TECHNOLOGICAL OPTIONS IN THE TRADITIONAL MARINE FISHERIES SECTOR AND IMPACT OF MOTORIZATION ON THE ECONOMICS OF GILLNET FISHING ALONG TUTICORIN COAST, TAMIL NADU

R. Sathiadhas, R.E. Benjamin and R. Gurusamy*

Dept. of economics, M.K. University, Madurai-21

Cost minimisation and profit maximisation are the twin interrelated objectives which influence the decision making of the investor on choices of techniques to be adopted for any production process. In marine fisheries the extensive adoption of fishing methods like mechanised trawling, shifting of cotton into synthetic nets, motorization of country crafts and innovative processing and preservation techniques in fish marketing are very much guided by the profit motive of individual fishermen. Capital being a scarce resource to many of the fishermen the choice of their fishing techniques at times drifts towards labour intensive devices. Utilizing sails for fishing operations by catamarans, plank-built boats and canoes has been practised time immemorial by the marine fishermen. With the advent of mechanisation and motorisation of country crafts, the use of sails for fishing operations lost its prime importance and it has been gradually replaced by power engines by most of the crafts operating in west coast. But in the east coast still majority of the traditional fishermen are using sails in their fishing crafts. In Tamil Nadu hardly 10 percent of the country crafts are fitted with power engines for fishing operations. Under this context information on the economics of indigenous fishing units operating by sails and inboard engines assumes paramount importance for proper planning and development of marine fisheries.

The present study was carried out in Tuticorin region of Tamil Nadu. The main objectives of the study were to identify the existing technological options of artisanal fishery sector and to assess the impact of motorization by comparing the costs and earnings of motorized and non-motorized boats carrying out the same type of gillnet fishing.

DATA AND METHODOLOGY

A preliminary investigation was carried out in fishing villages of Tuticorin region of Tamil Nadu to find out the present status of technological options available for fishing operations in the traditional sector and to identify the centres for indepth study. Details regarding various craft-gear combinations, capital and labour requirement, fishing hours, species composition on catch and existing in-

frastructure facilities at each centre were collected. Based on this information two centres namely Therespuram and Tuticorin south were selected and two types of craft-gear combinations were identified for continuous observation. They were (i) plank built sail boats (non-motorized) operating gillnets (kolavalai) by wind energy and (ii) plank built sail boats with inboard (I.B) engines (motorized) operating gillnets *(kolavalai)*.

To collect data on the fixed and operational costs and revenue of these two categories of craft-gear combinations, two types of schedules were prepared. The fixed cost details of 100 boats in each category were collected in Schedule I. Further, 20 units of each category were randomly selected for collection of data on operational costs and revenue on sample days in each season in schedule II Three seasons identified for the purpose of data collection and referred in text are Sept. Dec. 1986 as season I, Jan. -April '87 as season II and May-Aug. '87 as season III

Data on daily operational costs, species-wise catch and revenue realized were collected 30 days each in all the three seasons from the selected units by direct observation. Local enumerators, well acquainted with the fishing operations of the locality were entrusted the responsibility of collection of costs and earnings data.

Existing technological options in traditional fishery sector along tuticorin coast

Catamarans and plank-built boats are operating different types of nets depending on seasonality of fish throughout the year along Tuticorin coast. Fitting of outboard motors for catamarans and inboard engines for plank built boats in this region is a recent technological improvement. Under this technique, human labour power is substituted by mechanical power for propulsion. Gillnets, drift and bottomset gillnets are the prominent gears used by the non-mechanised crafts. Specifically *chalaivalai*, or *kolavalai*, *valavalai* or *podivalai*, *paruvalai*, *sinkiralvalai*, *thirukkaivalai* and *thallumadi* are widely used by plank built boats in this region.

