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Technical Efficiency of Fish Catch and its Socio-Economic Determinants towards Freshwater Fisher Population in North Central Province, Sri Lanka

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ABSTRACT

In this study, freshwater fisherman in the area of Sri Lanka's north central province had their technical efficiency of fish catch measured. The study focuses on freshwater fisherman who only make their living in the districts of Anuradhapura and Polonnaruwa. There are 175 fishing teams in total in the sample. During the survey, comprehensive information is gathered on the monthly catch, its market worth at the time of capture, labor hours, age of catchers, experience, education, boar size, scale type, and other fishing specifics. Data on specific socioeconomic variables and indicators were considered. Descriptive statistics, regression analysis, correlation analysis, frequency analysis, t test, and ANOVA with inefficiency effects are estimated on the basis of cross-sectional primary data on fishing independent variable, dependent variable, and moderator variable. Age of catchers, education, experience, boat size, and labor hours were the independent variables. The monthly income from fishing was employed as a dependent variable, while scale type was used as a moderator variable. According to statistical analysis, technical efficiency is positively influenced by education, experience, boat size, labor hours, and

scale type, however it is negatively impacted by the age of the catchers. However, technical effectiveness is declining as catchers get older. According to the study, the technical efficiency can be raised by increasing the experience of fishermen, labor hours, education, use of 18.5-ft boats, and scale for medium size. In addition to employing fewer fisherman than 40, fishing might become more proficient technically. Because physical and mental issues can be noticed when a person is older than 40. A case in point is vision issues. Therefore, it may be inferred by looking at the outcomes employing middle-aged fishermen whose technical performance can be improved.

Keywords: *Dependent Variable, Fish Catch, Independent Variable, Moderator Variable, Socioeconomic, Technical Efficiency*

1. INTRODUCTION

There are around 103 river basins in Sri Lanka. Sri Lankan has no natural lakes despite its size of 59217 hectares. However, the island has around 12000 man-made lakes (tanks). The principal water bodies in the dry zone are tanks or man-made reservoirs. Our ancient monarchs built these tanks from time-to-time store water from the north east monsoon rains for household and agricultural usage during the rest of the year. New reservoirs such as Castlereigh, Victoria, Kotmale, Rantambe, and Randenigala have also been built. (FAO, 2013)

The island inland fishing and aquaculture resources includes lakes, brackish water ponds, lagoons and significant and small reservoirs like community tanks and floodplain lakes. Two of the 51 to 55 species of fish found in sri lanka's inland waters, *Labeo dussumein* and *Puntius sarana*, are used as primary food fish (De Silva 1988). There are reportedly 30 species in the species in the reservoirs, spread over 11 families and 6 orders. Except for the recent surge in prawn's culture in the coastal belt and lagoon edges, there is no aquaculture activity in the state. Reservoirs are regarded as small water bodies because they make up the

majority of inland fishing resources and have an average area of less than 1000 ha. This includes tanks, seasonal tanks, and large, medium, and small reservoirs.

For a country of its size, Sri Lanka has the most reservoirs, and nearly all the country's inland fish production which makes up 20% of all fish produced there comes from capture and culture-based fisheries in the reservoirs. The reservoirs historical fish yield figures are equally excellent. The introduction of alien cichlids (*Oreochromis mossambicus*) in 1952 is largely blamed for the current high output, which is relatively recent event. Since 1950s, efforts have been made to fill Sri Lanka's reservoirs with exotic species in an effort to make up for the lack of indigenous species that could support a suitable fishery. 22 species, including 19 exotic fish and three country translocated species, have been added to the reservoirs over the years.

For tropical lacustrine fisheries, the annual harvest from reservoirs is predicted to be between 27000 and 30000 t, with an average yield of 300kg/ha (pet, 1995). There are three key characteristics for Sri Lankan reservoirs that can be connected to their high yields.

It is necessary to explain why the current research is necessary. Fresh water fishermen make up the majority of the population around the north central province in Sri Lanka. (Anuradhapura and Polonnaruwa). Inland reservoirs and catchment area in the area is the north central province. People who depend on fishing as their primary source of income or who are freshwater fishermen have lived in the area for numerous generations. This north central province has access to income levels that are sufficient to maintain their way of life. More than 10 thousand families directly rely on fishing on the north central province. Fishing is the primary source of income for these people, it is inextricably linked to sustainable livelihood, living standards, and ultimately the total quality of life of the fishing households.

