



## Role of Inland Fisheries in the Socio-Economic Development of Cooperative Fishermen in Sikkim, North East India

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### ABSTRACT

The objective of this paper is to describe and evaluate the livelihood status of the rural fishing community of Sikkim. For this purpose, 100 samples were collected through a personal interview method based on questionnaire from the different PFCS (Primary Fishermen Cooperative Society) located in different districts of Sikkim. The socio-economic conditions of the fish farmers were analysed by tabular analysis with percentages and mean. Gini coefficient was used to measure the extent of income inequality among the fish farmers of PFCS. A logit model was used to ascertain the impact of different socio-economic factors on fish farmers' perception concerning the improvement in their living conditions. The study found that the socio-economic status of the people was favourable and there were less variations among the fish farmers. The majority of the respondents were stated to have either pucca or semi pucca houses and they are using both firewood and LPG for cooking food. The study also found that the farmers have access to basic amenities like drinking water, electricity, sanitation facilities, housing, etc. The study revealed that income inequality was not so severe amongst the farmers of PFCS. The socio-economic indicators like per capita income, housing conditions and the ratio of above primary education to total members were found to impact the perceived living conditions of the fish farmers. Overall, it can be said that the majority of the fish farmers of each PFCS have realised improvements in their economic conditions after the adoption of fish farming.

### 1. Introduction

The fisheries sector occupies a very important place in the socio-economic development of the country and it is a source of livelihood for a large section economically backward rural population (Ayyapan and Krishnan 2007; Sen and Roy 2015). In India, this sector provides a livelihood for more than 14.73 million people engaged fully, partially or in subsidiary activities pertaining to this sector (HFS 2020). Besides, this sector is also an important source of ancillary jobs for the rural population, especially in marketing, retailing, transportation etc. (HFS 2014). It ensures food security and also tackles unemployment in these regions which are predominately inhabited by the rural populace (Datta and Kundu 2007). Fisheries are next to agriculture in terms of providing employment and food supply (Rao 1973).

It has become an important activity that is recognised as a rich source of cheap nutritious food and a powerful income and employment generator (Dagtekin et al. 2007; Kumar et al. 2007; Sen and Roy 2015).

Sikkim is a landlocked state situated in the laps of the Eastern Himalayan Region. The total geographical area of Sikkim is 7,29,900 ha out of which 74,343 ha (10.20%) is cultivable whereas the remaining land areas are forest, cultivable waste and barren and uncultivable land. Sikkim is blessed with beautiful natural resources and is rich as a biodiversity hotspot. Mixed farming is practiced in Sikkim where agriculture and allied activities go in hand in hand supplementing and complementing each other for income generation and livelihood of the farming communities. Among the major allied activities undertaken by Sikkimese

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farmers are cattle, buffaloes, sheep, goats, pigs, poultry, yak rearing and fish farming etc. (DAHLF&V 2017)<sup>1</sup>. Given the limited landholding in Sikkim, livestock and fisheries have emerged as the sole solution to provide sustainable economic upliftment for the rural masses.

Sikkim has potential in the fishery sector both for capture and culture fisheries due to the abundance of coldwater resources. The state has various water resources in the form of rivers, lakes, streams and perennial springs which provide immense scope for the development of inland fisheries. The estimated total water bodies of the state are 0.03 lakh ha, the length of rivers is 900 km while the area of ponds and lakes are 0.1 and 3.2 thousand ha, respectively. Teesta and Rangeet are the main river systems with their numerous tributaries which support the major riverine fisheries resources of the state. The water resources of Sikkim contain 48 fish species belonging to 9 families under 23 genera (Tamang 1993). The most important fish species are Mahaseer (Sahar), Snow trout (Asla), Catfish (Ther, Gandi), some carps (Budana, NakKauta) etc. are found in rivers and streams. On the other hand, the important cultivable fish species are Rainbow and Brown trout, Chinese, Common and Grass carps etc. The total annual fish yield from the riverine resources is about 120-150 MT, about 1500-2000 villagers living close to the river banks are engaged in part-time fishing (Mahanta 2014). As of 2016-17, around 2045 fish farmers are engaged in fish farming and they earn their livelihood from this sector. Amongst these, 349 farmers are actively participating in trout culture in the state.