Both *kolavalai* and *podivalai* are gillnets made by nylon threads operated through out the year by plank built boats with sails. The average mesh size is 3 cm for *kolavalai* and 6.3 cm for *podivalai*. Normally 4 to 7 persons go for fishing with these nets. They leave about 8 P.M. and reach the shore with the catch on next day by 7 to 10 in the morning. The distance of operation is 5 to 15 kms from here for both the types of net. The major species caught by *kolavalai* units are *sardinella gibbosa, sardinella albella, sardinella sirm sardinella clupeoids and thryssa spp.* For *podivalai* the catch comprises *chirocentrus dorab, caranx, scombroids, scomberamorus, perches, lactaries lactaries* and pomfrets. The number of units operating with kolavalai and *podivalai* are in an increasing trend in this region in recent years. Either 20 pieces of *kolavalai* or 30 pieces of *podivalai*, each piece costing around Rs. 500/- are taken by a single sail boat for fishing operations. *Paruvalai* is another prominent gear used for fishing by sail boats. It is a driftnet made of nylon threads with a mesh size of 15cm. The major species caught by this gear are *scombromorus guttatus, S.commersoni, carangids, lethrinus, lutjanids*, barracudas and pomfrets. About 40 pieces of *paruvalai* is taken by a single boat for operation and the cost of each piece is about Rs.1000/-. The area of operation, number of crew and fishing hours are more or less similar to *kolavalai, podivalai and paruvalai.*

Among the bottom set gillnets *sinkiralvalai* and *thirrukkaivalai* are widely used for fishing operations by sail boats in Tuticorin region. The prominent centres operating *sinkiralvalai* or lobsternet are Pattinamaruthoor, Kayalpattinam, veerapandiyan Pattinam, Pun-

nakayal and Harbour point. This is also a nylon net with the mesh size ranging from 3 to 15 cm from code end to the mouth. The distance of fishing ground is 2 to 5 kms and generally 3 to 5 crew members go for lobster fishing. They go to the fishing ground around 2.30 p.m. set the net and come back by 4.30 p.m. Next day about 4.30 a.m. they again go the the fishing ground and come to the shore along with the catch around 2.10 a.m. Each piece *sinkiralvalai* costs around Rs. 500 and each crew usually possesses 3 pieces of this net. Each member of the crew takes the catches of his net. The owner gets 10 per cent of the gross returns as the share of craft. The number of sinkiralvalai units in this region is almost stagnant during the past few years.

Thirukkaivalai is another bottom set gill-net made up of nylon with the mesh size of 46cm. Although this net is operated throughout the year, the major season is April to September. The prominent centres operating this net are Vipar, Tuticorin north, Punnakayal, Amalinagar, and Alanthalai. The technique of operation is like that of *Sinkiralvalai*. Skates, sharks, and rays are the major species caught by this net. The number of units operating this nets in this region is almost stagnant during the last few years. Hooks and lines,(*Thoondil*) such Mandlines, *Ayiaramkal thoondil* and Troll lines are also operated by *vallams* and catamarans along Tuticorin coast.

The changing pattern of marine fishing can be seen from the lesser utilisation of some nets and introduction of few new gears. The *karavalai* (shore-scines), *ralvalai* (Prawn net) and *Madivalai* (Bagnet) are the nets almost gone out from the field. *Karavalai* is an inshore drag-net made by cotton threads with an average mesh size of 1 to 2 kms from the shore. About 10 persons go in a Tuticorin type plank built boat, fix the net and come back. About 25 to 40 persons in shore pull the net back. Pallavali, Harbour point, Alangarathattu and Vembar are the prominent centres operating this type of net. Most of the people operating this type of net belongs to Vembar. They migrate to other centres depending upon seasons. The number of units operating this net shown a steady decline during the last few years.

Ralvalai is another net which is completely gone out of operation in recent times. This may be due to the introduction of shrimp trawlers. This is also a nylon net with an average mesh size of 5.5 cm. The major species caught by this net are *P. indicus, P. semisulcates and P. monodon. Madivalai* is a bagnet made by cotton threads, the average mesh size being 1.5cms. Fishermen wait in the shore and operate whenever they locate some shoals. Now this gear has also completely disappeared.