Its earnings, the productivity and efficiency of fish catch in relation to catch effort or labor time spent, and earnings from any non-fishing jobs, such as those in agriculture and related industries or other small businesses. However, the effectiveness of fish capture and that of other jobs also depend on the health (degree of physical aptitude and fitness) of the fishermen. A plethora of other socioeconomic aspects, such as knowledge, awareness, and overall quality of life. Alternatives to fishing for a living for instance, agricultural or small company income.

The study on the fresh water fisher population community in north central province intends to evaluate the sustainability of fishing as a sustainable source of income on the one hand, and how standards of living and general quality of life affect the technical efficiency of fish catch on other age and experience of the fishermen, as well as their education, boat size, labour hours and income from sources other than fishing, are non-input variables that may have an impact on efficiency.

The study based on primary data that was gathered as part of a household level socioeconomic survey. The direct interview approach was used to obtain the data. Which was done so utilizing a well-structured, previously tested schedule. The first body of available literature indicates that estimate of descriptive statistics, correlation, multiple regression analysis was used. The effects of living standards, general quality of life, and other chosen socioeconomic variables on the degree of technological efficiency of fish catch are only infrequently studied by researchers. Therefore, it is clear and obvious that there is a research need in this field. The current study has identified the major causes of the socio-economic underachievement of fishing households and offers invaluable policy recommendations with the sole aim of enhancing fish catch productivity, living standards, and ultimately the general standard of living of this long-established fishing community in north central province in Sri Lanka.

Fishing has long been recognized as one of the most important sources of income for thousands of households in Sri Lanka. Sri Lanka has number of fresh water river, lakes, ponds etc. The majority of educated people in the region (including fishermen) believe that there has been an overabundance of catches in Sri Lanka in recent years as a result of the complete lack of entry restriction during peak fishing season. Furthermore, most of the fishing households are unable to progress beyond traditional way due to lack of modern skills, resources, and knowledge. With limited resources and rising fish demand, decision makers (policy makers and households) face the task of creating a sustainable small scale fishing industry that can include socioeconomic and environmental goals into planning decisions.

Poor and inefficient fishing gear and vessels, a lack of capital, poor fishing management, and limited access to larger markets, poor handling facilities, poor infrastructure and high post-harvest losses are among the key concerns identified by the fishermen themselves. Overcrowding of catches, which leads to overexploitation of the resource and destruction of fish stocks, may be the results of a lack of alternative employment possibilities and an increase in the number of fishing households.

Fishing is the primary occupation of some people living in Sri Lanka, their living standards are low. The fishing household is inextricably link to the productivity and efficiency of fish catch in terms of catch effort or labor time spent, as well as the revenue earned from it and the income from non-fishing occupations, such as agriculture and allied activities or even other pretty business. However, the efficiency of fishing may be influenced by a number of elements that aren't considered by fishermen as inputs. Several non-input socio economic factors may influence the efficiency of fishing technology. These factors include the fishermen's health (degree of physical fitness and physical competence), experience, knowledge and awareness, living standards, indebtedness,

understanding among fishing team members and revenue sources other than fishing, such as agricultural or pretty business income. As a result, the current study investigates how non input socio economic variables affect the technical efficacy of fish harvest. (Roy and Mazumder, 2015)

For starters, it reduces the output quantity for a particular set of inputs. Second, some of the inputs will be used efficiently or excessively. Third, it rises the production costs. Finally, there will be a profit reduction. Efficiency is divided in to three categories: technical, allocative, and scale efficiency. Technical efficiency refers to the creation of actual output compared to the frontier output for a given quantity of inputs. The producer's choice of the best input combination affects allocating efficiency. Finally, scale efficiency is a circumstance in which the right quantity of output is chosen at the same price as the marginal cost of production.

