Chapter Five

SUMMARY AND POLICY CONCLUSIONS

This chapter summarizes the entire study and then presents a set of policy suggestions aimed at improving catch efficiency in the Sone Beel without compromising the issue of sustainability. The first section is dedicated to the summary of the entire study and the second section deals with policy suggestions on the basis of findings and observations. The last section of the present study focuses on the possible ways in which this study may be extended.

5.1 Summary of the Study

This study has measured technical efficiency of fish catch among traditional fishermen living in the neighborhood of the Sone Beel, in Karimganj district of southern part of Assam. The Sone Beel is the largest wet land and catchment area of the region. The study focuses on traditional fishermen exclusively dependent on the Sone Beel for their livelihood. The monsoon months are chosen for analysis only. Three distinct types of fishing teams are commonly observed in the Sone Beel – (i) paired boat with 6 to 8 catchers, (ii) Single boat with 2 to 3 catcher (net users) and (iii) single boat single catchers (a few with net, and others with various traditional equipments). In the present study all distinct types of fishing teams are separately taken into consideration for measuring technical efficiency. A statistically sufficient

sample is drawn and chosen purposively to meet the specific requirement of the study based on a pilot survey. The sample selected for the present study is rather heterogeneous as far as method of catch is concerned. The sample contains 149 fishing teams with single boats and multiple members, 16 paired boat teams with multiple catchers and 100 single catchers or individual catchers with boats and nets, and finally 60 single catchers with boats and traditional fishing tools and equipment. All these sub-samples have different catch methods and thus are statistically treated differently as far as production function estimation and analysis is concerned. The sample contains a total of 385 catchers (or fishermen).

The Sone Beel is a catchment area and as a result the water volume in the Sone Beel rises several times during the monsoon, which is the peak fishing season. Property rights are not defined during the peak fishing season. In other words uncontrolled fishing is practiced during the monsoon months in Sone Beel. The peak fishing hours in the lake is 4:30 AM to almost 6:30 AM. There are a 3 to 4 fixed boat landing sites where the fishing boats return. There is no government regulated organized whole sale trading place for fish transactions. However a whole trading place exits where the harvest is sorted weighed and valued. Middlemen and whole sale traders transport the fish to nearby markets for immediate sale. The catch is sold locally and is not marketed outside the district of Hailakandi. There is no ice factory nearby which means that fishermen have no access to ice-boxes or freezer boxes by means of which they may store their harvest for a day or even half a day. Thus the catch has to be immediately sold as fish is perishable. Other features of backwardness or informal nature of the fishing activity include, (i) no breeding area in the lake, (ii) no control over number of catchers, (iii) no boat registration, (iv) no registration or identity

number or even a registered log book for catchers, and finally (v) no control over the density and gapping of net used.

The detailed data on monthly catch, its market value at the time of catch, total labour hours spent, size of boats, nets and other fishing equipments are collected in detail during the survey. Both personal as well as fishing household level data on selected socio-economic variables and indicators such as age and work experience of the catcher, education, non-fishing income, housing type and quality, sanitation type and quality and source of drinking water, are collected in detail. For individual or single catchers more personal information could be collected. For team catchers some personal information could not be obtained and used for analysis. However information from the team leaders or skippers provided adequate data for efficiency analysis. A stochastic production frontier with inefficiency effects is estimated on the basis of cross-sectional primary data on fishing inputs as boat, net and labour and value of catch. The sample size was determined by means of an appropriate sample size determination formula (when the population size is unknown). A pilot survey was first conducted in the study area for this purpose. Thus total sample size of all teams in the present study is 325. The sample size is almost 37 percent of the unofficially and informally known population. Likelihood ratio tests suggest that the Battese and Coelli (1995) inefficiency effects model appropriately describes the underlying relationship between inputs and output.

The principal findings of the study turn out to be rather interesting but are more or less obvious in the context of traditional fishing community. A noteworthy finding is that all key inputs that associated with fish catch are positively influence on value of fish catch. The mean technical efficiency is around 68 percent for multiple catchers' team and 65 percent for single catcher teams. Turning to the estimates of Cobb-

Douglas production frontier parameters, the constant term is found to be significant in both the catch methods. So are the experience in fishing is found to have a positive influence on technical efficiency while formal education and income from other sources have dampening influences on the same. Sanitation dummy and house type dummy have positively influence on technical efficiency for single catcher teams. The elasticities of output with respect to inputs are more important and are computed from the estimated parameters of the Cobb-Douglas production frontier. Interestingly the study finds that the underlying technological relationship between inputs and output exhibits increasing returns to scale (IRS) for multiple catchers teams and decreasing returns to scale (DRS) for single catcher teams. A remarkable result for non net single catchers is that there is no technical inefficiency in the data and the frontier model merges with the usual OLS model. This is because the null hypothesis of no technical inefficiency in the data for single catchers without net (sample is of size 60) was statistically accepted using the Likelihood Ratio test. The results strongly signify that technical inefficiency is absent in the data set. This further implies that traditional least squares method would be appropriate to estimate parameters of the production function. This is also apparent from the statistically insignificant values of the variance parameters of the stochastic frontier model. The single catcher's sub-sample without net is the only subsample where OLS is statistically accepted and preferred over the frontier model.