There are eight fishermen cooperative operating at the village level in Sikkim and all these cooperative societies are registered with the Cooperation Department, Government of Sikkim. Each cooperative society constituted a managing committee consisting of a president, secretary, manager and members. President and secretary look over the overall functioning of the cooperative society while the manager takes the responsibility related to the cost and budgeting. To form a cooperative society there should be at least ten members including the president, secretary, and manager. In this paper, the rural livelihood of the people has been evaluated through the study of the socio-economic condition of the fish farmers. The following are the objectives of the study

- a) To examine the socio-economic status of the coldwater inland fish farmers of PFCS.

- b) To observe the degree of income inequality among fish farmers of PFCS
- c) To analyse the impact of different socio-economic factors on fish farmers' perception regarding the improvement in the living condition of the PFCS

## 2. Materials and Methods

A total of 100 samples were collected through personal interviews based on a pre-structured questionnaire comprising 12 respondents from Upper Sribadam PFCS, 21 from Uttarey PFCS, 19 from Upper Rimbik PFCS and 20 from 20<sup>th</sup>Chujaachen PFCS, 14 each from Mangshilla and Dalep PFCS. There are 4 trout and 2 carp PFCS operating in the state, 3 trout PFCS in West Sikkim, 1 trout PFCS in East Sikkim and 1 each carp PFCS in South and North Sikkim respectively as shown in (Table 1).

**Table 1: PFCS wise Sample Farmers**

PFCS	Location	Species	Number of Farmers (Sample)
Upper Sribadam	West	Trout	12
Uttarey	West	Trout	21
Upper Rimbik	West	Trout	19
Chujachen	East	Trout	20
Mangshilla	North	Carp	14
Dallep	South	Carp	14
Total	Sikkim		100

*Source: Field survey conducted during 2018-19*

In Sikkim, fish farming activities are scattered in different locations and farmers are available in cluster form, therefore, the purposive random sampling method was adopted for choosing the location area and ponds. The socio-economic conditions of the fish farmers were analysed with tabular analysis in terms of percentage and mean. The Gini coefficient<sup>2</sup> was used for measuring the extent of income inequality among the fish farmers of each PFCS. Gini coefficients were calculated separately for yearly income from fish farming and yearly income from all other sources because income from the primary activities like agriculture, fishing and other allied activities yields annual or seasonal income. The logit model was applied to determine the impact

<sup>1</sup>[http://www.sikkim-ahvs.gov.in/fisheries\\_development.html](http://www.sikkim-ahvs.gov.in/fisheries_development.html)

<sup>2</sup>Gini coefficient was calculated by using the simple software i.e. Microsoft Excel. It was calculated by taking the level of income and its frequency. Let  $x_i$  is a level of income and  $f_i$  is its frequency. First cumulative frequency  $cf$  was calculated along with %  $cf$  (represented by  $pi$ ). Then level of income was multiplied with its frequency i.e.,  $x_i f_i$ ; again,  $cf$  of  $x_i f_i$  and %  $cf$  of  $x_i f_i$  (represented by  $qi$ ) were calculated. Next the deviation in the form of  $pi - qi$  was taken. After this, summation of  $pi$  and  $pi - qi$  was calculated. Finally, Gini coefficient was obtained

as  $\frac{pi - qi}{qi}$

of diverse socio-economic factors on the perceived state of living conditions of the fish farmers, i.e. whether their socioeconomic condition has improved or not. For this purpose, the following logit regression model has been used:

$$L_i = \ln \left( \frac{P_i}{1-P_i} \right) = \alpha_1 + \beta_1 \text{pcmi}_i + \beta_2 \text{nfm}_i + \beta_3 \text{age}_i + \beta_4 \text{ht}_i + \beta_5 \text{rpetfm}_i + \mu_i$$

where,  $P_i = 1$  if there is an improvement in the perceived socio-economic condition of the fish farmers, 0 otherwise. The explanatory variable  $\text{pcmi}$  represents to monthly per capita income of the family members,  $\text{nfm}$  stands for the number of family members in a family,  $\text{age}$  is the age of the respondent,  $\text{ht}$  means the type of house where  $\text{ht} = 1$ , if the respondents had the pucca house, 0 otherwise.  $\text{rpetfm}$  means the ratio of above primary education to total members of the family and  $\mu_i$  is the error term. Since the dependent variable is a binary outcome that may not give an appropriate result by Ordinary Least Square (OLS) or Weighted Least Square (WLS) methods, therefore, non-linear estimation procedure viz. method of maximum likelihood was applied.

