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Economic viability of mechanized fishing units and socio-economics of fishing ban in Kerala

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ABSTRACT

In open access unregulated marine fisheries, the viability of a fishing unit greatly influences the entry or exit of vessels in the fishing industry. The economic performance of fishing operations is affected by various factors including fluctuations in revenue, diminishing catch per unit of effort, unforeseen increases in the cost of key inputs and catch and effort restrictions. Capital and labour will continue to enter the fishery until the economic rents are totally dissipated and profits to individual units are reduced to the level of their opportunity costs. In the long run, the reduction in catch rates lead to reduction in fishing effort levels. The economic performance also plays a crucial role in the investment decisions at micro level. The paper analyses the viability of various mechanized fishing units in the Kerala state using different economic and financial indicators. Socioeconomic impact of fishing ban on fishing labour was also worked out and suggestions were given for improving the livelihood security of fish workers.

Keywords: Economic viability, Livelihood security, Resource conservation

Introduction

Kerala is an important maritime state in India, which contributes nearly 20% of the country's marine fish landings and 24% of the state's export comes from this sector. It has a coastline of 590 kilometers, which forms 10% of the country's coastline. The marine fish production in Kerala during the year 2009 was estimated at 5.17 lakh tonnes, of which the mechanized units contributed 59% (CMFRI, 2010). Of the 10 lakh active fishermen spread over nine coastal states, 2.5 lakh are in Kerala. About six lakh people make out their living from allied activities like fish vending and processing. There are 12 active fishermen per square kilometer of coastal seas in the state, as compared to three at the national level.

Though the marine fish production in the state had registered an impressive growth between 1950 and 1980, it showed a dwindling tendency after 1980. Analysis of the species wise landings for the last four decades showed that many of the marine fish species in the state are in the verge of over exploitation (Sathiadhas and Narayanakumar, 2001). The depletion in the stock of resources targeted by the mechanized units and the rising fuel prices pose a serious threat to the economic viability of most of the mechanized fishing units. The overcapitalization and increase in the number of fishing units results in bioeconomic unsustainability in fish harvest levels and lead to exit of fishing vessels in the long run. Devaraj and Smitha Paralkar (1988) reported that the rapid growth in the fleet size of mechanized trawlers in Kerala from 769 per day in 1979 to 3,500 per day in 1980 resulted in considerable reduction in the annual net profit from Rs. 5,37,500 in 1976 to Rs. 5,805 in 1980 and the study proposed to optimize the fleet size to 1,460 per day. The reduction in the number of mechanized trawlers in Kerala from 4,484 in 1998 to 3,982 in 2005 might have resulted from the uneconomic levels of operations of atleast few of the fishing units. In addition to the reduction in the fishing effort in the mechanized units, the regulatory mechanisms like fishing ban imposed by the state also affect the livelihood security of fish workers in the mechanized sector and results in conflicts among the fisherfolk.

A review of some of the community based mechanisms for income sharing in the marine fisheries sector of the state is relevant in this context, for protecting the fisher livelihoods, conflict resolution and management of common property resource. The *karanila* system prevalent in Alappuzha district in the state ensures that the total number of fishermen present at the seashore and who touch the craft at the start of the fishing trip are considered as the crew of the respective unit for that day. From those present, the required number will get into the craft and go for fishing

and the remaining "temporary" fishermen are free to change units as and when they like. It is this group of temporary standby crew who is granted *karanila* or "shore-status" (Kurien and Vijayan, 1995). In the *padu* system of community-based fisheries management in Vallarpadam area of Kerala, the fishing grounds are shared out by means of a lottery. One of the key elements of the *padu* system is to ensure equal opportunity to prime fishing locations (Lobe and Berkes, 2004).

The present study focuses on the economic viability of mechanized fishing units in Kerala state and the impact of fishing ban on the livelihood security of workers and suggest appropriate policy measures for ensuring the livelihood security of fishers in the mechanized sector.

Materials and methods

The costs and returns of mechanised fishing units were collected from major fishing harbours in Kerala for the year 2007. The mechanised category included trawlers, purse-seiners and gillnetters which used mechanization both for voyage and actual fishing operation. The harbours selected were Neendakara, Cochin, Munambam and Beypore. Data on single day trawlers were collected from Neendakara and Beypore fishing harbours where they are predominantly operating. Data on multiday trawlers were collected from Neendakara, Cochin, Munambam and Beypore Fishing Harbours. Data on purse-seiners and gillnetters were collected from Cochin fisheries harbour. The operational costs and returns, prices and quantities of the major species caught and the capital investment in various mechanized units were collected at weekly intervals from the selected landing centres covering all the seasons.

