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Economic and Behavioural Trends in Low Energy Fishing in the South Coast of India

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Artisanal fishing in India based on low energy and low capital investment continues to be a parallel system of fishing against the more modern industrial fishing sector. Choice of low energy and low capital intensive techniques in fisheries is encouraged as much by the steep rise of fuel prices as by the traditional factors of labour abundance and the nature of domestic demand for fish. The recent adoption of outboard motors in traditional craft on a wider scale underscores the point that the choice of low energy fishing techniques is not to be equated with lack of economic rationalism and dynamism. This intermediate technology has enhanced the economic viability of artisanal fishing in the face of competition from mechanised sector. While the rate of return on investment on motorised traditional craft shows considerable variation for different size classes of the craft and between areas of their operation, ranging between 11 - 35% the innovation has contributed to higher absolute income to the operators as compared to non-motorised craft. The innovation has further set in motion important organizational and behavioural changes in the traditional fishing sector.

Artisanal fishing is characterised by intense use of man power for propulsion and hauling, very low capital labour ratio and is unaided by efficiency increasing infrastructural facilities. The craft used by this sector, takes off from and land in open beaches disposing off the catch in traditionally determined mode that is well-known for effecting a sluggish upward response of prices to excess demand and a sharp downward response to excess supply.

In terms of energy and capital use, the traditional fishing enterprise is backward. In this respect, Indian fisheries share the low energy, low capital intensive mode of production. Yet the widespread appeal of such technologies to user cannot be attributed to want of economic rationality, or to the hold of tradition that comes in the way of adoption.

The economic tendencies that force the choice of relatively backward technologies by the mass of Indian fishermen are (a) relative labour abundance in fisheries and (b) the nature of domestic demand for fish and fishery products.

Abundance of labour in the field of fisheries is contributed both by the natural increase of coastal population and by the insignificant absorption of labour force from that community into industry, service and trade. An immediate consequence of labour abundance is to reduce fishing from a business proposition to a means of subsistance. The sheer imperative of subsistance induce the labour force in fisheries to opt for labour intensive techniques of harvest and substitute labour in place of capital and man power for fuel energy. The labour abundance also resists the flow of outside capital and skill into fishing. This tendency to promote and preserve the low energy fishing has of late been encouraged by steep rise in fuel prices.

The demand for fish and that for animal protein in general is highly elastic to consumer income. A higher household income would result in higher intakes of fish. The numerical preponderance of poor house- holds in our society affects the demand for fish in two different ways (1) the overall quantitative demand is reduced (2) the available demand is scattered in

small quantities over a vast number of households. Both these features of demand encourage small scale fishing and vendor-run marketing as opposed to large scale fishing and mass marketing of standardised fish products.

An important technological change that has transformed the operation of traditional fishing craft is the introduction of motor for the purpose of propulsion. Some of the leading economic and behaviour trends resulting from this innovation are discussed in this paper.

Materials and Methods

The data for the study were gathered from selected villages of the Kanyakumari district of Tamil Nadu. Two types of traditional craft were subjected to the study namely motorised catamaran and motorised navas. The size of the catamaran ranged between 4 to 5 m OAL, composed of 4 to 5 logs. These were manned by a crew of 3-4. Motor was diesel-run and consumed 5 litres per hour if the trip is local. More fuel was used during November to February when the craft migrated to northwards along the west coast. The size of the motorized navas varied between 6 to 7 m OAL and were of plank built. The motor was fueled by kerosene and its quantitative requirement was also highly variable between 5 litres to 17 litres. Average number of persons on board was 4.

Results and Discussion

The average capital investment required for setting up one motorised fishing unit is Rs.25,400/- for catamaran and Rs.52,480/ for traditional nava (Table 1). Motorization has enhanced the investment both directly and indirectly. A very high percentage of the average investment is accounted for the cost of motors themselves. It is 62.25% for catamaran and 30% for the nava. Further, the introduction of motor has increased the gear requirement of the fishing unit. The catamaran based fishing units which used to go generally for line fishing have after motorization taken to gill net operations also. Likewise, the type and quantity of gear used by navas have increased considerably. Hence the phenomenal increase in capital requirement of a motorized fishing unit. The craft which used to be the major item of investment in the artisanal fishing accounts for only 16% of the total investment on motorized catamaran and 29.6% of the motorized navas.

The steep increase in the investment requirements of a motorized fishing unit has set in motion a series of changes in the organisational behaviour of traditional fishermen. For the first time, the fishermen have understood the importance of financial institutions. The amount of capital needed by different fishermen seeking to motorize their craft is so huge as to be well beyond the capacity of private resources within the village to meet. Secondly, the increased investment, if financed from private sources, would have huge interest liabilities affecting the very viability of the technology. As a result, the traditional fishermen seeking to motorize their craft come into the network of institutional finance in a big way.

Table 1. *Investment profile on a motorized fishing unit.*

Sl. No.	Type	Craft Cost (Rs.)	Engine average cost (Rs.)	Gear average cost (Rs.)	Capital investment per fishing unit (Rs.)
1.	Catamaran	4070	15,820	5530	25,420
		16%	62.25%	21.75%	100%
2.	Nava	15,533	15,747	21,200	52,480
		29.6%	30%	40.40%	100%

The fishing operations that used to be dominated by individual ownership of craft are now witnessing collective enterprises. The high investment cost leads to joint ownership of a fishing unit by a team of fishermen due to the following individual expectations.

(i) It is easier to mobilize the required capital by a team rather than by an individual

(ii) A joint ownership reduces individual risk.