In recent years thallumadi and disco - net are the two fishing gears introduced by fishermen with the intention of catching more prawns in this region.. Thallumadi is operated by the sail boats in the near shore areas within 5 meters depth range and disco-net by boats fitted with inboard engines in deeper waters of 6 tp 15 meter depth range. Thallumadi is a modified shrimp trawl operated by mechanised boats but without otter board. Just like the shrimp trawl the net has a bag portion with wide mouth and narrow cod end Mesh size at cod end ranges from 20 mm to 30 mm. The side ropes from the mouth of the net has a length of 10 to 15 metres and the ropes and the net are made of synthetic fibre. The side ropes of the net were attached with the boat at its sides. *Thallumadi* is operated by keeping the mouth end facing the wind direction and allowing the net and boat to drift slowly in the water current. The direction of the net is corrected by moving the boat as and when required. Prawns and fish are caught into the net along with water current and each haul takes 1 to 2 hours. Normally 3 to 5 persons go for *thallumadi* operation. It is op-

erated throughout the year in Tuticorin area either towards north or south depending on the direction and intensity of winds. The initial cost of a *thallumadi* is about Rs. 1500/-.

Disco-net is in effect re-introduction of prawn gillnet in a different form. Unlike the gillnet the disco-net takes in prawns and fisher in wide range of sizes. It is essentially a trammel net of synthetic twines. Three vertical walls of netting are joined at the top and bottom with thicker lines. At the top line are added rubber floats and lead sinkers are attached at the bottom line. The middle wall of netting is made of fine twine with mesh size from 2.0 cm to 3.5 cm and is hung loosely. The outer walls are of large mesh and thick twine and are hung tightly. The cost of the net is about Rs.500/- per piece. Usually 3 to 5 fishermen are going for fishing in a single boat fitted with inboard engines along with 7 to 8 nets. Four to five hauls are made each day. *Penaeus indicus, sciaenids, sillago sihama, leiognathus* and carangids are the major catches. Disco-nets are operated in Tuticorin region during the prawn season of June to September.

Operational costs and returns of non-motorised units.

The operational costs and species wise revenue realised for a sail boat operating gillnet in different seasons during 1986-87 is given in table 1. Number of actual fishing days for these boats are 97 for season 1, 92 for season II and 88 for season III. The average operational expenditure per season ranges from Rs. 9043 to Rs.15070. About 64 to 68 per cent of the operating expenditure is incurred towards payment of wages to crew for different seasons. Normally six persons go for fishing in sail boats operating *kolavalai*. Sharing system is followed for the payment of crew wages. Expenses of food, auction charges and other day to day expenses are deducted from the gross income and 50 per cent of the remaining is paid as crew wages. Repairing and maintenance of the craft, gear and sails are entirely borne by the owner. The expenses for repairing and maintenance of the unit ranges from 10 to 14 per cent of the operational costs. Food expenses ranges from Rs. 8 to 12 per cent, auction charges 9 to 11 per cent and miscellaneous expenses 1 to 3 per cent. As a whole the operating expenditure of a sail boat operating *kolavalai* ranges from Rs.93 to Rs.164 per day for different seasons. The wages earned by a member crew ranges from Rs.10 per day during season I to Rs.19 per day during season II

The peak fishing season for the *kolavalai* units found tb be Jan- April. Major species of fish caught in these units are *sardinella gibbosa, sardinella albella, sardinella sirm, Thryssa spp and pellona sp.* Some other varieties like barracudas and sharks also come in these units occasionally. The study reveals that the survival of the *kolavalai* unit mainly depends on the catches of *sardinella gibbosa.* About 63 to 72 per cent of the quantity caught and 65 to 86 per cent of the gross returns are contributed by this species. *Sardinella albella* contributes about 3 per cent of the catches in season I and III with 2 per cent of the gross returns. *Sardinella sirm* is caught in considerable quantity during Jan-April and in accounts for about 12 per cent of the catches and 20 per cent of the revenue for this season. About 15 to 28 per cent of the catch is contributed by *thryssa spp.* and the value realised by it ranges from 6 to 13 per cent of the gross revenue for different seasons. *Thryssa spp.* is available throughout the year, but maximum quantity of the same is caught during Jan-April season and minimum during May-August.

