POVERTY, INEQUALITY AND NATURAL RESOURCE DEGRADATION: AN INVESTIGATION INTO THE SMALL-SCALE FISHERY SECTOR OF SOUTH KERALA

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PhD Abstract

I. INTRODUCTION

Degradation of natural resources such as land, forest, marine and fresh water, etc. threatens the livelihoods of many people, especially the rural poor. Various studies and literature have shown that rural people especially the poor depend on natural resources for their livelihood and survival. Even when the poor have access to other resources, these natural resources provide a cushion to them during periods when income from other sources decline or become unavailable.

Declining natural resource environment threatens the livelihoods of poor people, especially in the absence of any successful process of regeneration. The link between natural resource degradation and poverty is a complex one; poverty may be associated with natural resource degradation, but there is not necessarily a direct causal relationship. The way in which natural resource degradation affects the poor and the extent to which it affects individual groups depend to a large extent on the types of 'poverty' of such groups and their asset portfolios.

The present study is an attempt to examine the impact of natural resource depletion on the livelihood of poor by examining the case of the coastal fishery sector of Kerala. There is little empirical evidence on the nature and extent of poverty in these communities and on the relative importance of different causes of poverty.

II. RESEARCH PROBLEM

In Kerala, the marine fishery sector is *de jure* under state ownership, but *de facto* unregulated and open access in nature. The sector is characterized by dualism in the form of co-existence of a small-scale sector side by side with a large-scale sector; but their activities are largely concentrated in the inshore areas of depth 0 to 50m.

Starting from the early 90's there has been tremendous increase in fishing pressure as a result of enormous increase in the number of fishing crafts and the use of destructive gears like trawls and ring seines. In spite of the increase in fishing pressure the fish output during the

last decade has been stagnating around 6.0 lakh tonnes against the optimum sustainable yield of 5.7 lakh tonnes; indicating resource stagnation.).

According to a CMFRI study about 50 percent of the marine fish output is cornered by the large-scale sector and another 40 percent by operators of large seines in the motorised sector; the traditional fishermen especially those in the non-motorised sector find themselves to be marginalized .

The cost of resource depletion is disproportionately paid by the poor who are the primary users of the commons. For many fisherfolk in the small-scale sector, daily earnings from fisheries are low, fluctuating and often uncertain affecting their livelihood security. There is some anecdotal evidence that fishing communities have above average poverty rates, but only very little data to analyse on the nature and extent of poverty in these communities, on the relative importance of different causes of poverty and on the most effective actions to alleviate poverty.

III. STUDY GOAL

The overall objective of the study is to understand the economic condition of fisherfolk in the small-scale sector in the context of change in access to and depletion of marine resources.

IV. RESEARCH QUESTIONS

1. What is the extent of income inequality among the small-scale fishing community? What are the causes of this inequality? Which are the groups in the lower strata?
2. How poor are the small-scale fishery households and who are the poorest among them?
3. What are the characteristics of the poor in relation to others?
4. What are the determinant factors influencing poverty?
5. To what extent the different groups depend on fishery resources for livelihood?

V. HYPOTHESIS

The inequality in the distribution of household income is closely related to fishing assets.

VI. STUDY AREA

In order to collect primary data to seek answer to the research questions Pullivilla, a typical coastal fishing village in Neyyattinkara taluk of Thiruvananthapuram District was chosen.

The primary data for the study were collected through a sample survey of households. From the selected households, data on demographic characteristics of household members, fishing and non-fishing assets possessed, employment particulars, income from different sources, consumption expenditure, etc. were collected through personal interviews using a structured schedule. In order to overcome the effect of seasonality the interviews were spread over a period of eight months with a break of one month during the monsoon period of June-July. The reference period for data on employment, income, and expenditure was 30 days previous to the date of enquiry. Along with the household survey, data on cost and earnings were also collected from a sample of 70 fishing units in the village by personal enquiry. The data collected referred to the fishing activities and earnings during the preceding 12 months.

VII. RESULTS OF THE STUDY

Income differentials among fishing units

From interaction with local community during the course of household survey, it was learnt that there were significant differences in fishing income among the small-scale fishermen in the village. One obvious reason was the difference in the fishing technology used. The two main types of fishing technologies used were the kattamaram propelled by human power and plywood crafts using outboard engines. But even among the fishermen operating same type of equipment, there was wide difference in catch value.

