Economics of Motorised Traditional Craft

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Motorization of traditional fishing craft is one of the fast spreading technological innovations in Indian fishing villages. The present study on the economic performance of the innovation shows that there is substantial increase in the gross earnings after motorization, the increase being more pronounced in the case of small (below 7.5 m) and medium (8 to 10 m) sized craft. However, the rising fuel cost and high prices of spares of motor and repair charges cut deeply into the operational profit. Rate of return on investment is generally very low and large class of craft (above 10.5 m) show the least return at 11%. The far reaching impact of motorization is to be found in the monetisation of craft operation. Only those fishing units having financial backing to carry on operation during long spells of poor harvest can remain viable in the long run and the rest are forced to fold up.

One of the recent innovations in the operation of traditional fishing craft is the fitting of outboard motors for propulsion. This innovation reduces the hard physical labour of craft operators, increases the speed of operation and enables the traditional fishing craft to explore relatively far lying fishing grounds, which could not be reached by manual towing of the craft. Also fishing in seasons of rough weather has been made more frequent and comparatively safe. Against these positive aspects of motorization, is to be seen the increasing operational cost on account of rising fuel cost, farely high level of investment on motor and the rising cost of repairs and maintenance. With a view to study the economics of operation of motorised traditional craft that would take into account the above factors, a survey was conducted in fiishng villages of Kerala coast.

Materials and Methods

Twelve fishing villages representing different regions of Kerala coast were selected for this investigation. Operational data of 46 traditional craft from these villages were collected. The craft made of wood ranged in size from 6 to 16 m. For the purpose of analysis craft were classified into 3 classes namely, small class of craft (below 7.5 m) medium class of craft (8 to 10 m) and large class of craft (above 10.5). There were not many makes of motors to choose from. Based on the availability, just two makes of motors accounted for the entire innovation. In the choice of gear, most of the craft were served by two to five different types of gear.

Results and Discussion

The investment profile for different size class of fishing units is given in Table 1. Small fishing units have an average investment of Rs. 49,973. Average investment for medium size fishing unit is Rs. 55,256 and that for large unis is Rs. 82,117. As may be seen from Table 1, the cost of fitting an outboard motor was almost equal to the cost of acquiring a fresh craft. Whereas, investment on motor and that on a craft

Table 1. *Average investment on fishing units*

Size of craft		Investment per craft (Rs.)	Investment per motor (Rs.)	Investment per gear set (Rs.)	Average investment per fishing unit (Rs.)
Below 7.5 m	12	14,375	14,375	21,223	49,973
		σ 4,704	σ 1,792.64	σ 10,115	σ 9,049.15
		28.77%	28.77%	42.46%	100
Between 8 & 10 m	22	19,114	16,620	19,523	55,257
		σ 4,661	σ 2,354.4	σ 6,563	σ 9,204.63
		34.59%	30.08%	35.33%	100
Over 10.5 m	12	25,958	17,092	39,067	82,115
		σ 10,308	σ 1,091.8	σ 15,619.9	σ 2,692.18
		31.61%	20.81%	47.58%	100

was equal in the case of the small class of craft it constituted 87% of the investment on craft of medium size and 67% of large size. Clearly motorising traditional craft as compared with the base investment on craft is found to be extremely high. In spite of the fact that motorization involved almost as much investment outlay as of acquiring a new craft, fishermen prefer motorization and increasing number of traditional craft are getting motorized irrespective of the size of the craft. Small and medium class craft also go for motorization, though proportionate to their total investment, the adoption carried a heavier financial burden. Cost of motor as a percentage of total investment worked out to 28.77 for small class and 30.08 for medium class whereas it was relatively low at 20.81 for large class craft. Motorization has its most notable impact on the choice of gear. The small craft which operated with one or two low cost gill nets (such as 'Chala vala' or 'Ayila vala') before motorization have added a few more types of low cost gear after motorization. It was found that some of these small craft have four to five types of such low cost gear each costing Rs. 3,000 to Rs. 10,000 adding upto a high level of investment on gear. Since operation of small craft even after motorization, is restricted to relatively shallow waters, they prefer low cost net of different types suited to harvest of different species. On the other hand, medium and large size craft, operating on distant grounds of increased depth, have gone for high cost nets of larger length. As a result, gear absorbs a high percentage of the total investment on fishing units. On an average investment on gear is worked out to Rs. 39,067 for large craft, Rs. 19,523 for medium and Rs. 21,223 for small craft. Of the total investment on fishing unit, gear alone account for 47.58% for large class, 35.33% for medium class and 42.46% for small class of craft.