### 3. Results and Discussion

#### Demographic Outline of the Fish Farmers of PFCS

The demographic profile of the fish farmers such as gender, age, social category, religion, caste category and family size of the household is presented in Table 2. The fish farming activity is mostly dominated by male members and such a report has been found by many authors in many studies. In the present study, it has been found that male members have dominated fishing activity in all the PFCS. It is observed that all the members in Dalep society were males whereas societies such as Mangshilla and Chujachen have a higher percentage of male members than females in upper Sribadam, Uttarey and Upper Rimbik. The percentage of female members is very less in all the PFCS, although, it is higher in trout PFCS like Uttarey, Upper Sribadam and Upper Rimbik as compared to carp PFCS. More than 70 percent of males participated in the fishery activities which increased to 100 percent in the case of Dalep. Annually, the female participation rate is increasing in trout farming and this is because of the higher returns from the trout and greater awareness amongst women.

**Table 2.** Demographic outline of Fish Farmers of PFCS (in percent)

	Trout Growers PFCS				Carp Growers PFCS	
	Upper Sribadam	Uttarey	Upper Rimbik	Chujachen	Mangshilla	Dalep
<b>Gender</b>						
Male	83.3	71.4	89.5	90.0	92.9	100
Female	16.7	28.6	10.5	10.0	7.1	0
<b>Age</b>						
21-30	16.7	4.8	21.1	10	14.3	14.3
31-40	25.0	19.0	31.6	45	57.1	14.3
41-50	25.0	47.6	21.1	40	21.4	42.9
51-60	25.0	14.3	21.1	5	7.1	14.3
61 - Above	18.3	14.3	5.3	0	0	14.3
<b>Category</b>						
ST	66.7	28.6	100	50.0	92.9	0
SC	0	0	0	0	7.1	7.1
OBC (CL)	33.3	71.4	0	40.0	0	92.9
OBC (SL)	0	0	0	10.0	0	0
<b>Religion</b>						
Hindu	8.3	80.9	94.7	35.0	100	85.7
Buddhist	91.7	4.8	0	40.0	0	0
Christian	0	14.3	5.3	25.0	0	14.3
<b>Caste</b>	Limboo: 8.3 Bhutia: 58.3 Gurung:33.3	Rai: 71.4 Limboo:23.8 Lepcha: 4.8	Limboo:100	Rai: 25 Lepcha: 10 Sherpa: 40 Gurung:10 Chettri: 5	Limboo:92.9 Kami: 7.1	Rai: 92.9 Kami: 7.1

				Pradhan:10		
<b>Family Size</b>						
1-4	16.7	14.3	21.1	25	21.4	14.4
5-8	83.3	80.9	73.7	50	64.3	50
9-12	0	4.8	5.3	25	14.3	28.6

**Source:** Computed by Author based on Primary Data

Note: ST is Schedule Tribe, SC is Schedule Caste, OBC (CL) is centrally listed Other Backward Classes, OBC (SL) is state (Sikkim) listed Other Backward Classes

The age structure is one of the important variables that determine the number of potentially productive human resources in an economy (Hussain et al. 2009). The maximum number of people of the age group of 31-40 and 41-50 were found to be involved in this activity. The PFCS like Uttarey and Dalep have maximum farmers in the age group of 41-50 whereas in the case of the other four PFCS the maximum farmers fall in the category of 31-40 age groups. Overall, it has been observed that productive working people have been participating in the fishery activities which is a good sign for the economy.

The majority of the farmers viz. 66.7 percent were SC in Upper Sribadam, 71.4 percent OBC (CL) in Uttarey, 100 percent ST in Upper Rimbik, 50 percent ST and 40 percent OBC (CL) in Chujachen, 92.9 percent ST in Mangshilla and 92.9 percent OBC (CL) in Dalep. In general, the maximum percentage of either ST or central list OBC communities' people were being participated in fishing activity in Sikkim.