In order to understand the variation in catch value a fishery production function was developed. The fishery production function combines both biology and technology. Combination of inputs of capital and labour produces the catching power referred to as the fishing effort. At any point of time, catch depends on the level of effort applied and fish stock. Assuming that the fisheries and the stock at a place are large in the short-run, the catch of individual units can be considered as dependent on the variation in the effort applied. With this assumption the production function depends on the inputs alone. One of the common functional forms used in fisheries is the Cobb-Douglas form: $Y = A\ K^{\alpha}\ L^{\beta}$ where, Y is the output, K is the capital, L is labour, A, α, β are parameters. For the two types of fishing operations namely motorised plywood and the non-motorised kattamaram operations the functional form was rewritten as 1 and 2.

(1) $LnCatchValue = Ln\beta_0 + \beta_1\ LnNet + \beta_2 LnHook\&Line + \beta_3 LnFuel + \beta_4\ LnLabour + \beta_5 D_1$

where $D_1 =$ 1 if 25 HP motor is used otherwise 0

(2) $LnCatchValue = Ln\beta_0 + \beta_1 LnGear + \beta_2 LnHook + \beta_3 LnLabour$

Of course that there is a specification error in the production relation due to the omission of other variables. Age, education, experience, etc. can be used as proxy dummy variables for management; but this has not been attempted since such a detailed analysis was beyond the scope of the present study.

It is realised that multi-collinearity is a problem in such estimates. However, in the present situation, where R^2 in both cases are high and the regression coefficients of most of the variables are individually significant it may not be wrong to conclude that multicollinearity does not pose a serious problem. The regression results were examined under this assumption. The regression results suggest that, in order to increase output, use of more labour has to be employed. Here increasing labour means carrying out more number of trips. Especially for Kattamaram operations contribution of labour is the main and only input for increasing catch. The contribution of additional gears, such as nets or hook and line are almost insignificant. For motorised operations, increase in labour employed, fuel used and engine power were the major influencing inputs. Even though the prevailing notion is that those using hook and line as an additional gear get higher catch, the data did not support this. Increasing gear weight has also only a nominal effect in increasing catch. At the same time, by switching over to higher engine power the catch could be increased by one-third (*antilog of the coefficient of D*). It seems that by using engines with higher horsepower, the operators can go to higher depths and also reach the fishing ground and return to landing place quickly. Increasing fuel use could also contribute to an increase in catch by one-third, may be because of longer fishing time.

As regards return to scale, motorised plywood operations show increasing returns to scale, while kattamaram operations show constant returns. It is thus seen from the analysis that the main reason for income differential among kattamaram operators is the difference in the number of fishing trips. This is also equally true for the plywood operators. For units with higher engine power there is a chance of getting higher earnings as it provides higher capability for hunting and intercepting migratory species at greater distances.

But why don't fishermen increase the number of trips by using the existing equipments? In the small-scale sector the decision, whether to undertake a particular fishing trip is taken by the team, which is based on the simultaneous integration of a large number of processes of

past experience coupled with immediate observation aided by human sense. It is willingness to take risk conditioned by practical knowledge.

Socio-economic condition of the community in the village

The study area being part of a coastal fishing village it is natural that majority of the households are engaged in fishing or fish related activities. Small-scale fishery is basically a household activity with male members engage in fishing and the female members attending to processing of the catch and often vending.

Since almost all the households in the study area depend on the marine resources in one way or other, all members who can work have to do some kind of gainful work to earn a livelihood. It is seen that 34.6 percent of the population do some kind of gainful work and another 4.8 percent are on the lookout for some work. In the fishery sector, since the demand for daily work in fishing is quite seasonal it is likely that even among those working, there may be considerable extent of underemployment.

The occupational structure of the workforce shows that, non-fishery employment is limited to a few salaried and regular wage paid employment, self-employment and casual wage labour. In the fishery sector men mainly work as crew men either as owner worker or hired worker in fishing, while women are mostly engaged in fish processing and vending. Alternate employment to the fishing community outside the fishery sector is very limited.

Educationally the workers in the village are very backward. Nearly half of the workers are illiterate and about three-fourth have not more than primary level of education. The survey results show that about 14 percent of the households have plywood boats and about 7 percent have catamarans. There are also a few units working with shore seines. It is seen that the main source of income of fishery households in the village was from fishery. In fact, about 86 percent of the average household income was from fishing and fish related activities. Income from non-fishery activities accounted for only about 7 percent of their income. Even ‘other coastal households’ were to some extent dependent on fishery income by way of fishery labour, fish processing and fish vending. Survey data show that their dependence on fishery as measured by income from it is about 26 percent. The overall picture that emerges is that almost all the households in the study area depend on marine resources in way or other for their livelihood.

The standard of living of the households was assessed in terms of monthly percapita consumer expenditure (MPCE). The average MPCE for ‘fishery households was 1393 and for

'other coastal households' it was 1191. Even though there is difference in average MPCE between the two categories of households, a two-sample t-test for means carried out shows that there is no significant difference between the two estimates. In view of this finding and also because of the dependency of both groups on fishery resources, in the remaining part of the analysis the categorisation as 'fishery households' and 'other coastal households' is dropped and all the households are referred to as 'fishery households'.