About 13 percent of the catches and 7% of value in Season I and 3% catches and 2% value in season II have been contributed by *Pellona sp.* The price realised per kg of *sardinella gibbosa* ranges from RS. 2.21 to 3.89, *sardinella albella* from Rs.1.5 to 2.00. *Thryssa spp and*

pellona sp. from Rs. 1.00 to 1.50 at the landing centre for different seasons from Sept. '86 to Aug.1987. The highest average price realised is for *sardinella sirm* during season II which is Rs.5.8 per kg. As a whole the average price realised for the fish caught by the sail boats operating gillnets has been Rs.2.78 per kg.

The gross revenue realised for a sail boat operating gillnet during Sept. Dec.1986 is Rs.13580 with an average pf Rs.140 per day. Although the maximum quantity of fish is caught during this season the gross revenue realised has been minimum due to comparatively lesser price for all the varieties. Maximum gross revenue of Rs.23828 is realised during season II (Rs.259 per day) mainly due to the availability of *sardinella sirm* which fetches comparatively better price than the other species. Minimum catch of 5544 kg is obtained in season III realising a gross revenue of Rs. 17864, an average of Rs. 203 per day of operation.

The net operating income per day of operation ranges from Rs.47 to 95 for different seasons. There are about 277 fishing days during Sept. '86 to August '87. The overall gross income realised per day works out at Rs.200 and net operating income Rs.72 per day.

OPERATIONAL COSTS AND RETURNS OF MOTORIZED UNITS

The operational cost per day of fishing ranges from Rs.1.30 to 2.00 for different seasons (table 2). The average number of fishing days is 101 for season I , 97 for season II and 95 for season III. Wages to the crew is the major operating expenditure accounting for 56%in season I, 68% in season II and 60% in season III. Fuel cost ranges from 10 to 19 per cent of the operating expenditure for the three seasons. Repairing and maintenance of the unit which is entirely borne by the owner ranges from 10 to 14 per cent of the operating costs. Auction charges ranges from 7 to 9 per cent and miscellaneous expenditure 2 to 4 per cent of the operating expenses for different seasons.

The species composition and the peak season of motorized boats are almost similar to that of the non-motorized sail boats operating *Kolavalai*. The catches of *sardinella gibbosa* constitute 57% of total catch in season I , 28% in season II and 57% in season III and the value realised being 63%, 34%, 72% of the gross revenue respectively. The contribution of *sardinella gibbosa* in catch and revenue is less in season II but considerable quantity of *sardinella sirm* is caught during this season. about 20%of the catches and 43 per cent of the gross revenue are realised by this variety in season II. Similarly the abundance of *sardinella albella* is restricted to season I contributing 178 per cent of the catches and 18 per cent of the gross revenue in these units. Although *thryssa spp* is available throughout the year maximum quantity has been caught during Jan-April season. The contribution of this variety ranges 14 to 49 per cent of the catch and 8 to 20 per cent of the gross revenue for different seasons. The fish caught in motorized sail boats realised comparatively better prices at the landing centre. The average price realised for *sardinella gibbosa* ranges from Rs. 2.33 to 3.41, *sardinella albella* Rs. 2.2 to 2.50 and thryssa spp. Rs.1.10 to 1.27 for different seasons. *Sardinella sirm* fetches about Rs. 6 per kg and *Pellona sp.* about Rs.1.40 per kg. As a whole the average price realised for the fish caught in motorized sail boats operating gillnets ranges from Rs.2.00 to 2.75 per kg for different seasons. The free mobility due to the inboard engines and non dependence on the direction and velocity of wind by these units lead them to reach the landing centre earlier and enable them to get better prices for their catch than the non-motorized sailboats. But the overall average price per kg of catch received by the sail boats with inboard

engines are comparatively less due to the higher contribution of less priced varieties like *pellona sp* and *thryssa sp*. than the non -motorized sail boats.