Net operating income, net profit, capital and labour productivity ratios were used for comparing the economic performance of different fishing units.

Operating ratio or Capital productivity = Operating costs/ Gross returns

Labour productivity = Gross revenue / Man days

The financial performance is assessed through the rate of return or return on investment (ROI) (Zugarramurdi *et al*., 1995; Tietze *et al.*, 2001). The ratio shows how much money needs to be invested in a fishing enterprise in order to generate a certain level of net profit.

Return on investment = Net profit/capital investment

Where net profit is the profit obtained after deducting operating expenses, depreciation and interest from the gross income earned. Loss in labour days and labour income due to fishing ban in the state was also estimated based on the average labour income earned per day in each category of fishing unit.

Results and discussion

Costs and returns of mechanised trawlers operating in different fishing harbours in Kerala

The mechanised trawlers were grouped into three categories based on the overall length of the boat and number of days involved in fishing for the purpose of the study. They are the single day boats, multiday boats of 2-5 days duration and multiday boats of more than six days duration. The fishing ban commenced from 15th June to 30th July for all mechanised vessels.

Single day trawlers

Single day trawlers operated for six months only during the peak fishing season from August to January. These boats had an overall length ranging from 8.5 to 9.5 meters (less than 30 feet) and made of wood. The fishing hours ranged from six hours to eight hours depending on the fishing season. These vessels were 10 to 15 years old with engine capacities of less than 90 hp. On an average, a single day trawler conducts 180 to 200 fishing trips in a year usually during the peak fishing season.

Table 1. Average operational cost and returns per trip of single day trawlers in Kerala

Costs	Average cost/returns (in rupees per trip)	% to total operating cost
Fuel	2,714	47.93
Bata	443	7.82
Wages	1,011	17.86
Repairs	888	15.68
Auction charges	606	10.70
Total operating cost	5,662	100.00
Fixed cost	432	
Total cost	6,094	
Total returns	8,095	
Net operating income	2,433	
Net profit	2,001	

The costs and returns data of single day trawlers in Neendakara and Beypore fishing harbours were collected and averages worked out for the state. The items of operational cost included costs of fuel, wages, repairs, auction charges and berthing charges. The items of capital cost included the expenses for hull, engine, gears (nets), sail cloth, ice box, otter board, ropes and batteries. The cost of hull varied from Rs.1-1.25 lakhs. The engine costs nearly one lakh rupees and the net cost was Rs. 20,000 which had an expected life of five years. The total capital investment in a single day trawler amounted to nearly three lakh rupees. The total operating cost per trip was Rs. 5,662 and the total revenue realized was Rs.8,095 per trip. The fuel cost accounted 47.9% of the total operating cost

(Rs. 2,714/trip). The single day trawlers could economize their operations even with reduction in effort levels.

The annual fixed cost was worked out from the capital costs and insurance charges. The capital cost included annual depreciation and opportunity cost of capital in terms of prevailing bank rate. An average bank rate of 10% was taken as the opportunity cost of capital. The total fixed cost worked out for the state was Rs. 77,674. With an average 180 days of operation in a year, the fixed cost per trip worked out to Rs. 431. The total cost of operation of a singleday trawler was Rs. 6,094 per trip (Table 1)

Multiday trawlers

Mechanised trawlers started undertaking multiday fishing trips from 1997 onwards. Multiday trawlers were classified into medium sized multiday trawlers which undertook fishing trips of 2-5 days duration and large multiday trawlers with fishing trips of more than six days duration. They usually moved from one harbour to other depending on the fishing season. Installation of fish finder, Global Positioning System and Radio Telephone has induced mechanised vessels to extend their activity to offshore regions. Most of the multiday trawlers used these advanced facilities for reaching the fishing ground and for finding shoals of fishes. The crew share varied from 32 to 35% of net returns.

Medium sized trawlers which undertook fishing trips of 2-5 days duration had an overall length (OAL) of 9.6 to 16 meters. The fuel consumption varied from 100 to 200 litres per day and up to 500 to 1,000 litres per trip depending on the days of fishing. They carried nearly 50 to 100 blocks of ice in a fishing trip. On an average, six crew members operated in a medium sized multiday trawler. Large multiday trawlers of more than six days operation were recent entrants to the mechanized fishing sector in Kerala. The overall length of the vessel was usually above 16 meters. The duration of fishing trips varied from 6 to 12 days. They conducted an average number of 30 to 40 fishing trips in a year. The horse powers of the engine varied from 124 to 170 hp. They consumed nearly 250-300 litres of diesel per day and the average fuel consumption per trip varied from 1,000 to 2,000 litres depending on the fishing season. The crew size went up to 10.