As may be observed from the Table, the higher average investment on gear is also accompanied by higher variability standard deviation (σ), the index of variability from the average investment is high at 10,115 for small class, at 6,563 for medium class and at 15,619.9 for large class. As against an average investment of Rs. 21,223 for small class, the difference between indi-

vidual investment on gear ranged between Rs. 8,000 to 40,000. For the medium class it ranged between Rs. 10,000 to 34,000 and for the large class between Rs. 10,000 to 75,000. The general trend of increased gear investment set in motion by motorization is not, therefore, uniform in its effect. While the technical requirement of fishing would no doubt need higher investment on gear to reap the full benefit of motorization, some of the economic forces operate to affect the gear investment, causing extreme disproportionality in combination of fishing equipment of craft, motor and gear. First of these forces is the capital constraint felt by the fishing units. The units that obtain craft, motor and gear as a package from institutional lending agencies fit a complete complement of gear required for the operation. Some more units with relatively better financial background also adopt this method of investment. Others with less investible funds at their comand acquire craft and motor first as these are indivisible items of investment. They cut down their investment on gear as it is possible to operate with low cost net initially and to acquire nets in due course from the earning. Thus investment on craft and motor forms the relatively long term investment and get priority from operators. Gear, being an item of more frequent replacement, mending and enalarging is adjusted to the availability of funds. Another important economic force that lead to higher variability in gear investment is the profitability of individual fishing units.

The units with low profitability or deficit would keep their operation by attending to essential repair and maintenance while the more profiting units would add to their gear length and type. Less profitable units would also allow one or two types gear to fall into disuse for want of funds thereby dwindling the gear stock and investment thereon. Thus the difference in access to capital and that in operational profit and the short run nature of gear investment as opposed to long run nature of investment in craft and motor contribute mainly to very high variability in gear investment.

Economics of operation

The relation between cost and return which constitutes the essential theme of economics of operation of any enterprise has a few peculiarities in fishing. For a given physical quantity of input applied to a production process, it is possible to specify a range of output with a minimum quantity and a maximum quantity. The more perfect the production process the least would be the range of difference between the two quantities. The cost and return data for the motorised traditional craft indicate that for a given quantity of input of labour and fuel, return varies by wide margin. On an average the small class of craft undertake 187 the medium class craft 192, and the large class 195 fishing trips per year. More than half these fishing trips are reported to fetch gross returns inadequate even to meet the fuel cost. On the other hand 5 to 20 trips per year bring in a return of Rs. 2,000 to 5,000 per trip. Fishing operation of the motorized traditional craft is, therefore attended with a high degree of uncertainty and the operational techniques are far from being perfect to ensure a viable minimum catch per trip. It is the rich harvest of a few days in a year and the staying capacity of fishing units through long spells of negative financial returns that makes the operation viable on an average basis. This aspect of the cost and return becomes crucial for the survival of fishing units in business. To survive, the fishing units should have aggregate annual profits and also the staying power in the form of finance to meet fuel expenses and the demands for advance of cash from the crew.

Labour and fuel for running the motor are the two constituents of the operational costs. Table 2 shows the average labour requirement per trip for different class of craft. There is no labour saving an account of motorisation and the number of fishing hands per trip continues to be the same after motorisation. Therefore, motorisation has not resulted in replacement of man by machine. To this extent motorisation has not had adverse impact on coastal employment. The motor serving the purpose of propulsion only, the hauling, operations are continued to be carried out manually. The manpower requirement is thus determined by size of net and attended operational needs.

The system of labour payment prevailing in all the villages surveyed is that the net proceeds after the deduction of fuel cost is shared between craft owner and the crew in a ratio determined by tradition and mutual consent. The total crew share is then divided among the members of crew. Therefore there is no guaranteed minimum wages for the crew members. Labour share of the proceeds is relatively higher at 67 to 75% for small craft. Except in two cases, share of labour is 60% for large class craft. In the case of medium class craft, it is varied between 55 to 67% from village to village. There is a general trend, however, that the larger the investment on fishing unit, lesser would be the share of the labour in the proceeds. The trend is observable from Table 3 where the actual labour share is given as a percentage of gross return. It is 44.4% of the gross return for small class and 41.9% for medium class and 38.72% for large class. Therefore, though the small craft employ less labour per trip, they incur higher labour cost as compared to medium and large class of craft. Another noteworthy feature of labour cost is the very low individual share of crew members of large class of craft. Individual share of a crew member works out to Rs. 5,574 (33,445/6) for small class and Rs. 4,905 (34,339/7) for medium class and Rs. 2,031 (34,530 17) for large class. The individual share of a crew member is comparable for the first two classes, it is incomparably low for the larger class. This very low earning raises a few important questions. The first is the size of the crew. The crew size of large craft is 17 whereas it is 6 and 7 respectively for the small and medium class. Large size craft employed large contingent of crew before motorisation to provide the manpower for propulsion also. Retention of the same size crew after motorisation also seems to be dictated by the village obligation to retain the fellow fishermen in the job. Further, failure of motor in the mid sea would demand a stronger crew to tow back the large craft ashore than would be necessary for the small and medium craft. Thirdly, a higher percentage of large size craft are jointly owned by a team of 18 fishermen. This arrangement was done to spread the capital cost over a large number of heads each bearing a small burden. As a result, all the eighteen have a right to be employed as crew whether that much number is required for operation or not. Labour component of large class craft seems to be on the high side. It should be noted, however, that a larger crew did not result in higher labour cost for the fishing unit. It only reduced considerably earnings of individual fishermen.