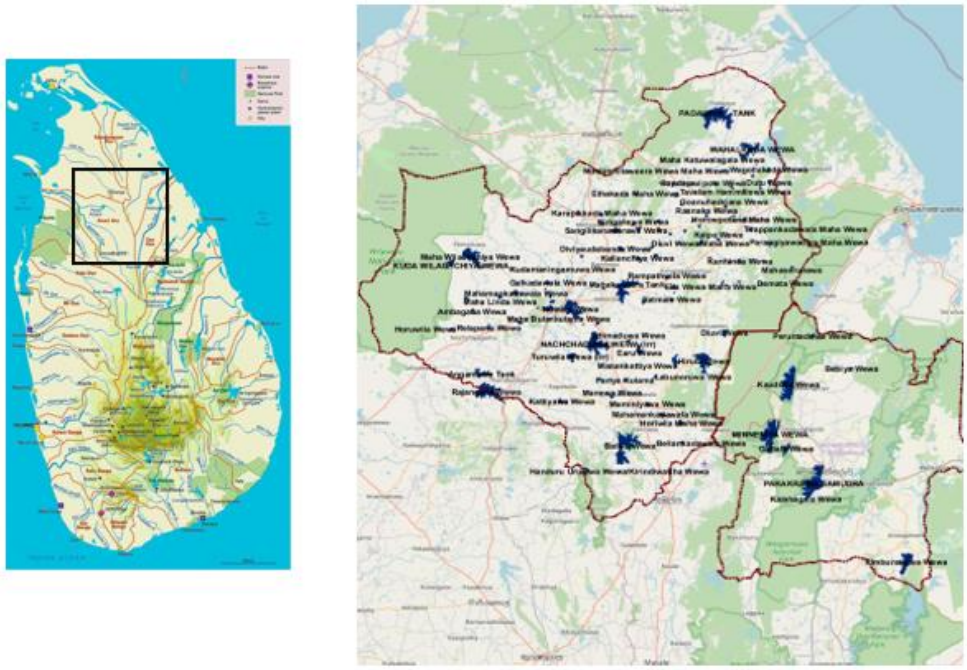
1.1. Profile of the Study Area

The largest province of Sri Lanka, located in the dry zone being 10,472 km^2, north central province located at 8˚19'60" N 80˚30'0" E (8.3333300, 80.5000000). It has neighbors: north western province and central province. In extent, the north central province that consists of two administrative districts viz. The province capital, Anuradhapura which is located 205km north of Colombo.

There are 6 small scale and medium scale reservoirs are selected for the study.

- Kalawewa reservoir
- Dewahuwa tank
- Nachchaduwa reservoir
- Parakrama samudraya
- Girithale reservoir
- Minneriya reservoir

Figure 1.1 *North Central Province Reservoir Map (Source: www.soslc.lk)*



The following lists the study's goals. It is important to highlight here the study's primary topic or central theme. The present study purposefully excludes from its scope the problems of overfishing or overconcentration of catchers in the area caused by fishing households' rapid population development. The study focuses on measuring the technical efficiency of fish catch among fishing teams within a freshwater fisher community as well as how various external socioeconomic factors that are not inputs into the production process affect the technical efficiency levels in the fishing team. The study looks at fishing's economic feasibility as a long-term job.

- To measure the technical efficiency of fish catch of freshwater fisher population in Sri Lanka.

- To identify selected non input factors and socio economic that influences technical efficiency of fish catch.
- To examine the economic viability of fishing as a sustainable occupation.
- To outline policy prescription aimed at raising technical efficiency of fish catch and improving overall quality of life of fishing households dependent on the Sri Lanka.

2. METHODOLOGY

2.1. Survey Methods and Data

Based on information gathered one week of June 2022, form north central province fishing boat landing site, and household's data for the current study is entirely primary in nature. The lake corporative society is organization in charge of overseeing fishing in the North Central Province.

Using the direct interview method, the relevant data was gathered from a chosen group of fishermen enthusiasts at the north central province fish landing locations. A well-structured, pre tested survey schedule was used. This included specifics on sales and quantity of catch, labour hours, education, experience, age, gear size, scale, fishing equipment, socio economic aspects etc. There are 175 of sample data was collected to the survey. By using face to face interview. There are six lake use to the collect data for the study. These all are situated in north central province, Sri Lanka.

2.2. Variable Construction

2.2.1. Output (Y_i)

If fish are captured by the fishing team at the time of scale during the study, the output (Yi) is essentially technical efficiency in the current study. This catch level relates to the amount of work done by the team or the individual in a single day.