Inequality and poverty measurement

The next attempt was to find out the extent of inequality in income among the households and to investigate factors influencing the inequality. Our hypothesis is that inequality in household income is closely related to fishing assets.

For analysis of inequality and poverty the unit of analysis considered were persons rather than households. In order to quantify the extent of inequality the Gini coefficient was computed and was found to be 0.33 for the total population. The Gini coefficient ranges from a minimum value of zero, when all individuals are equal, to a theoretical maximum of one in an infinite population in which every individual except one has a size of zero. The present estimate indicates that there is income inequality but the extent is not severe. To get an insight into the contribution of the characteristic of asset ownership to the overall inequality Theil Index was computed because of its property of decomposability. The results are given in table 1 and 2.

Table 1
Theil index and Gini ratio

Type of household	Theil index	Gini ratio
With fishing Assets	0.0915	0.24
Without fishing assets	0.2040	0.35
All	0.1842	0.33

Table 2
Decomposition of Theil Index

Overall inequality (I)	0.1842
Inequality within groups (I_w)	0.1667
Inequality between groups ($I_b = I - I_w$)	0.0175
Inequality explained by difference between groups with and without fishing assets ($R = I_b / I$)	0.0950 i.e 9.5%

The results show that while possession of fishing assets influences household income, the inequality in income is mainly due to other factors. The reason for this seems to be the method of income sharing in the fishing activity. From ownership of fishing assets, the owner

gets a fixed share of the net sale value of the catch and the remaining to be shared among the crew. Households with fishing assets and labour thus get a larger share of the income and the variation depends on the number of labour contributed by the household.

From the distribution of household income it is found that about 42 percent of the households have very low monthly income of less than Rs. 1000 percapita. Further, nearly 15 percent have less than Rs. 500. This points to the prevalence of poverty in the coastal community.

For the purpose of the study, we defined the poverty in absolute terms as getting an income below a given level referred to as the poverty line. Poverty can be approached from objective or subjective perspective; both provide valuable insights to the measurement and analysis of poverty. In the present study, we have used a combination of the two approaches. First, a 'food poverty line' was developed. This is the cost of purchasing a specific basket of food items. The composition of this basket was determined through a participatory analysis in the local community. From the survey data the amount deemed necessary to cover essential non-food consumption was estimated and this was added to the 'food poverty line'. The poverty line was thus estimated as Rs. 633 per person per month. Persons/households with MPCE less than or equal to this level were treated as poor. To measure poverty we used the FGT family of measures, which gives three types of indices, the 'head count index' (HCI), 'the poverty gap index' (PGI) and 'the squared poverty gap index' (SPGI). The HCI measures the incidence of poverty as the percentage of population whose income falls below the poverty line. The PGI measures the degree to which the mean income of the poor differs from the poverty line (depth of poverty). The SPGI indicates the severity of poverty. In terms of number of poor depth of poverty and severity of poverty, households in the non-asset category are on the higher side. (See table 3)

Table 3
FGT Indices

Type of household	HCI	PGI	SPGI
Asset group	8.9	1.9	0.4
Non-asset group	25.2	9.2	4.7
All	21.2	7.4	3.7

Determinants of poverty

Once the extent of poverty was assessed the next step is to find out who are the poor. For this a poverty profile of different socio-economic groups was developed. An examination of the poverty profile indicated the major characteristics that contributed to pushing a household into the poverty group. The main characteristic identified were (i) single earner household,

(ii) high dependency ratio, (iii) occupation of the head of household in non-fishery sector, and (iv) head of household illiterate. That is to say, incidence of poverty was higher among households with these characteristics. The risk of a household being poor can therefore be said to be dependent on these characteristics; and this was estimated using the following logistic model.

$\log (p/1-p) = \beta_0 + \beta_1$ Dependency ratio $+ \beta_2 D_1 + \beta_3 D_2 + \beta_4 D_3$

where, p is the probability of being poor based on the explanatory variables; $D_1 = 1$ for single owner household, otherwise 0; $D_2 = 1$ if occupation of head of household was non-fishery, otherwise 0; $D_3 = 1$ if head of household was illiterate, otherwise 0. The estimated model when applied to the observed data was found to make 68% correct predictions and 3% tied, indicating a satisfactory level of reliability. The Wald scores for D_2 and D_3 were low, still they were retained because of their socio-economic relevance in the model. The estimated coefficients have special meaning in assessing the effect of the corresponding characteristic on poverty. The coefficients are related to the concept of 'odds ratio' (Expβ). Thus when odds ratio is 2.058 we can say that poverty occurs about 2 times as often among single earner households as compared to other households. Similar interpretation for other variables.