The other component of operational cost, the fuel expenditure, is composed of cost of kerosine, petrol and engine oil required to run the outboard motor. Of these, craft operators are provided with a ration supply of kerosine at a fair price of Rs. 2.4 per litre, the quantity of which would meet 35 to 40% of their annual requirements. The balance of the requirement is met from open market purchase at a rate of Rs. 3 to 4 per litre. Total cost of fuel, given in Table 3, is worked out on the basis of these two rates

Table 2. *Crew size and remuneration*

Class of craft	Size of crew	100 = Gross return minus fuel cost	
		Crew share, %	Owners share, %
Below 7.5 m	6	67 to 75	25 to 33
Between 8 & 10 m	7	55 to 67	33 to 45
Above 10.5 m	17	60 to 72	28 to 40

Table 3. *Economics of operation*

Size class of craft	Number of fishing trips per year	Operational cost		Annual gross return per craft	Annual net return per craft
		Fuel	Labour		
Below 7.5 m	187	21,549	33,445	75,425	20,431
	₹22.11	₹8,811.32		₹16,393.13	₹9,305.57
		28.6%	44.4%	100%	27%
Between 8 & 10 m	192	22,459	34,339	81,909	25,111
	₹13.12	₹3,816.13		₹18,448.5	₹11,091
		27.4%	41.9%	100%	30.7%
Above 10.5 m	195	33,574	34,530	89,188	21,084
	₹18.48	₹11,219.12		₹28,630.75	₹8,536.97
		37.64%	38.72%	100%	23.64%

for corresponding quantities. Petrol and engine oil are procured at rate of Rs. 10 and 18 per litre respectively.

Average fuel cost per fishing trip works out to Rs. 115.24 for small class of craft, Rs. 117 for medium class and Rs. 172.17 for large class. The large class of craft incur about 47.15% more expenditure on fuel as compared to medium class craft. There is very little difference in average fuel cost per trip between the small and medium class craft. Higher fuel cost reported for large class craft is due to farther reach of these fishing units into the sea.

Average gross return works out to Rs. 75,425 for small, Rs. 81,909 for medium and Rs. 89,188 for large class of craft, which is equivalent to Rs. 403.34, Rs. 426.61 and Rs. 457.37 per fishing trip for the respective class of craft. The gross return from the large class of craft is only 18.25% higher as compared to that from small class of craft. Considering the fact that the larger class of fishing units have 64.32% more investment on fishing equipment and incur 55.8% more expenditure on fuel, the 18.25% rise in gross return is extremely low. This would mean that the response of fish harvest to increased investment on operational cost is extremely poor. Though an years data is inadequate to warrant such a conclusion, some of the operational difficulties of large class craft do have an adverse impact on their gross earnings. While the small class craft designed for near shore fishing have easy access to a little far off grounds, the large class craft cannot fish near shore as demanded by mutual agreement and custom. Thus the

large class craft suffer from an area restriction in fishing operations. Further the traditional fishermen who operate large craft are well versed through long years of experience in near shore operations only. These factors that are not accounted for by the fishing technology have a bearing at the relative returns from the different class of craft. Consequently gross return from medium class of craft and large class are higher by only 8.6 and 18.25% respectively over that from small class of craft, though the investment for fishing unit is higher by 10.6 and 64.3%.

Operational profit for the three class of fishing unit range from Rs. 20,431 to 25,111. It is the medium class craft that show highest operational profit of Rs. 25,111. The operational profit of large class of craft at Rs. 21,084 is only marginally higher than the small class of craft. The benefit accuring to large class of craft on account of lower labour share in gross return is offset by the higher fuel expenditure. After a higher cost of fuel at 37.64% owner share of large craft in gross earning is only 23.64 as against 27% for small and 30.7% for medium class. The low response of gross return and operational profit to the investment and operational cost needs further investigation to see whether the trend is persistant and/or reverses in the course of time.