2.2.2. Measurement of Input – Age of Catchers, Education, Experience, Boat Size, Labour Hours and Scale Type

Age of catchers, education, experience, boat size, labor hours, and scale type are the six inputs that are measured physically rather than nominally. Given that every fishing crew in the samples were used the same methodology, there is neither a technical nor a statistical issue with this. In this area of catchers, scale type is employed as a moderator variable, and education, experience, boat size, and labor hours are used as independent variables

2.2.3. Inefficiency Effects of Variable

Housing types, drinking water sources, sanitary conditions, cooking fuel sources, asset holdings, sanitation, socioeconomic traits, and health status were all evaluated (smoking, chewing tobacco, chronic disease, health condition, and government support). All of them are employed in the study as ineffective variables. Additionally, non-fishing income was utilized as a measure of inefficiency

2.3. Variable Measurement

Five independent variables were included in the analysis. Age, education, experience, number of hours worked, and boat size of the catchers. The dependent variable was technical efficacy. Scale type was used as moderator variable and

technical efficiency was used as dependent variable. Following that, descriptive statistics, correlation, and multiple regression analysis were used to analyze the data (with independent variable). With moderator variable t test, univariate analysis of variance and multiple regression were used to analyze data.

3. RESULTS AND DISCUSSION

Table 3.1 *Descriptive Statistics*

	N	Minimum	Maximum	Mean	Std. Deviation
Age	175	1	4	2.66	.881
Education	175	1	4	2.57	.707
Non Fishing Income(monthly)	175	1	4	1.83	1.157
Per capita Consumption of Household (monthly)	175	1	4	2.23	.979
Experience	175	1	4	2.55	.938
Labour Hours	175	1	4	2.73	1.224
Scale	175	1	2	1.40	.491
Gear Size	175	1	2	1.89	.319
Net Income (weekly)	175	1	4	2.21	.973
Net Pieces	175	1	4	1.66	1.065
Members of Two Types Of Boats	175	1	4	3.06	.720
Valid N (list wise)	175				

Source: Authors' estimates based on primary data.

Table 3.1 shows that there is a lot of variances in the outputs (Technical Efficiency) and inputs (Age, Education, Experience, Labour hours, Gear size) across the catchers. Fishing crews also have a wide range of working hours. Because net pieces vary so much between fisheries society and the lake. Pieces of the net could be a deciding factor in determining the size of catch fish. The difference in age, education, and experience amongst fisheries societies are smaller. Although the difference in gear size is little, it may play a considerable role in deciding catch effort. Finally, non-fishing income, is a key measure of fishing dependency. Increased non fishing income could indicate a shift away from fishing and toward other occupations.

Catchers have an average age of less than 50 years, which may be appropriate at the fisheries society. Although the number of years of experience varies from two to fifty-eight, the larger range of experience the mean years of experience being less than 25, shows that the more experienced catchers serve as society leader or skippers, while the younger members assist in the catch. It's possible that the leaders will include young and inexperienced catchers because newcomers are already familiar with the fishing system from childhood, as they were largely born and raised in the area.

Table 3.2 Correlations

		TE	Age	Education	Experience	Labour Hours	Gear Size
TE	Pearson Correlation	1	.284**	.314**	.235**	.278**	.316**
	Sig. (2-tailed)		.000	.000	.002	.000	.000
	N	175	175	175	175	175	175
Age	Pearson Correlation	.284**	1	.726**	.663**	.610**	.616**
	Sig. (2-tailed)	.000		.000	.000	.000	.000
	N	175	175	175	175	175	175
Education	Pearson Correlation	.314**	.726**	1	.681**	.749**	.590**
	Sig. (2-tailed)	.000	.000		.000	.000	.000
	N	175	175	175	175	175	175
Experience	Pearson Correlation	.235**	.663**	.681**	1	.556**	.472**
	Sig. (2-tailed)	.002	.000	.000		.000	.000
	N	175	175	175	175	175	175
Labour Hours	Pearson Correlation	.278**	.610**	.749**	.556**	1	.476**
	Sig. (2-tailed)	.000	.000	.000	.000		.000
	N	175	175	175	175	175	175
Gear Size	Pearson Correlation	.316**	.616**	.590**	.472**	.476**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	

N	175	175	175	175	175	175

**. Correlation is significant at the 0.01 level (2-tailed).

Source: Authors' estimates based on primary data.