The gross revenue obtained by a motorised sail boat operating gillnet is Rs. 18081 for season I , Rs.29876 for season II and Rs.29000 for season III. The gross revenue per day of operation ranges from Rs.179 to Rs. 308 for the three seasons. The net operating income works out to Rs.4985 , Rs.10523, and Rs.6821 for season I,II and III respectively. Net operating income per day of operation ranges from Rs. 49 in season I to Rs.109 in season II. The actual number of fishing days for the whole year comes to 293 with an average daily gross income of Rs. 235 and net operating income of Rs. 76.

ANNUAL INCOME AND EXPENDITURE

The boats observed are 30 to 32 footers and the average initial investment worked out Rs. 17500 for non-motorized boat and Rs. 18200 for motorized boats operating gillnets. For the operation of gillnets (*kolavalai*) each boat takes 15 to 22 pieces along with them, each piece costing around Rs.500. Average number of *kolavalai* pieces taken for fishing by a non motorized sail boat is 18 and a motorized sailboat 20, costing Rs.9000 and Rs.10000 respectively. The purchase price of sails ranges from Rs.350 to 650, the average being worked out to Rs. 500 for both the categories of units observed. The purchase price of a 10 H.P. inboard engine ranges from 12500 to 15500, the average being Rs.14000.

The average initial investment of a sail boat operating gillnet comes about Rs. 27000 and sail boat with inboard engine operating the same type of net about Rs.42700 (Table 3). Since most of the craft (resale values at the time of observation) has been taken as the initial investment. The life expectancy also varied from 3 to 10 years for the observed units. Hence an average life of 5 years has been considered to work out the depreciation of crafts. With regard to sails,gear and engine the life expectancy is short as it is 2,3,and 4 years respectively.

The annual fixed cost includes the depreciation of the unit and the interest for initial investment. Depreciation is worked out under straight line method by allocating equal values every year on the basis of expected life of each type of capital asset. The interest for the initial investment is worked out at Rs. 6750 for non - motorized boat operating gillnets and Rs.10723 for motorized boat operating gillnets. The interest for initial investment varies from Rs.4050 for non- motorized to Rs.6405 for motorized boats operating gillnets. The annual fixed cost for non -motorized boats comes about Rs.10,800 and motorized boats Rs.17128. With regard to non-motorized boats the annual total costs comes about Rs.46243 in which about 33 per cent is incurred towards fixed cost and the rest operating expenses. The annual average catch per boat is 19.9 tonnes obtaining a gross revenue of Rs.55272. The annual total cost for a motorized boat comes about Rs.63656in which fixed cost alone constitute about 27 per cent and the rest towards operating costs. The annual catch per boat is 29.4 tonnes realising a gross revenue of Rs.68857. The net profit per annum works out to Rs.9029and Rs.5201for non-motorized and motorized boats operating gillnets respectively.

KEY ECONOMIC INDICATORS

To highlight the comparative economic efficiency, some of the key economic indicators are estimated on the basis of costs and returns data and given in table 4. Cost -income ratios are used to measure the overall input-output efficiency it terms of value. They measure the margin by which the value of total production exceeds production costs. Operating cost ratio relates variable costs to

gross income, fixed cost ratio is composed of the fixed expenses plus the operating expenses divided by gross income. The operating cost ratio indicates that 67% of the gross income for non- motorized units and 68% for motorized units were spent towards operating expenses. Similarly the fixed ratio indicates that every one rupee earned, 19% of gross income of non-motorized units and 25% of the motorized units were fixed expenses. The gross ratio being 86% and 93% for these units respectively. It may be noted that in terms of input-output efficiency, non-motorized sail boats operating gillnets are found to be more efficient.

Generally income-investment ratios are used to indicate the efficient with which capital is being utilized in the business. Capital turn over ratio works out at 205% for non-motorized boats and 161% of motorized boats operating gillnets. Considering the opportunity cost of capital as 15%, the investment on these units are found to be highly profitable. The period required to recover the initial investment is termed as pay back period is 1.9 years for non-motorized units and 2.8 years for motorized units.