From the average operational profit of Rs. 20,431, Rs. 25,111 and Rs. 21,084 of the small, medium and large class of craft provision has to be made to meet repair charges and depreciation of the fishing equipment. Data on repair charges incurred during the years suggest that expenditure on craft and gear follow some regularity, that on motor is often unexpected and sudden. Failure of motor could occur anytime and obstruct the operation during peak seasons thereby reducing the annual income considerably. Also the craft and gear could be mended locally and during off seasons, motor repair needs mostly outside help. Thus it is costly, unforeseable and time consuming. Cost figures on repair charges go up when motor is repaired. Thus average charges are higher for small class of craft at Rs. 6,409. One of the reasons for this high cost is that the sample of small craft include large percentage of older motors than in the case with the other two classes. Frequency of repair is thus more for these motors.

Deducting the average repair charges from the operational profit and also allowing 10% of the total investment for depreciation net profit or income from fishing unit is arrived at and the data is presented in Table 4. The last column in Table 4 gives the rate return on investment which is the percentage of income to the total investment.

Table 4. *Return on investment*

Class of craft	Average investment on fishing unit	Operational profit	Repair charges	Depreciation	Income	Rate of return to investment
Below 7.5 m	49,973	20,431	6,409	4,997	9,025	18.06%
Between 8 & 10 m	53,893	25,111	3,527	5,389	16,195	30.05%
Above 10.5 m	82,117	21,084	3,825	8,211	9,048	11.02%

From a purely accounting point of view rate of return on investment in fishing is very marginal and offers a depressing picture of business profitability. For instance, the investment made in large class of craft earn just 11.02%. The money could be alternately invested in fixed deposits in commercial banks to get the same average return of 11%. Return from small class of vessel at 18.06% is only slightly higher. Only medium craft shows a fairly good return of 30.05%. Even this rate would be unattractive when we consider the prevailing interest rates of private lenders at 24%.

In spite of these low average returns, the motorised traditional craft survives in business mainly through the personal acuman of the fishermen. Formost of these individual dexterity is found in maintaining the craft and gear to make them go a little longer, thereby postponing the replacement requirement. Unit that are more successful in this endeavour would incur less depreciation and have more disposable income. The units that allow their craft and gear to wear out easily would incur more depreciation cost and run the risk of going out of business.

Another important point in the long run profitability of fishing unit is the high range of variation in returns. Variation implies a few units earning extremely good returns. Such returns are not confined to a particular fishing unit year after year. A fishing unit earning a lower return in one year may earn an extremely good return in the following year, as the chance variable continues to play a greater role in the quantity of catch. The units with a high frequency of high catch and thereby able to maintain higher long run return would survive in business and those with consistently poor performance would be driven out. This feature of struggle and extinction of units is a very common sight in the fishing business.

It is appropriate now, to consider the relative gross return before and after motorization. The figures of gross return before motorization could be obtained only from the craft that were motorised just a year or two before. The owners of the craft who have motorised fairly early could not supply this information satisfactorily. Hence the average return from craft without motor is drawn from a smaller sample. However these figures are fairly representative.

For the purpose of comparison, the gross return from motorised craft is given after deducting the fuel cost. As may be seen from the Table 5, the largest increase in gross income on account of motorisation accrue to small class of craft. There is an increase of 93.79% followed by medium class, 63.67% and lowest increase is for the large class, 44.88%.

The increase in gross return even after providing for fuel looks very impressive both in terms of actual amount and in terms of percentages. But the entire increase does not go to the investor or the craft owner. As is shown earlier, 67 to 75% of this added return would go to labour of the small class, 55 to 67% to the labour of medium class and 60 to 72% to the labour of large class. Of the balance, provision has to be made for repair and maintenance. As a result both the operational profit and rate of return on investment offer a depressing picture.

Introduction of the innovation of outboard motor to the traditional craft marginally enhances the annual return of fishing units of different classes. The relative economic benefits is more pronounced in the case of small (7.5 m and below) and medium (8 to 10 m) class of craft, it is of least advan-

Table 5. *Comparative gross return with and without motor*

Size class	Gross return net of fuel cost	Gross return without motor	Increase in gross return	Percentage increase
	Rs.	Rs.	Rs.	
Below 7.5 m	53,875	27,800 (100)	26,075	93.79
Between 8 & 10m	59,450	36,324 (100)	23,126	63.67
Above 10.5 m	55,614	38,386 (100)	17,228	44.88

tage to the large craft (above 10.5 m). Introduction of motor has brought in the cash requirement for fuel for every trip. As most of the trips fetch negative return and annual return is mainly from a few trips of good season, cash requirements put heavy strain on the business of fishing operation. Survival of fishing unit in business depends on their financial capacity to stay through lean days. This has completely transformed the character of traditional craft operation into one of monetised business.

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