch at the price range between Rs.54/- and Rs.56/- per kg. There is no significant difference in the prices of **P2** variety between both types of boat operators.

P2 value: The average total value of **P2** variety of marine catch per voyage is Rs.24, 017/- in Sona boat operators and Rs.18, 193/- in Sorra boat operators. Both put together, the average value of **P3** variety comes to Rs.22, 076/- per voyage. It can be seen from the table 3 that about 20% of Sona type of MFBOs received below the average value of **P2** of Sorra type of MFBOs (Rs.18,193/-) while 20% of Sorra type of MFBOs received above the average value of Sona type of MFBOs (Rs.24,017/-). This difference is mainly due to the variety of fish catch, and its quality and size. The calculated chi-square value (with Yates correction) is 16.52 and is found to be statistically significant at 1% level. Further, the coefficient of association is 0.61. This clearly shows that the value of **P2** variety of catch is associated with the type of boat. The value of **P2** obtained is higher in Sona type of boat than in Sorra type of boat.

e)Product Line – 3 (P3): This category consists of low grade Prawn, Sheerfish, Rainbow Runner, Reefcod, Scads, Goatfish, Ribbonfish, Rays, Lizardfish, Indian Pellona and Whitebites, etc.

P3 – Volume: The average volume per voyage is 557 kgs. in Sona type and 461 kgs. in Sorra type of boat. Both put together, the average volume comes to 525 kgs. It can be seen from table 3 that 30% of Sona boat MFBOs got less than the average volume of Sorra type of MFBOs (461 kgs.) while about 22% of Sorra type of MFBOs got more than average volume of Sorra type of MFBOs (557 kgs). The difference is mainly due to: (a) preservation of ice, (b) variety of marine fish, (c) size and quality of the catch. The calculated Chi-square value (with Yates correction) is 10.39, which is found to be statistically significant at 1% level. Further, the coefficient of association is 0.51. This clearly shows that the **P3** volume in the total catch is associated with the type of boat and the volume of **P3** catch is higher in Sona type of boat than in Sorra type of boat.

P3 Price: There is no significant difference in the prices of **P3** variety of marine catch. All the sampled mechanized boat operators sold their **P3** variety at a price ranges between Rs.10/- and Rs.12/- per kg. The main factors determining the price of **P3** variety of marine catch are, freshness of the stock, variety of the fishes in the stock, market demand, supply of these varieties in the Visakhapatnam fishing harbor.

P_3 Value: The average total value of **P3** variety of marine catch per voyage is Rs.6557/- in Sona type of and Rs. 4405/- in Sorra type. Both put together, the average value of **P3** variety is Rs.5839/-. It can be seen from table 3 that 20% of Sona type of MFBOs have got less than the average value of **P_3** of Sorra type of MFBOs (Rs.4405/-) while about 7% of Sorra type of MFBOs have got above the average value of Sona type (Rs.6557/-). The calculated chi-square value (with Yates correction) is 36.34, which is found to

be statistically significant at 1% level. Further, the coefficient of association is 0.85. This clearly shows that the value of **P3** variety of catch is associated with the type of boat and the value of **P3** is higher in Sona type of boat than in Sorra type of boat.

f)Product Line – 4 (P4): The money they get from these products is negligible. Hence it's not included in this analysis.

g)Total Value of the Catch: The total value of the catch per voyage is obtained by multiplying the volume of catch of each type of product line by the price at which it is sold by the mechanized fishing boat operators. The value of the catch per voyage on average comes to Rs.78,056 in the case of Sona type, Rs.52,813/- in the case of Sorra type, and Rs.69,642/- in the case of both types of boat operators. It is observed that about16% of Sona type of MFBOs received below the average value of the product mix of Sorra type of MFBOs (Rs.52, 813/-) and 10% of Sorra type of MFBOs got more than the average value of the product mix of Sona type (Rs.78,056/-). The calculated Chi-square value (with Yates correction) is 18.55, which is found to be statistically significant at 1% level. Further, the coefficient of association is 0.66. This clearly shows that the total value of the catch per voyage is associated with the type of boat, and the total value is higher in the case of Sona type of MFBOs than in Sorra type of MFBOs. Since frequency of voyages differs significantly, the total value of the catch per annum is estimated taking into account the frequency of voyages and the product mix. However, the price is considered uniform.