The costs and returns of multiday trawlers operating in the four major harbours in Kerala were collected and averages worked out for the state. The average operational costs for a multiday trawler of 2-5 days duration was Rs. 43,121 and the net operating income was Rs. 15,047 per trip whereas in the case of large multiday vessels, the average operating costs and returns were Rs. 1,03,789 and Rs. 1,60,197 respectively. The total investment in a multiday trawler (2-5 days) ranged from Rs. 10 to 15 lakhs whereas in the case of large multiday trawlers, the capital investment went up to Rs. 35 lakhs. With an average number of 60 fishing trips in a year, the fixed cost per trip was Rs .4,777 in the case of multiday (2-5 days) and with an average 30 fishing trips per year for multiday (more than six days) the fixed cost worked out to Rs.15,681per trip. The average cost per trip for the state was Rs. 47,898 for medium sized multiday trawlers and Rs. 1,19,470 for large multiday trawlers (Table 2).

Economics of fishing operations of mechanised purse-seiners

There are about 50 purse-seine boats operating in Cochin Fisheries Harbour. The capital investment in a mechanized purse-seiner ranged between Rs. 35 to 45 lakhs. Analysis of economic performance of mechanized purse-seiners showed that the operating costs per trip at

Table 2. Economic performance of multiday trawlers operating in Kerala

Items of cost	MD (2-5 days)		MD (>6 days)	
	Costs/returns (in rupees per trip)	Percentage to total operating cost	Costs/returns (in rupees per trip)	Percentage to total operating cost
Fuel	24,245	56.23	50,956	49.10
Bata	2,260	5.24	5,972	13.85
Wages	9,160	21.24	30,526	70.79
Repairs	2,144	4.98	3,014	6.99
Auction charges	3,308	7.67	9,492	22.01
Ice	2,008	4.66	3,830	8.88
Operating cost	43,121	100.00	1,03,788	100.00
Fixed cost	4,777		15,681	
Total cost per trip	47,898		1,19,470	
Total returns	58,168		160,197	
Net operating income	15,047		56,409	
Net profit	10,270		40,727	

MD : multiday

Rs. 58,871and the total returns at Rs. 96,850 per trip. The average fuel consumption was 300-400 liters per day and it constituted 19.81 per cent of the total operating cost. The labour cost constituted the major item (66.18 per cent) in the operational expenses as the purse seine gear is highly labour intensive with an average number of 30 workers per trip. The total cost of operation was Rs. 62,621per trip (Table 3). The purse seiners mainly target pelagic resources like oilsardines and mackerels and an increasing trend in the resources stock of oilsardines in recent years and its better price realization in the value chain might have contributed to the better performance of these fishing units. The estimated landings of oilsardines in Kerala increased from 93,636 tonnes in 1997 to 2,50,469 tonnes in 2007.

Table 3. Economics of fishing operations of mechanized purse-seiners in Cochin Fisheries Harbour

Costs	Costs/returns (in rupees per trip)	Percentage to total operating cost
Fuel	11470	19.48
Bata	1650	2.80
Wages	38960	66.18
Repairs	980	1.66
Auction charges	5811	9.87
Total operating cost	58871	100.00
Total fixed cost	3750	
Total cost	62621	
Total returns	96850	
Net operating income	37979	
Net profit	34229	

Economics of fishing of mechanised gillnetters/liners

Mechanized gillnet units operating in Cochin Fisheries Harbour undertook both singleday trips and multiday fishing trips of up to 10 days duration. They mainly target large pelagic and demersal fin fishes like sharks, rays, tunnies, seer fishes, scads and sailfishes. The average fuel consumption was 80-120 litres per trip in the case of single day gillnetters and 500-1000 litres per trip in the case of multiday boats. The wage sharing was up to 50% in fishing units which undertook hooks and line fishing in addition to gillnet operations. The total cost of operation per trip was Rs. 11,509 for a singleday gillnetter and Rs. 81,244 for a multiday gillnetter of more than six days operation (Table 4).