Poor peoples' dependence on fishery

From the survey data it is seen that in the study area the dependence of the poor and non-poor households on the fishery resources is almost the same, the only difference being that for the poor households it is from wage labour in fishery. Recent studies have shown the existence of an inverted U-shape relationship between environmental quality and percapita income level. It is stated that in the later stages of development environmental quality level improves because people become more environmentally conscious. The assumption is that individual demand for environmental quality rises with income. To see whether the assumption is applicable in the case of coastal fishery we examined the relation between MPCE and dependence on fishery. The tabulated results indicated that as the percapita income increases resource dependency increases up to a stage and then begin to decrease. A visual examination of the fitted quadratic curve on the cross-sectional data also indicates that to some extent the relationship holds good.

Factors influencing household well-being

From the analysis carried out, it was seen that the main source of household income was fishery resources. Fishery income depends on the utilisation of fishing assets and labour in

fishing and related activities. Because of high level of uncertainty involved in fish harvest, the daily income from fishing is highly fluctuating and there is wide variation among households using the same technology. The non-fishery income is comparatively low and is mainly composed of employment in non-fishing activities and remittance. To some extent ownership of non-fishing assets also contribute to the household income but the data show that this is negligible. Taking these factors into consideration the household income model for fishery households was specified as in equation (1). Since the fishery resource (S) is in a specified location it can assumed to be constant and eliminated from the equation. Similarly, ownership of land (T) is dropped from the equation since in the study its contribution was found to be nominal. The specified model is given as:

$$lnY = a_0 + a_F lnK_F + a_N lnK_N + b_F lnL_F + b_N lnL_N$$

The regression was estimated based on sample cross-section data using household consumer expenditure as a proxy for household income and linear regression techniques. The estimated results were in line with our expectations even though the model explains only 33 % of the household income. This seems be due to the high degree of uncertainty associated with fishing operations. Another reason may be the use of consumption expenditure as proxy for the dependent variable household income. In spite of these, the results suggest that fishing employment is the most important determinant of income. Possession of assets either for fishing and for non-fishing is equally an important determinant of income coming next to fishery employment. The estimated values of the parameters denote the income elasticities. These tell us the percentage increase in income resulting from a one percent in the factor, other factors remaining constant. For example, the parameter estimate of LNFISHASSET is 0.17 which indicates that a one percent increase in fishing assets will deals to 0.17 percent increase in household income. As compared to these three variables, the role of non-fishery employment in income determination is low. This could be explained by the lack of alternate employment opportunities in the other sectors.

IX. CONCLUSION

This study was carried out to understand the economic condition of small-scale fishing community in the context of change in access to and depletion of fishery resources. In southwest coast of Kerala, two types of fishing techniques are practiced – motorised plywood crafts and non-motorised kattamarams. The economic activities in the study area are mainly confined to fishing and fish related activities like fish processing and vending. There are very little alternate employment opportunities here.

I. (i) There are significant differences in fishing income among the small-scale fishermen and even those operating same type of fishing equipment. Apart from the technology used the main reason for the difference in income is the difference in the number of fishing trips. In the case of motorised crafts difference in the engine power is also a major reason.

(ii) As regards household income, the survey results show that there is difference in income between households with and without fishing assets and also among households in each category. The extent of overall inequality as measured by the Gini ratio 0.33 and for households with fishing assets and without fishing assets the ratios are respectively 0.24 and 0.35. An exercise on decomposition of inequality using Theil Index shows that possession of fishing assets does not significantly contribute to inequality. In other words, possession of assets is associated with higher mean income, it does not contribute to overall inequality.

II. In the fishing community 21 percent of the population can be considered as poor (i.e. MPCE below Rs. 633). The percentage of poor is higher in the non-asset group (25) as against 9 in the asset group. The indicators of depth and severity of poverty are also higher in the non-asset group.

III. The main characteristic that differ between the poor and the non-poor as seen from the poverty profile were possession of fishing assets, asset profile, educational level, sector of occupation, number of earners, number of children over two, and dependency ratio.

IV. Further analysis showed that the main determinants of poverty were (i) single earner in the household, (ii) larger dependency ratio (iii) head of the household working in non-fishery sector, and (iv) head of the household illiterate.

V. The dependence of both poor and non-poor on fishery resources is almost same; but in the case of poor households income is mainly from fishery labour. However, there is an indication that as income increases dependency on fishery resources increases up to a certain level and then decreases.

VI. In the fishery households, the main source of household income is the employment in fisheries sector. Alternate employment opportunities are very limited.

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