(iii) A share in the ownership of a fishing unit ensures work.

The large capital requirement has thus contributed to the emergence of collaborative fishing enterprises among fishermen. Fishermen of lesser means could participate in the ownership and get rewarded for their labour as well as for their share of capital. This feature of joint ownership of fishing equipment is seen to take root in several fishing villages in Kerala and Karnataka coasts also.

One more noteworthy trend in the organizational behaviour of traditional fishermen is the growth of fishermen cooperatives. Though the cooperative societies have a thriving past much earlier to motorisation, the latter development has given further strength to the organisation of cooperatives. In the east coast of Andhra pradesh for instance, the cooperative societies own the motorized fishing equipment and lease them out to the fishermen members in fixed schedules. This arrangement enables the fishermen to profit from an innovation without being burdened by the high investment cost. It also frees the fishermen from the risk of capital loss as well as the botheration for repair and maintenance. The economic performance of the motorised craft operation is presented in Table 2.

Table 2. *Annual operational profit of a motorised fishing unit*

Craft type	Gross return Rs.	Fuel cost Rs.	Net return Rs.	Labour share Rs.	Operational profit Rs.
Catamaran	26,500	5,200	21,300	12,780	8,520
	100%	19.62%	80.38%	48.23%	32.15%
Nava	52,939	12,607	40,322	20,161	20,161
	100%	23.80%	76.20%	38.10%	38.10%

As may be seen from Table 2, fuel cost accounts for 20% of the gross return in the case of catamaran and 24% of the gross return in the case of nava. Though both the types of craft operate on an average 220 days per year, nava consumes more fuel per trip and also pays higher rates per litre. While diesel was available for the relevant period at Rs.4/-per litre, kerosene had to be procured at Rs.4.50 per litre in the open market. Inadequacy of funds and storage facilities and cost of bulk transportation detered the users from bulk purchase, through ration supply. As a result, the fuel was purchased at higher rates in required quantities from open market. The prevailing market conditions of fuel thus seems to escalate the cost of operation of navas more seriously than was the case with catamaran.

As a compensatory mechanism devised locally the pattern of sharing the net return between crew and owner of the craft favoured the nava owners. They appropriated 50% of the net return as their rentals for fishing craft and gear, whereas the owners of the catamaran got 40% of the return. Appropriation of a larger share of the net return by the nava owners justified the higher investment.

The cost of operation both for labour and fuel constituted very high percentage of the gross return ranging between 62 to 68%, affecting the viability of motorized craft operation as a business venture. The average operational profit is hardly adequate to make provision for depreciation, maintenance and interest charges.

The average business profit, after making provision for depreciation and maintenance is given in Table 3. It is to be pointed out that the rates of return so worked out do not take into account interest charges on investment. These rates of return being just marginally higher than the normal commercial lending rates of banks, hardly any surplus would be left if the entire

investment were to be made on borrowed capital. Thus the motorization of traditional craft as a commercial venture is not found to be economically viable. The discouraging conclusion is not in anyway peculiar to the southern district of Tamilnadu. Similar study conducted by the authors for the technology in Kerala coast also led to the same results.

The pioneering adoptors of the technology in each village are resourceful fishermen. The technology offers a source of investment to their resources simultaneously providing a competitive edge in fishing over their non-motorised rival fishermen. As briefly mentioned earlier, team ventures of fishermen into motorization also have greater chance of success. In these cases, the team can set apart the entire collective owner's share for repayment of loan and interest charges limiting their take home earning to the labour share. Such collective effort ensures work for the grossly under employed fishermen labour force.

Table 3. *Rates of return on investment on motorised fishing unit*

Craft type	Operational profit	Depreciation and maintance @ 15%	Business profit	Rate of return on investment
	Rs.	Rs.	Rs.	%
Catamaran	8,520	3,813	4,707	18.52
Nava	20,161	7,872	12,289	23.42

The advent of motorization has set in motion a series of changes in the fishing operation such as migration of motorized craft to distant coasts. Fishermen of Kanyakumari coast concentrate on local fishing during May to October and from November quite a large percentage moves northwords along Kerala coast. They return to their native villages only by February or March. 25 to 40% of the annual cash surplus is generated from these trips. As the huge capital investment cannot be allowed to idle, the traditional fishermen have become more mobile in search of new fishing ground.

To a large extent, motorisation has brought cash as a chief input into fishing. The fuel being the primary input, cash is the first requirement for a fishing trip. Also repair and maintenance of the engine and the more sophisticated gear requirements make the need for cash far more frequent than was the case earlier. Most important consequence of this trend which may be called the monetisation of traditional fishing is to increase the risk of loss. Fear of such risk of operational loss haunt fishermen during off season fishing trips. Consequently, fishermen in several villages restrict their motorized craft operation and the number of fishing trips per year has come down.

Conclusions

The artisanal fishing marked by low energy use continue to be a dominant type of fishing in India in spite of the availability of alternative technologies. A major innovation that has affected the artisanal fishing is the motorisation of craft operations. From a purely commercial point of view the investment on motorization is not a paying proposition. The rate of return on investment is hardly above the interest charges on the capital investment. The main attraction of the innovation is for the resourceful fishermen to invest their own funds to get a competitive advantage in fishing over their non-motorized rivals. Regular migration of motorized craft to distant coasts and monetisation of the operation of fishing are the two major trends observable in recent times. Motorization has also contributed to the emergence of new organisatiional behaviour on the part of fishermen such as team ownership of fishing equipments. Increased interaction with financial institutions, as opposed to traditional money lenders, has also been brought about by the innovation.