Religion is one of the major determining factors that affect the socio and cultural environment of people of a particular community and area (Khatun et al. 2013). Religion-wise distribution of people showed that the percentage of Buddhists was higher in Upper Sribadam. In Chujachen, people from all religious backgrounds were involved, while in PFCS like Uttarey, Upper Rimbik, Mangshilla and Dalep, the Hindu community was more dominant. The study revealed that except Upper Sribadam, the Hindu community dominates in the other five PFCS.

Caste plays a vital role in affecting the occupational structure and a person's skill in diverse rural economic activities (Singh 2003). Caste distribution of the people revealed that 58.3 percent farmers were Bhutia, 33.3 percent Gurung and 8.3 percent Limboo in Upper Sribadam, 71.4 percent Rai, 23.8 percent Limboo and 4.8 percent Lepcha in Uttarey, 100 percent Limboo in Upper Rimbik and a mixture of six communities in Chujachen, 92.9 percent Limboo in Mangshilla and 92.9 percent Rai in Dalep. The study revealed that the Limboo and Rai communities were larger in terms of fishing activity in Sikkim.

The family size of a household is one of the significant socio-economic variables because it replicates the income, expenditure and economic well-being of a family (Hussain et al. 2009). As far as the size of the family in fishing activity is concerned, the majority of the fish farmers of every PFCS have a family size of 5-8 members and the percentage is mostly higher in Upper Sribadam, Uttarey and Chujachen.

#### Socio-Economic Conditions of the Fish Farmers of PFCS

Table 3 shows the result of the socio-economic conditions of fish farmers in each PFCS. Socio-economic indicators like marital status, education, occupation, training, experience, income from fisheries and economic conditions were considered for the study. In all the PFCS, the majority of the farmers are married and the percentage of married people was highest in Upper Sribadam followed by Dalep, Uttarey, Upper Rimbik, Chujachen and Mangshilla whereas the percentage of unmarried people was less in every PFCS and in comparison, it is found to be higher in Upper Rimbik, Mangshilla, Uttarey and Dalep.

**Table 3.** Socio-Economic Conditions of Fish Farmers of PFCS (in percent)

	Upper Sribadam	Uttarey	Upper Rimbik	Chujachen	Mangshilla	Dalep
<b>Marital Status</b>						
Single	8.3	14.3	21.1	20	21.4	14.3
Married	91.7	76.2	73.7	70	64.3	78.6
Widow	0	4.8	0	5	7.1	7.1
Separated	0	4.8	5.3	5	7.1	0
<b>Education</b>						
No formal Education.	0	4.8	10.5	15	7.1	7.1
Primary (1-5)	25	47.6	31.6	25	42.9	28.6

High School (6-12)	58.3	33.3	47.4	50	42.9	57.1
Graduate & above	16.7	114.3	10.5	10	7.1	7.1
<b>Primary Occupation</b>						
Agriculture	16.7	14.3	26.3	20	14.3	21.4
Fisheries & Allied Activities	66.7	61.9	52.6	50	57.1	42.9
Govt. Employees	8.3	9.5	10.5	10	14.3	14.3
Private Employees	0	4.8	5.3	5	7.1	14.3
Business	8.3	9.5	5.3	2	7.1	7.1
<b>Training</b>						
Trained	100	61.9	52.6	60	64.3	57.1
Untrained	0	38.1	47.4	40	35.7	42.9
<b>Experience</b>						
1-10	83.3	66.7	84.2	85	78.6	71.4
11-20	16.7	33.3	15.8	15	21.4	28.6
<b>Annual Income from fisheries (₹ in lakhs)</b>						
0 -1.0	8.3	9.5	78.9	65	100	100
1.0 -2.0	50	38.1	10.5	25	0	0
2.0 -3.0	25	42.9	10.5	5	0	0
3.0 – 4.0	0	4.8	0	0	0	0
4.0 – 5.0	8.3	4.8	0	5	0	0
5.0 – 6.0	8.3	0	0	0	0	0
AMITS (₹)	25305	23327	15456	19033	18854	11157
AMIFF (₹)	19055	16603	7456	9033	2282	1443
<b>Economic Condition</b>						
Improved	92	88	70	78	63	58
Not improved	8	12	30	22	37	42

**Source:** Computed by Author based on Primary Data

**Note:** AMITS means average monthly income from total source and AMIFF is average monthly income from fish farming.

Education is one of the important socio-economic factors that bring positive change in an economy with regards to knowledge and skill, earning, living conditions and overall development in a society. The majority of fish farmers in all PFCS have attained either primary or high school education level. Besides them, graduate people were also taking participation in this activity.