The pair wise correlation coefficient between all variables considered in the study are presented in table 3.2 The correlation between the technical efficiency and age of catches was statistically significance at the 0.05 level with a Pearson correlation coefficient of +177. It shows that there is a positive relationship between the technical efficacy and age. The correlation between the technical efficiency and education was statistically significance at the 0.001 level with a Pearson correlation coefficient of +0215. It shows that there is a positive relationship between the technical efficiency and education. The correlation between the technical efficiency and experience of catches was statistically significance at the 0.05 level with a Pearson correlation coefficient of +0.166. It shows that there is a positive relationship between the technical efficacy and experience. The correlation between the technical efficiency and labour hours of catches was statistically significance at the 0.01 level with a Pearson correlation coefficient of +0.278. It shows that there is a positive relationship between the technical efficacy and labour hours. The correlation between the technical efficiency and gear size of catches was statistically significance at the 0.01 level with a Pearson correlation coefficient of +0.207. It shows that there is a positive relationship between the technical efficacy and gear size.

Table 3.3 Model Summary

				Std. Error of	Change Statistics					
Model	R	R Square	Adjusted R Square	the Estimate	R Square Change	F Change	df1	df2	Sig. F Change	Durbin-Watson
1	.348[a]	.121	.095	.684	.121	4.672	5	169	.001	.624

a. Predictors: (Constant), Gear Size, Experience, Education, Labour Hours, Age
b. Dependent Variable: TE

Source: Authors' estimates based on primary data.

According to the table 3.3, presents a summary of the model in which the item of interest is the R Square statistics, which is 0.121 with a statistical significance of P

<0.05. This suggests that 121.1% of the variants of the technical efficacy was predicted from level of predictors (Age, Education, Experience, Labour hours and Gear size). The Durbin Watson statistic was 0.624 and not between +1 and +3 which means that the independence of the observation has not been met.

Table 3.4 *ANOVAa*

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	10.919	5	2.184	4.672	.001[b]
	Residual	78.990	169	.467		
	Total	89.909	174			

a. Dependent Variable: TE

b. Predictors: (Constant), Gear Size, Experience, Education, Labour Hours, Age

Source: *Authors' estimates based on primary data.*

Under the table 3.4, the F ratio in the ANOVA table tests whether the overall regression model is a good fit for the data. The table shows that the independent variable (Age, Education, Experience, Labour hours and Gear size) statistically significantly predict the technical efficiency. F (5,169) = 4.672., P < 0.05. (That is the regression model is a good fit of the data).

Table 3.5 Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	.967	.346		2.798	.006
	Age	-.017	.073	-.020	-.229	.819
	Education	.153	.078	.151	1.958	.052
	Experience	.042	.063	.055	.671	.503
	Labour Hours	.125	.049	.213	2.576	.011
	Gear Size	.264	.172	.117	1.539	.126

a. Dependent Variable: TE

Source: *Authors' estimates based on primary data.*

Under the table 3.5, the unstandardized coefficient β_1 for Age is equal to -0.017. This means that for each one unit decrease in Age, there is and decrease technical efficiency of -0.017 times unit. The unstandardized coefficient β_2 for Education is equal to 0.153. This means that for each one unit increase in Education, there is and increase technical efficiency of 0.153 times unit. The unstandardized coefficient β_3 for Experience is equal to 0.042. This means that for each one unit increase in Experience, there is and increase technical efficiency of 0.042 times unit. The unstandardized coefficient β_4 for Labour Hours is equal to 0.125. This means that for each one unit increase in Labour Hours, there is and increase technical efficiency of 0.125 times unit. The unstandardized coefficient β_5 for Gear Size is equal to 0.264. This means that for each one unit increase in Gear Size, there is and increase technical efficiency of 0.264 times unit.

From the above results, it is evident that the Age, Education, Experience, Labour Hours, Gear Size have unstandardized coefficients of -0.017, 0.153, 0.042, 0.125 and 0.264 respectively and the following regression equation can be derived from the available data for predicting the technical efficiency form non input factors.

$$\mathbf{Y = 0.9647 + (-0.017)\ X_1 + (0.153)\ X_2 + (0.042)\ X_3 + (0.125)\ X_4 + (0.264)\ X_5}$$

Y = Technical Efficiency

X_1 = Age

X_2 = Education

X_3 = Experience

X_4 = Labour Hours

X_5 = Gear Size

Table 3.6 *Independent Samples Test*

	Levene's Test for Equality of Variances	t-test for Equality of Means

		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference Lower	Upper
TE	Equal variances assumed	4.237	.041	-.392	173	.696	-.04271	.10894	-.25774	.17232
	Equal variances not assumed			-.392	171.056	.696	-.04271	.10900	-.25788	.17245

Source: *Authors' estimates based on primary data.*

Under the table 3.6, significance value of levene's test is 0.082 and two tailed significance value is 0.230. It means there are no significance between technical efficiency and scale. Because values are higher than 0.05.