Now, two key areas of concern that emerge from the present study are, (i) socio-economic backwardness (that includes poverty for obvious reasons) of the catchers or fishermen, and (ii) declining fish population or fish stock in the water body even during peak seasons in recent years. For obvious reasons these two issues are related. Higher the level of socio-economic backwardness among the traditional fishing

community, higher is the dependence on fishing for livelihood. With low levels of education, alternative occupation and employment opportunities are also low. Thus a majority of households are rather forced to remain in the traditional occupation which in this case is also the ancestral occupation. A relative small percentage of catchers are engaged in non-fishing activities during the slack season, which implies that the majority are either unemployed or are forced to depend on very scanty fish catch during winter months. This raises their socio-economic distress levels substantially. Naturally, higher the accumulation of catchers during a given time point, higher would be the catch levels (over fishing) finally resulting stock depletion and loss of aquatic species.

During the survey it was revealed that almost 85 percent of the respondents do not have access to a hygienic sanitary toilet. Moreover 50 percent of the respondents depend on dug wells and pond for their drinking water needs. Some were even found to consume from community tube well water. Alarmingly 81 percent of the catchers' households were found to have 4 to 5 children. None of the catchers were found to have crossed the secondary educational level. Paradoxically 96 percent of the respondents were found to be using mobile phones. Regarding overcrowding of fishermen, around 87 percent catchers felt that there are more catchers currently fishing in the Sone Beel than what it should have been. Around 69 percent felt that they had to take up fishing as their primary occupation not by choice but rather by compulsion. Most catchers are not confident about other occupations as they are mostly unskilled in any non-fishing work. Almost all respondents felt that uncontrolled fishing in the area during peak fishing seasons is the consequence of overdependence on fishing and this is leading to falling fish stock in the lake.

The immediate goal for planners and policy makers of the district and region would be to create sufficient levels of non-fishing employment opportunities for fishing households so that no traditional fishing household is forced to take up fishing as the only livelihood. This would address the issue of overcrowding and overfishing in the Sone Beel thereby checking the loss of fish stock and aquatic species in the region.

The key issues of concern as identified by the fishermen themselves include poor and inefficient fishing gears and vessels, lack of capital, poor fisheries management, limited access to larger markets (e.g. Silchar, Guwahati and Agartala) coupled with poor handling facilities, poor infrastructure and high post-harvest losses. Lack of alternative employment opportunities and rising number of fishing households have possibly been the main cause of over-crowding of catchers leading to over-exploitation of the resource and degradation of fish stock. Almost all fishing households around the Sone Beel continue to be trapped in poverty and this has been their status over generations.

5.2 Policy Recommendations

Coming to the specific issues related to sustainability, several problem areas were identified during the survey.

First, boats used by catchers are not registered with the Fisherman's Co-operative Society. There is no boat identification number assigned. In other words there is no formal mechanism in place to keep track of the exact population of boats. Since there is no control on fishing during the monsoon months, the exact number of boat on the water cannot be enumerated. Assignment of a boat identification number or a registration number is the key to control over fish catch. Obviously there is no log book or log sheet to formally record who exactly are fishing at any point of time. The

suggestion is that the society must maintain a record of the total population of boats operating on the one hand and number of boats in operation during a 24 hour period on the other. The state fishery department must ration the labour time (say 4 days a week) spent by each fishing team so that even during the peak season anyone and everyone is not allowed free access.

Second, there is a government regulation in place regarding the exact gapping of the nets to be using in fishing but it is almost always violated. In other words there is no check or control over the type of nets used. It is the indiscriminate use of the dense net that is responsible for loss of non-fish species – especially small species in the Sone Beel. Thus there has to be regular surveillance by some government appointed dedicated and trained team to keep a check on the use of unapproved nets. The catchers are tempted to use unapproved nets in an attempt to harvest more using the same labour time. But in doing so they disturb the overall ecological balance of the water body which ultimately affect the fish population adversely. The survey revealed that small varieties of fish are caught during the peak season. The catchers themselves reported that large sized fish is almost extinct in the Sone Beel. This is because even the large species of fish do not

Third, the fishermen were not found to be using any type of storage facility as refrigeration even for a limited period with the help of ice-packs or ice-boxes. To avoid distressed or forced sale at throw away prices, government has to provide temporary refrigeration facilities in the area. Apart from forced sale, refrigeration would allow better fish quality for consumers of the region.

Fourth, because of the open access nature of fishing any boat can travel to any corner of the Beel and there is no demarcated or well defined area or enclosure for fish breeding. This is a biologically crucial aspect as because fish population can be

restored or even grown by demarcating an area within the Sone Beel for fish breeding. Since there is no dedicated breeding ground at present stock depletion is most likely if there is over fishing. Fishing boats should not be allowed to enter the breeding area. Protecting the breeding area could be the most significant step in restoring fish stock. This in turn would raise the catch levels and hence revenue earned without raising labour time.