Labour efficiency is often measured by dividing total output by units of labour engaged. Average production per man -day in terms of quantity is worked out at 12 kg for non-motorized and 17 kg for motorized units, the value received being Rs.33 and Rs.39 respectively. The average wages received per day of operation by the labourers worked out at Rs.15 for non-motorized and Rs.17 for motorized units.

Break even point in terms of production, and price is useful to determine the economic feasibility of any investment. Break even point is that point at which the cost and revenue are equal or that point at which there won't be any loss or profit. Break even production based on the prevailing market price and catch composition is worked out at 17.1 tonnes for non-motorized and 27.6 tonnes for motorized boats as against the actual catch of 19.9 tonnes and 29.4 tonnes respectively. Break even cost at the existing level of production worked out at Rs.2.4 and Rs.2.2 per kg for non motorized and motorized boats, the actual price realised being Rs.2.8 and Rs.2.3 respectively. In the short run the unit can operate as long as its operating costs are covered. The fixed costs have to be incurred even if fishing operations are not carried out. Hence the break even cost per kg of fish to cover operating expenses is also worked out and it is found to be Rs.1.8 per kg for non-motorized boats and Rs.1.6 per kg for motorized boats.

SUMMARY AND CONCLUTION

A preliminary investigation in Tuticorin region indicates that *chalavalai* or *kolavalai valavalai, paruvalai, thirukkaivalai, sinkiralvalai, thallumadi* and hooks and lines, are the prominent gears operated by sail boats. During the last few years the traditional gears like *modivalai* and *ralvalai* have gone completely out of operation and the utilization of shore-seines declined drastically. The emerging new gears in recent years in this area are *thallumadi* and disco-nets. The study indicates that in the motorized and non-motorized boats operating *chalavalai,* the major species caught are *sardinella gibbosa, sardinella albella, sardinella sirm, sardinella clupeoids* and *thryssa spp.* However the profitability of gillnet operation depend on the availability of *sardinella gibbosa* for both type of units.

The peak season is found to be January -April and 43% of the annual gross revenue of gillnet units are generated during this period. The number of annual fishing days for non-motorized boats are 277 as against 293 for motorized boats operating gillnets. The minimum number of fishing days are observed for during May-Aug. period. The average operational expenditure per day of fishing of a non-motorized unit works out at Rs.128. Wages to the crew form 64 to 68 percent of operational costs for different seasons. Average operational expenditure per day for motorized units

worked out at Rs.158 the share of labour ranges from 56 to 68 per cent for different seasons.

Average initial investment of a non-motorized boat operating gillnet comes about Rs.27,000 and a boat with inboard engine operating same gillnets comes about RS.42,700. The annual total cost comes about Rs. 46,243 for non-motorized units and Rs.63,656for motorized units. Annual average catch per non-motorized units works out at 19.9 tonnes and same boats with inboard engines 29.4 tonnes generating a gross income of Rs.55,272 and Rs.68,857respectively. The net operating income per annum works out at Rs.19,829 for non-motorized boats and Rs.22.329 for motorized boats, the same per day being Rs.72 and Rs.76 respectively. Net profit earned per annum works out at Rs.9029for non-motorized units and Rs.5201for motorized units operating gillnets, the same per day being Rs.27.63 and Rs.15.70 respectively.

The study indicates that out of each rupee earned, 86 paise for non-motorized boats and 93 paise for motorized boats accounted for cost of production, the share of operating expenses alone being 67 paise and 68 paise respectively. The capital turn over ratio for these units indicated that each rupee invested generated an annual turn over of Rs.2.05 for non-motorised boats. Rate of return of capital is found to be 83% and 63% for these units respectively. The pay back period is 1.9 years for non motorized and 2.8 years for motorized units.

Average production per man -day worked out at 12 kg for non - motorized units and 17 kg for motorized units operating gillnets, the value realised being Rs.33 and Rs. 39 respectively. The average daily wages received by these labourers are Rs.15 and Rs.17 for these units enabling them to earn an annual income of Rs.4155 and Rs.4981. The cost of production per kg of fish worked out at Rs.2.4 for non-motorized boats and Rs.2.2 for boats with inboard engines operating gillnets as the average value realised per kg being Rs.2.8 and Rs.2.3 for these units respectively.