Table 3.7 *Tests of Between-Subjects Effects*

Dependent Variable: TE

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	10.925[a]	6	1.821	3.873	.001
Intercept	3.479	1	3.479	7.400	.007
Age	.022	1	.022	.047	.828
Education	1.733	1	1.733	3.687	.057
Experience	.212	1	.212	.451	.503
Labour Hours	2.885	1	2.885	6.137	.014
Boat Size	1.112	1	1.112	2.366	.126
Scale	.006	1	.006	.013	.909
Error	78.984	168	.470		
Total	986.000	175			
Corrected Total	89.909	174			

a. R Squared = .122 (Adjusted R Squared = .090)

Source: Authors' estimates based on primary data.

Under the table 3.7, by considering significance values of Age, Education, Experience, Labour hours, Gear size and Scale are 0.828, 0.057, 0.503, 0.014, 0.126

and 0.909. Only labour hours is significance. Because value is less than 0.05. But others are non-significance. Because significance values are higher than 0.05.

Table 3.8 *Coefficients*

Scale	Model		Unstandardized Coefficients		Standardized Coefficients		
			B	Std. Error	Beta	t	Sig.
small	1	(Constant)	1.617	.163		9.924	.000
		NIF	.285	.072	.362	3.946	.000
medium	1	(Constant)	.746	.596		1.252	.215
		NIF	.575	.212	.312	2.708	.009

a. Dependent Variable: TE

Source: Authors' estimates based on primary data.

As seen in the table 3.8, small scale fisheries significance with technical efficiency because P value. It is less than 0.05. As well as medium scale fisheries also significance with technical efficiency. Because P value is 0.009. It is less than 0.05. By comparing unstandardized β value is small scale fisheries is equal to 0.285. It is positive relationship with technical efficacy. And also unstandardized β value of medium scale fisheries also have positive relationship with technical efficiency.

According to this study, monthly income and per capita consumption of north central province households are can be seen in below.

Table 3.9 *Non-Fishing Income (Monthly)*

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	less than Rs.15000/=	109	62.3	62.3	62.3
	Rs. 15000/= to Rs.29999/=	12	6.9	6.9	69.1
	Rs.30000/= to Rs.49999/=	29	16.6	16.6	85.7
	Rs.50000/= or more	25	14.3	14.3	100.0

	Total	175	100.0	100.0	

Source: Authors' estimates based on primary data.

Table 3.10 Per-Capita Consumption of Household (Monthly)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	less than Rs.25000/=	50	28.6	28.6	28.6
	Rs. 25000/= to Rs.3500/=	53	30.3	30.3	58.9
	Rs. 35000/= to Rs.45000/=	54	30.9	30.9	89.7
	Rs.45000/= or more	18	10.3	10.3	100.0
	Total	175	100.0	100.0	

Source: *Authors' estimates based on primary data.*

Table 3.11 Net Income (Weekly)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	less than Rs. 10000/=	42	24.0	24.0	24.0
	Rs. 10000/= t0 less than Rs. 15000/=	81	46.3	46.3	70.3
	Rs. 15000/= to less than Rs. 20000/=	26	14.9	14.9	85.1
	Rs. 20000/= or more	26	14.9	14.9	100.0
	Total	175	100.0	100.0	

Source: Authors' estimates based on primary data.

The approach utilized to identify households in the study sample of fishermen is rather straightforward. The number of household's members is first calculated using primary data gathered during the survey. On the basis of the information provided by the catchers during the interview, the weekly household income and monthly consumption are also documented. For the purpose of this study, the consumption figure is regarded more credible. The per capita monthly consumption expenditure in the current rupees for each sample fishing households is calculated by dividing the

monthly household consumption expenditure corresponding to each catch by the number of house hold members.