Fifth, the immediate goal for planners and policy makers of the district and region would be to create sufficient levels of non-fishing employment opportunities for fishing households so that no traditional fishing household is forced to take up fishing as the only livelihood. This would address the issue of overcrowding and overfishing in the Sone Beel thereby checking the loss of fish stock and aquatic species in the region. Almost all catchers complained to the survey team members that the same catch effort is resulting in lower catch in recent years. In other words catch levels are falling for the same fishing effort. This perception mostly among experienced fishermen is clearly indicative of declining fish stock in the Sone Beel. Thus catch has to be controlled along with over-crowding. The best policy would be not to allow any fishing team to fish for more than 4 to 5 days per week on a rotation basis. This may solve the problem of overcrowding to an extent.

Sixth, the dry season or winter season has not been considered in the study. During winter the water body shrinks enormously and it is leased out to wealthy businessmen of the region who partition the reaming area with the help of bamboo barricades. These partitioned water bodies, around 5 to 6 bighas on an average, are utilized for fish production during November to April. The State Fishery Department can provide incentives to these large wealthy fish growers so that the responsibility of fish breeding may be entrusted upon them.

Seventh, the size of catch on an average is small in the Sone Beel. Even the larger species such as *Rohu, Katla, Aar, Boal,* among a few others are not allowed to attain full sizes in the Beel. For instance at the fish transactions site the average weight of four above mentioned species was found to be just 472 grams, which is a shocking discovery. This is so because each of these four species is capable of attaining an average weight of 2.5 to 3.2 kg within 5 to 8 weeks. The maximum weight may go up 4 kg beyond 8 weeks. Thus a dedicated area apart from the breeding area may be demarcated for.

5.3 Possible Extensions of the Study

No study can be free from drawbacks or lacunae and future studies in the area will usually have scope for improvements. The present study also has several aspects which may be taken care of in future studies in efficiency of fishing where access to the resource is free. This section focuses on the possible ways in which this study may be extended. These are as follows.

Firstly, due to the backward informal nature of the study region formal records and reports are unavailable especially when it comes to fishing. In other words secondary data or information on fishing in the Sone Beel does not practically exist. Thus during the peak fishing season actual number of fishermen and boats in the Sone Beel could not be ascertained. Thus the population size was not accurately known. Future studies may focus on investigating the exact size of the fishing population in the Sone Beel. Future studies may also focus on regions where credible data on fishing population is available. Statistical estimates of catch efficiency would be robust in areas where boats are registered (and so are the catchers), and day to day records of value and quantity of sale for each catcher are maintained. This organized aspect of

formalization of the local fish economy is absent in the study. Acceptably this is beyond the control of the study.

Secondly, although peak and slack season water volume in the lake was known, an estimate of fish stock in the lake across seasons was unknown. Data on stock of fish over a few years is not available. Moreover total volume of catch during the season is also unknown. Without boat registration and fishermen's log-book entry prior to catch, exact number of catchers in the water at a given time point cannot be ascertained. Hence in the absence of these estimates, it cannot be determined whether the rate of catch falls short of, or exceeds the natural rate of stock growth. This is very vital from the point of view of sustainability of the resource.

Thirdly, this study does not focus on the slack season fish growing problem when the water body is partitioned and leased out of fish growers. Arguably this is outside the scope of the present study. Future studies on efficiency of fishing in the Sone Beel can be dedicated to the winter season problem which is quite different from that of the peak season.

Fourthly, there is ample scope of studying the overall quality of life of the fishing households in greater detail. Specifically areas which may be covered in future are health, education of male and female members (children and adults), nutrition, employment status, among a few others. Household level studies on human development parameters would throw light on the exact areas of policy intervention. Future studies may delve deep into the household level development aspects among fishing families.

Fifthly, in collaboration with zoologists and aquatic experts it is important to have a confined and well demarcated enclave in any suitable corner of the Beel for

conservation purposes. This includes breeding. In this enclave natural rate of regeneration or stock growth may be observed and estimated by the biologists. Moreover the economically larger species would have a chance to grow in size and the rate of weight gain may be observed over time. One standard criticism with regard to fishing in the Sone Beel is that catchers do not allow fish to gain weight, due to over fishing as well as wrong specification of the net. Once the estimates of stock growth are obtained for the conservation enclave, the same for the entire Beel could be simulated. Moreover the exact time period after which the large species attain an economical size can also be accurately estimated. This breeding or conservation enclave has to be managed by biologists appointed by the Government Fishery Department. In future works a bio-economical model of sustainable fishing may be estimated in the context of Sone Beel.

Finally, the present study has dealt with estimation of technical efficiency of catch only. Future studies can also focus on allocative efficiency and scale efficiency so that overall economic efficiency may be measured.