Based on the key economic indicators, non-motorized boats operating gillnets are found to be economically more efficient than the motorized units. Perhaps this may be the reason behind the slow phase of motorization of country crafts along Tamil Nadu coast. However in terms of number of fishing days, level of income generated and net operating income of the owner the performance of motorized units are found to be better.

ACKNOWLEDGEMENTS

We are thankful to Dr. P.S.B.R. James, Director, Central Marine Fisheries Research Institute, Kochi-31 and the Indian Council of Agricultural Research for granting study leave to the senior author for his Ph.D. work in Fisheries Economics. Thanks are also due to Shri. K.K.P.Panikkar, Scientist, (SG) of C.M.F.R.I. for critically going through the manuscript and Mr.M. Antony Joseph for his assistance in tabulation of data

References

Anon. 1988 Endeavour and achievements as on 1.4.88, Directorate of Fisheries, Madras-600 006.

Balan K; K.K.P. Panikkar, T.Jacob Andrews and Rajendran 1989 Motorization of country craft in Kerala- an impact study, C.M.F.R.I.special publication,No.45.

Sam Bennet, P and G. Arumugham, 1989. The present status of small scale traditional fishery at Tuticorin. Mar.Fish. Infor.serv; T&E ser. No. 99. 1-15

Sathiadas, R. 1982 Mechanisation of Indigenous crafts with outboard metres in Tamil Nadu- an impact study. Mar. Fish. Infor. serv; T&E ser. No. 38. 17-19.

Sathiadas, R. 1989 Comparative economic efficiency of sail boats operating different years in Tamil Nadu-Mar. Fish. Infor. serv; T&E ser. No.97. 8-16.

Sathiadas, R. and K.K.P.Panikkar. 1989. Cost and earnings of trawlers operating at Tuticorin Fisheries Harbour (Tamil Nadu). Mar. Fish. Infor. serv; T&E ser. No.100. 1-8.

Table 1

Season-wise operational costs and returns of a non-motorized operating gillnet at Tuticorin, 1986-87.

Items		Sept-Dec.		Jan.-April		May-August		Annual	
		Total	Average per day	Total	Average per day	Total	Average per day	Total	Average per day
I. Oprational costs(Rs)									
1. Repairing and Maintenance									
a) Craft		480	5	720	8	430	5	1630	6
b) Gears		670	7	685	7	600	7	1955	7
c) Sails		85	1	98	1	80	1	263	1
2. Food		776	8	1740	19	1170	13	3686	13
3. Wages		5772	59	10262	112	7644	87	23678	86
4. Auction charges		970	10	1380	15	1056	12	3406	12
5. Other expenses		290	3	185	2	350	4	825	3
Total		9043	93	15070	164	11320	129	35443	128
II. Returns (Q-quantity caught in (kg) and V-value realised (Rs.)									
1) Sardinella	Q	4559	47	4048	44	3960	45	12567	45
gibbosa	V	10088	104	15364	167	15400	175	40852	148
2) Sardinella	Q	194	2	-	-	176	2	370	1
albella	V	291	3	-	-	352	4	643	2
3) Sardinella	Q	-	-	828	9	-	-	828	3
sirm	V	-	-	4784	52	-	-	4784	17
4)Thryssa spp.	Q	1067	11	2024	22	880	10	3971	15
	V	1164	12	3036	33	1144	13	5344	19
5) Pellona sp	Q	970	10	-	-	176	2	1146	4
	V	970	10	-	-	264	3	1234	5
6) Others	Q	485	5	276	3	352	4	1113	4
	V	1067	11	644	7	704	8	2415	9
III Total Catch(kg)		7275	75	7176	78	5544	63	19995	200
IV Gross revenue(Rs)		13580	140	23828	259	17864	203	55272	200
V Net operating income (Rs.)		4537	47	8758	95	6544	74	19829	72

Table 2

Season-wise operational costs and returns of a motrorized boat operating gillnet at Tuticorin, 1986-87.