Based on survey data, the study examined whether north central province fresh water fisher population have sufficient source of income from fishing to justify their continued involvement in the industry.

According to the tables, per capita consumption ranges between Rs. 35000 and Rs. 45000 from 54000 fishing households (or around 30.9 percent of the total sample number of households). Per capita consumption is between Rs. 25000 and Rs. 35000 in 53 households. The per capita consumption of 10.3 percent of households exceeds Rs. 45000. In terms of income, 24 percent of households earn less than Rs. 10000 per week, according to the table. The majority of people have a weekly net income of between Rs. 10000 and Rs. 15000 rupees. The figure is 46.3 percent. More than 14 percent of households have a weekly net income of Rs. 15000 to Rs. 20000, and more than 14 percent have a weekly net income of more than Rs. 20000. By considering these data, most of the fishing households are living above the poverty line since their minimal consumption expenditure is marginally above the recommended poverty line norm. Because fishing as a source of income is insufficient to provide minimum acceptable standards of living and thus a life of dignity and command over resources or financial freedom, the remaining some fishing households, or approximately percent of all households are living below the poverty line.

When it comes to the important criteria that influence living conditions, just all households have clean sanitary facilities. However brick walled, tin, mud buildings with or without clean floors are found in roughly 55% of the sample fishing households. This disparity must imply that a portion of households with desirable dwelling do not have access to a hygienic toilets.

In conclusion, fishing cannot be considered a sustainable or financially viable source of livelihood for a little more than 70% of the sample of fish catchers because it is

unable to support an average monthly per capita consumption just equal to the fishery statistics prescribed minimum necessary level of per capita consumption.

Apart from that, even for households that are above the poverty line according to the study estimates, general living conditions, housing quality, sanitation quality, basic education attainment and access to safe drinking water, to name a few indicators, are in a deplorable state to say the least. In other words, the sample of fishing household's human development levels is far from satisfactory, despite the fact that a systematic attempt to capture human development levels among fishing households is outside the scope of this study. As a result, it is safe to conclude that fishing in the north central province is neither financially viable nor sustainable. In this context, financial viability is defined as a minimal necessary level of income earning sufficient for a life of resource control, self-esteem and dignity.

On the other hand, the question of sustainability must be considered in light future generation's capacity to earn at least as much as the current generation of fishermen from fishing activities in the north central province. In this context the study highlights two main areas of concern. The first one is catchers or fishermen's socio economic backwardness (which includes poverty for obvious reasons) and the second one is falling fish population or stock in the water body, even during the peak seasons in recent years. For obvious reasons, these two concerns are inextricably linked. The grater the fresh water fishing community's socio economic backwardness, the grater its reliance on fishing for a living. Alternative jobs and employment prospects are limited due to low levels of education.

As a results, the majority of households are compelled to continue in their conventional occupation, which is also their ancestral occupation in this situation. Throughout the slack season, only a tiny fraction of catchers engage in non-fishing activities implying that the majority are either unemployed or obliged to rely on a relatively limited fish harvest, during the rainy season. This has significant impact on their socio economic misery. Naturally, the grater the number of catchers at given

time period, the higher the catch levels (overfishing), eventually leading to stock depletion and the extinction of aquatic species.

Almost 100 percent of respondents have access to a sanitary toilet, according to the report. Furthermore, approximately half of those polled get their drinking water from tap line. Some were even discovered drinking water from tube well, community well and self well. Alarmingly, 2 to 3 children were detected in 90 percent of the catcher's houses. There was some evidence that some catchers had completed secondary school. Surprisingly, mobile phones were discovered to be used by 99 percent of individuals interviewed. Approximately 62 percent felt compelled to take up fishing as their primary occupation, rather than by choice. Because they are usually untrained in any non-fishing profession, most catchers are unsure about other occupations. Almost all respondents agreed that unrestricted fishing in the area during peak seasons is result over reliance on fishing. Because there is no estimate of peak season fish stock and harvest rate as well as statistics on natural rate of regression, the conclusion about sustainability in this study are purely speculative. According to the catchers perspectives it takes more fishing time today to catch the same amount of fish as it did roughly 5 years ago. Almost all of the catchers agreed that the north central fish stock is fast dwindling. As a result, fishing in the north central province may be considered unsustainable at the movement.