h)Annual Total Value of the Catch: The total value of the marine catch per annum is obtained by multiplying the value of the catch per voyage of each type of boat with the number of voyages made per year. The total value of the catch per year on an average comes to Rs.11,67,362/- in the case of Sona type, Rs.10,56,410/- in the case of Sorra type, and it is Rs.11,30,378/- in the case of both types. From the distribution presented in table 3, it can be noted

that about 59% of Sona type of MFBOs received below the average total value of the product mix of Sorra type (Rs.10,56,410/-) while about 27% of Sorra type of boat operators got more than the average total value of the product mix of Sona type (Rs.11,67,362/-). The calculated chi-square value (with Yates correction) is 20.32, which is found to be statistically significant at 1 per cent level. Further the coefficient of association is 0.67. This clearly shows that the total value of the catch per annum is associated with the type of boat, and the total value of the marine catch per annum is higher in Sona than in Sorra type of boats.

i)Profit Per Annum: In the mechanized fishing boat operations, most of the capital is borrowed from commission agents or from their own source. Further, it is also noted that commission agents discount the price by Rs.30-40 per kg of **P1** variety over the actual market price. Hence, interest charges do not come into existence either for the fixed capital or variable cost. Therefore, the calculation is being done as the difference between the total estimated net return per annum and the estimated variable cost to derive the profit. Thus, in interpreting the profit/loss of MFBOs in Visakhapatnam, the point to be noted is that no amount has been deducted towards imputed cost of capital in the case of own capital and interest on the fixed or the variable costs. For those who have contributed more from their own funds, profits may be an overestimate, since imputed cost of capital has not been deducted and for those who borrowed more from commission agents, profit may be an underestimated as the commission charges will be much higher than the interest rates. Since this practice has been going on for years in this sector, profit is simply defined as the revenue minus variable costs. The average profit per annum is Rs.1,41,000 in the case of Sona MFBOs and Rs.80,000/- in the case of Sorra MFBOs. It is noted from table 3 that 60% of the Sona type of MFBOs and 68% of the Sorra type of MFBOs are in the lowest range of less than Rs.79,722/- and 32% of Sona type of MFBOs and 23% of Sorra type of MFBOs are in the highest range of

Rs.1,41,000/-. The calculated Chi-square value (with Yates correction) is 0.9689, which is not found to be statistically significant at 1% level.

Iv. Conclusions

The Sona type of boat is well fitted with a high capacity engine and equipped with more facilities to stay for longer period during a voyage. The voyage frequency is usually less in Sona type than in the Sorra type. The average cost of Sona type of boat is about Rs.7.63 lakhs while that of Sorra type boat is Rs.5.68 lakhs. The cost difference is mainly due to size and capacity of the engine installed, and other equipment like Gear, VHFset, Sonarsets, etc. Employment is higher in Sona type than in Sorra type of boat. The average number of voyage days are 11 in the case of Sorra boat and 16 in the case of Sona boat. Further, it is observed that voyage days per year are less (31%) even in Sona type of MFBOs and more in Sorra type (25%). However, the voyage period for Sona boat operators is more than that of Sorra type. The major factors that influence the voyage period are quantity of catch (98.33%), weather conditions in the sea (85%), boat conditions and scarcity of raw materials (100%). The main geographical area of concentration for fishing is in and around Visakhapatnam coast. The major fishing grounds in and around Visakhapatnam are Pentakota, Pudi Madika, Visakhapatnam, Bhimunipatnam, Konada, Chintapalli, Kalingapatnam, Bhavanapadu, Poondi and Bharuva. The average number of voyages per year comes to 16 in the case of Sona type and 21 in the case of Sorra type of boats.

Berth charges are fixed by the port/fishing harbor governing authorities towards the anchoring, reloading and unloading activities of the fishing boat operations. Fuel is the major variable cost and the average cost of the fuel per voyage comes to Rs.53258/- in Sona type and Rs.36,633/- in Sorra type of boats. The average cost of lubricants per voyage varies between Rs.403/- in Sona type and Rs.319/- in Sorra type of boats. The average cost incurred for Ice is Rs.4, 858/- in

Sona type and Rs.4, 190 /- in Sorra type of boat operations. In this sector, apart from salary, the personnel also get about 10% as commission on the catch value and also receive low variety of fish (trash fish) for their own consumption. The average salary of an employee varies between Rs.2361/- in Sona type of boat and Rs.1,592/- for Sorra type of boat. The study reveals that the average cost incurred for food material and drinking water per voyage is Rs.4,640/- in Sona type and Rs.3,517/- in Sorra type of boats. The average total variable cost per voyage comes to Rs.69, 435/- in Sona boat operations and Rs.48,498/- in Sorra boat operations. The average of both types comes to Rs.62,456.