Items		Sept-Dec.		Jan.-April		May-August		Annual	
		Total	Average per day	Total	Average per day	Total	Average per day	Total	Average per day
I. Oprational costs(Rs)									
1. Repairing and Maintenance									
a) Craft & engine		908	9	1070	11	864	9	2842	10
b) Gears		780	8	647	7	670	7	2097	7
c) Sails		200	2	185	2	180	2	565	2
2. Fuel		2522	25	1949	20	2390	25	6861	23
3. Wages		7272	72	13077	135	8455	89	28804	98
4. Auction charges		909	9	1843	19	1140	12	3892	13
5. Other expenses		505	5	582	6	380	4	1467	5
Total		13096	130	19353	200	14079	148	46528	158
II. Returns Q-quantity caught in kg and V-value realised in Rs.									
1) Sardinella	Q	4848	48	3007	31	5700	60	13555	46
gibbosa	V	11312	112	10282	106	15105	159	36699	125
2) Sardinella	Q	1415	14	-	-	190	2	1605	6
albella	V	3234	32	-	-	475	5	3709	13
3) Sardinella	Q	-	-	2134	22	-	-	2134	7
sirm	V	-	-	12804	132	-	-	12804	44
4)Thryssa spp.	Q	1212	12	5335	55	3610	38	10157	35
	V	1516	15	6014	62	3990	42	11520	39
5) Pellona sp	Q	505	5	-	-	-	-	505	2
	V	708	7	-	-	-	-	708	2
6) Others	Q	605	6	388	4	475	5	1468	5
	V	1311	13	776	8	1330	14	3417	12
III Total Catch(kg)		8585	85	10864	112	9975	105	29424	101
IV Gross revenue(Rs)		18081	179	29876	308	20900	220	68857	235
V Net operating income (Rs.)		4985	49	10523	109	6821	72	22329	76

Table 3

Annual average, costs and earnings of gillnet units at Tuticorin (1986-87)

No	Items	Non-motorized boats	Motorized boats
A.	Initial investment(Rs)		
	Crafts	1750	18200
	Engine	-	14000
	Gear	9000	10000
	Sails	500	500
	Total	27000	42700
B.	Fixed cost(Rs)		
	Depreciation		
	Craft (20%)	3500	3640
	Engine(25%)	-	3500
	Gear (33.3%)	250	250
	Sub total	6750	10723
	Interest(15%)	4050	6405
	Total fixed cost	10800	17128
C.	Operating cost(Rs)	35443	46528
D.	Total cost(Rs)(B+C)	46243	63656
E.	Catch (tonnes)	19.9	29.4
F.	Gross revenue(Rs)	55272	68857
G.	Net profit income (F-C)	19829	22329
H.	Profit of the unit (G-B)	9029	5201

Table 4

Key Economic Indicators

No.	Items	Non-motorised units	Motorized units
1.	Input-output efficiency		
	a. operating ratio	0.67	0.68
	b. fixed ratio	0.19	0.25
	c. gross ratio	0.86	0.93
2.	Capital efficiency		
	a. Capital turnover ratio	2.05	1.61
	b. Rate of return to capital (%)	83	66
	c. Pay back period (years)	1.87	2.79
3.	Labour efficiency		
	a. No. of crew required for operation	6	6
	b. Average production per man-day(kg)	12	17
	c. Value of production per man-day (Rs)	33	39
	d. Average wages per man-day	15	17
4.	Break even analysis		
	a. Break even production (tonnes)	17.10	27.60
	b. Break even price (Rs)	2.39	2.18
	c. Break even revenue to cover operating expenses (Rs)	1.85	1.60
	d. Average price realised per kg of fish (Rs)	2.78	2.33
5.	Average annual fishing days	277	293
6.	Average catch per day(Kg)	72	101
7.	Gross revenue per day (Rs)	200	235
8.	Net profit per day(Rs)	27.63	15.70
9.	Net operating income per day(Rs)	72	76
10	Net income of the owner including family labour per day (Rs)	87	93