4. SUMMARY AND CONCLUSION

The population of freshwater fishermen in Sri Lanka's north central province was studied to determine the technical efficiency of fish harvest. The population of freshwater fishers, who only depend on the north central province for their subsistence, is the subject of the study. Six small- and medium-sized reservoirs in the north central province were chosen for the investigation. All fishing teams and reservoirs are taken into account in the study when calculating technical efficiency. Based on the results of a pilot survey, a sample that is statistically sufficient is selected and drawn in order to satisfy the specific needs of the study. In terms of the method of catch, the sample chosen for the current study is fairly diverse. There are 175

respondents in the sample. Only the net pieces differ between the reservoir and the fisheries association, and all of these responses use the same catch methods.

Because the north central province is a catchment area, the volume of water in the reservoirs increases significantly during the monsoon. The reservoirs are open for fishing from 4.30 am to about 7.30 am. From 2 p.m. to about 4.30 p.m., fishermen were at the caste nets. At the fishing landing, the catch is sold. Outside, there isn't a market. The fish is delivered to surrounding locations by middlemen and sales traders for quick sale. The crop is, however, sorted, weighed, and appraised in a separate trading area. Fish is perishable, thus the catch must be sold right away.

During the survey, comprehensive information is gathered on the monthly catch, its market value at the time of capture, labor hours expended, size of boats, age of catchers, level of education, level of experience, scale type, net pieces, and other fishing activities. Data on specific socioeconomic variables and indicators, including as non-fishing income, dwelling type, sanitary facilities, and the quality and source of drinking water, are meticulously gathered at both the individual and household level for fishing households. On the basis of cross-sectional primary data on fishing inputs including age of catchers, education, experience, boat size, labor hours, and scale, multiple regression, descriptive statistics, and T tests with inefficiency effects are assessed. A suitable sample determination formula was used to determine the sample size. A pilot survey was first conducted in the study area for this purpose.

Although the study's main conclusions are very intriguing, they are more or less clear when seen in the context of the freshwater fishing community. One interesting discovery is that the value of fish catch positively influences all important inputs that are connected to fish catch. Regarding the estimates of the coefficient, it is discovered that the constant term has a substantial impact on technical effectiveness. Thus, it is discovered that in fishing, technical efficiency is positively influenced by education, experience, boat size, and labor hours, whereas the same is negatively impacted by catchers' ages. Technical efficiency is positively impacted by scale type as well.

The socioeconomic illiteracy of the catchers of fishermen and the recent decline in fishing population or fish stock in the water body covered by the Moragahakanda project are two major areas of concern that come to light from the current study. These two problems are connected for clear reasons. The freshwater fishing community is more dependent on fishing for a living as its socioeconomic backwardness increases. Alternative professions and career prospects are few among those with low levels of education. As a result, the majority of households are compelled to continue working in their customary profession, which in this instance is also their ancestral profession. Only a small portion of catchers are involved in activities other than fishing. This significantly worsens their socioeconomic hardship levels. Naturally, increased catch levels (overfishing) would arise from higher catch accumulation over a specific period of time, depleting stocks and causing the extinction of aquatic species.

The survey indicated that practically all participants have access to hygienic restroom facilities. In addition, 54 percent of respondents use tap water exclusively. The majority of the households had two to three kids, it was discovered. It was discovered that none of the catchers had completed a secondary education. Surprisingly, it was discovered that 98 percent of individuals surveyed were using mobile phones. About 62 percent of respondents claimed that they were forced, as opposed to choosing, to make fishing their primary career. Since most catchers lack the necessary skills for any non-fishing work, they are generally unconfident about other professions.

The immediate objective for planners and policy makers in the region would be to provide enough non-fishing employment options for homes with fishermen so that no household with freshwater fishermen is compelled to rely solely on fishing. By halting the decline of fish populations and aquatic species in the area, this would address the issues of overpopulation and overfishing in the province's north central region.

The fishermen themselves identified several key issues of concern, including inadequate and ineffective fishing equipment and vessels, a lack of funding, poor

fishing management, restricted access to larger markets, inadequate handling facilities, inadequate infrastructure, and significant post-harvest losses. The primary factors that contributed to the congestion of catchers, which resulted in overexploitation of the resource and destruction of the fish stock, may have been the absence of alternative employment alternatives and an increase in the number of households that fished. Since generations, virtually all of the fishing homes in the center province have been impoverished.

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