Comparative economic performance of mechanized fishing units and socioeconomics of fishing ban

The comparative analysis of various fishing units in Kerala showed that the single day purse-seiners and multiday trawlers of more than six days operation are showing the highest capital productivity with lowest operating ratios of 0.60 and 0.64 respectively. The higher per day earnings of purse-seiners were due to the increase in the landings and prices of oilsardines and mackerels. The costs and earnings per day of different fishing units revealed that the costs as well as returns increased with multiday operations in the case of trawlers, whereas for gillnetters the lowest per day costs and returns were seen in the case of multiday (2-5 days) operations. The labour income earned per crew member per day was highest for single day purse-seiners followed by single day gillnetters at Rs. 1,354 and Rs. 842 respectively. The financial analysis showed that the singleday purse seiners and singleday gillnetters are performing better with higher return on investment of 205% and 167% respectively (Table 5). The findings of the study suggest that mechanized trawlers, purse-seiners and single day gillnetters in Kerala are economically and financially viable and generate sufficient revenue to cover the cost of depreciation, the opportunity cost of capital and thus generate

Table 4. Costs and returns per trip of mechanized gillnetters/liners operating in Kerala

Costs	SD		MD (2-5 days)		MD (>6 days)	
	Costs/returns (rupees per trip)	Percentage to total operating cost	Costs/returns (rupees per trip)	Percentage to total operating cost	Costs/returns (rupees per trip)	Percentage to total operating cost
Fuel	4,134	(28)	12,956	(50)	38,456	(54)
Bata	400	(4)	2,075	(8)	4,100	(6)
Wages	3,811	(44)	5,895	(23)	17,881	(25)
Repairs	889	(8)	1,270	(5)	1,835	(3)
Auction charges	1,805	(16)	2,824	(11)	5,372	(8)
Ice	-	0	1,060	(4)	3,700	(5)
Total operating cost	11,039	(100)	26,080	100	71,344	(100)
Total fixed cost	470		6,866		9,900	
Total cost	11,509		32,946		81,244	
Total returns	16,033		36,643		89,545	
Net operating income	4,994		10,563		18,201	
Net profit	4,524		3,697		8,301	

SD – Single day, MD - Multday

Table 5. Comparative economic analysis of mechanized fishing units in Kerala (Rs./day)

Economic indicators	Trawlers			Purse-seiners	Gillnetters/liners		
	SD	MD (2-5 days)	MD (>6 days)	(SD)	SD	MD (2-5 days)	MD (>6 days)
Operating cost/day	5,662	8,624	12,974	58,871	11,039	6,520	8,918
Total cost/day	6,094	9,579	14,934	62,621	11,509	8,236	10,156
Returns/day	8,095	11,634	20,025	96,850	16,033	9,161	11,193
Operating ratio	0.70	0.74	0.64	0.60	0.69	0.71	0.79
Labour productivity (kg per manday)	49	36	26	248	53	21	26
Labour income (Rs. per crew member/day)	291	393	456	1354	842	332	275
Return on investment (per cent)	120.06	51.35	45.25	205.37	167.04	18.48	9.96

sufficient funds for reinvestment. The lower cost of investment because of the use of older fishing vessels and operations restricted to the peak seasons explain the higher profitability of single day trawlers.

The loss in labour days and income loss to the fish workers during fishing ban period was estimated based on an average of 39 fishing days during the ban period. Nearly one million man days are lost during fishing ban period accounting for a labour income loss of 50.30 crores to the mechanized fishing sector. Majority of the loss occurs to the mechanized trawl sector which constitutes 80% of the mechanized crafts in the state (Table 6).

The findings of the study suggest that mechanized fishing in Kerala is an economically and financially viable undertaking and trawlers, purse-seiners and single day gillnetters generate sufficient funds for reinvestment in the fishery. The socioeconomics of fish workers during the fishing ban period revealed that nearly one million man days are lost during the period accounting to a loss of nearly 50 crores to the labour income and majority of the loss occurs to the trawl fishing sector. Salim (2010) reported that in Maharshtra, the disparity arising in the income levels of labourers during the ban and the non-ban period is very high which make a substantial difference in their livelihood. In Kerala, only 10% of the mechanised workers are found employed in fishing in the traditional sector during the ban period and the incentives given by the trawl owners and public bodies are inadequate and many of the trawl workers are depending on private money lenders during this period (Aswathy and Sathiadhas, 2005). Since fishing is the only source of livelihood for these workers, alternative employment opportunities in traditional fishing vessels during the ban period through community based arrangements, in repair and maintenance of fishing equipments and in the fish processing sector may be created for protecting the livelihood security of mechanized workers. Creation of savings cum relief scheme using the additional income generated in the non-ban periods is also suggested for providing a regular income for the workers in the mechanized sector during ban period.

Table 6. Employment and labour income loss in mechanised fishing in Kerala during ban period

Category	No.of units	Average crew size	Income loss per day per labourer	Total employment loss (in man days)	Total loss in labour income (Rs.lakhs)
Trawlers	3982	7	380	10,87,100	4131
Purse-seiners	54	30	1354	63,180	855
Gillnetters/Liners	438	7	383	11,570	44
Total	4474			11,61,850	5030

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