It is also noted that, the **P1** and **P2** categories of fisheries have exportable value, and value of catch is high in Sona type of boat than in Sorra type. Due to good storage facility, Sona type of MFBOs receive relatively better price than Sorra MFBOs. This is also true in the case of **P2** category of catch. Regarding **P3**, though quantity is high in Sona type of boat, the price is the same for both. The total value of the catch per voyage is significantly higher (Rs.78,000) in Sona type of boat than in Sorra type of boat (Rs.52,000/-). The total annual catch is estimated by taking into account the number of voyages. Thus, it is found that the total annual revenue of Sona type MFBOs comes to about Rs.11.67 lakh while that of Sorra comes to about Rs.10.56 lakhs. Taking into account the costs and returns, the average profit per annum of Sona type of MFBOs is higher (Rs.1.41 Lakhs) than that of Sorra type of MFBOs (Rs.0.80 Lakhs).

V. Suggestions

Based on this study, the following recommendations are made to exploit the marine fisheries in a more sustainable manner and to get the more profit from mechanized fishing boat operations in India in general and in Visakahapatnam in particular. These

recommendations are categorized into p suggestions to policy-makers and suggestions to Mechanized fishing boat operators.

i. **Suggestions to Policy-makers:** Fishing communities, who are socially and economically underdeveloped, should be given due attention in the planned fishery development of the state by providing them with credit, marketing and other infrastructural facilities.

   a) Leadership: The MFBO's in general and cooperative associations in particular should upgrade their leadership capabilities. They should have sufficient exposure in grading the catch, knowledge about international market prices, identification of target markets and supportive government schemes.

   b) Establishment of a separate financial institution: Every coastal state and union territory should set up a separate financial institution to provide financial services to the MFBOs at a lower interest rate whenever they are in need. This would be helpful for them to get rid of the middlemen who provide finance easily but at a higher interest rate. This facility would be useful for the fishing operators to earn more profit.

   c) Strengthening Non-Government Organizations: Non-governmental organizations should be strengthened to implement various development programs of the state as well as the central governments. These organizations should provide a market facility for marketing of fish and fishery products. It is also necessary to establish a National Fisheries Development Bank. In this context, it is worth noting the operations of "Kanyakumai District

Fishermen's Sangham's Federation" (KDFSF) in Tamilnadu ,India.

d) **Price of fuel (diesel):** More than 70% of the total variable cost goes to fuel charges. The enormous increase in the cost of fuel and declining market prices of the catch in recent years has had an adverse effect on profitability of the medium fishing boat operations. Subsidy on fuel should be provided in a more liberal way to the fishing communities to enhance the profitability in boat operations.

e) **Restricted fishing license:** The present number of mechanized fishing boats is more than the optimum for exploiting commercially important species. Mechanized fishing licenses should be stopped and the existing excess boats should also be deployed to diversified fishing activities.

ii. Suggestions to mechanized fishing boat operators

a) **Membership and role in the Cooperative Association:** All the Mechanized Fishing Boat Operators should be members of the Cooperative Association and need to play a vital role to represent the industry and get support from the government. All these operators should work hard to strengthen the fisheries cooperatives. Further, it is advisable to develop a separate fund to help the Mechanized Fishing Boat Operators to purchase and operate trawlers for marine fisheries and try to reduce the dependency on the commission agents and to gain more profit from the fishing operations.

b) Upgrading the mechanized boats: There is a need for upgrading the mechanized boats with up-to-date fishing technologies to get the more valuable catch with less fishing effort. There is a need to adopt the fishing boats which have low operating cost (less fuel consumption) and provide adequate fishing storage facility. It is also advisable to use proper shrimp fishing technology which protects the young prawns and control over-exploitation to sustain this sector for a longer period.

c) Approaching the banks and making use of it: It is advisable to deposit the return or profit in the public or private sector banks established in and around the fishing harbor and also advisable to procure the required capital (fixed and variable cost) from these organized financial institutions to get out of the clutches of the commission agents.

e) Fisheries marketing societies: To ensure better and reasonable prices for the fish catch, fisheries marketing societies need to be established by the boat operators and fishermen. There is a need to focus on establishing a retail market chain to market the catch directly to the ultimate consumers through the cooperative associations so as to harvest a good percentage of the consumer price.

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