The level of earning and living standards of fish farmers depends on their primary as well as secondary occupations (Goswami et al. 2002). The major primary occupation of the farmers of each PFCS was fisheries and allied activities. Apart from this activity, few people were also engaged in agriculture, government and private job and business.

Training is an effective tool for the transfer of technology and knowledge on the method of production. Trained farmers may produce a better product in fish farming. The majority of the people were found to be trained and the percentage of trained farmers in Upper Sribadam was 100 percent, 61.9 percent in Uttarey, 52.6 percent in Upper

Rimbik, 60 percent in Chujachen, 64.3 percent in Mangshilla and 57.1 percent in Dalep. Overall, we can say the maximum farmers of the PFCS are trained.

The level of experience is an important factor that affects the level of output and hence the earnings of the farmers. When the farmers are more experienced in any particular activity there is a chance of an increase in output level and as a result income increases, which boosts the living standard of the farmers. All the farmers of PFCS were well experienced in fish farming and the majority have gained experience of 6-12 years with a few being 12 & above years. 83.3 percent of farmers in Upper Sribadam, 66.7 percent in Uttarey, 84.2 percent in Upper Rimbik, 85 percent in Chujachen, 78.6 percent in Mangshilla and 71.4 percent in Dalep have gained an experience of 6-12 years. In the present study, the minimum experience of the farmers was 6 years because PFCS which have completed 6 years have been taken into consideration for the study.

In general, employment and income are the alike significant factors generally used for determining the living standard of any community or region. Equitable distribution of income further augments the social harmony among diverse units of the population (Goswami et al. 2002). The average monthly income from total sources as well as from fish farming was observed to be highest for Upper Sribadam followed by Uttarey while it was lowest for Dalep PFCS. In the case of Upper Sribadam and Uttarey more than 80 percent have stated their economic conditions have improved after the adoption of fish farming. In the case of Upper Rimbik and Chujachen this figure is more than 70 percent of the members while for Mangshilla and Dalep it is more than 50 percent. In trout PFCS, the average monthly income from fish farming was highest for Upper Sribadam followed by Uttarey with the lowest being found for Rimbik.

#### Access to Basic Amenities to Fishing Community

Table 4 represents access to basic amenities by the farmers of PFCS. Basic amenities like house type, electricity, drinking water, fuel sources, and type of toilet facilities were included. Housing pattern is considered to be the most important factor used to access the economic well-being of any community (Goswami et al. 2002). The majority of the farmers of each PFCS have either pucca or semi pucca houses. The maximum number of pucca houses was found in Upper Sribadam whereas the minimum was observed in Upper Rimbik. More than 50 percent of members of all PFCS have pucca houses except for Upper Rimbik. Much less percent of the farmers of each PFCS has kachha houses, the lowest being found in Mangshilla and Upper Sribadam. Overall, we can state that the majority of the fish farmers of each PFCS have better housing conditions. 100 percent of

electrified houses were found in the sampled areas. All the villagers have access to electricity with up to 100 units free in rural areas.

There is no problem of drinking water facilities in fish farming premises in Sikkim because without the sufficient availability of water farming is not possible. In rural parts of Sikkim people have access to drinking water facilities. More than 70 percent of members of the fishing community in Upper Sribadam, Uttarey, Upper Rimbik and Chujachen and more than 50 percent in Mangshilla and Dalep have access to their drinking water facilities. Approximately 20 to 30 percent of members of the PFCS have access to both owned and government-supplied drinking water facilities. The use of firewood alone as a source of fuel for cooking food was very less of about varying between 5 to 15 percent only. Basically, in rural areas of Sikkim people prefer to use both firewood and Liquefied Petroleum Gas (LPG) for cooking purposes which constituted more than 80 percent of the members of the fishing community of all PFCS. But for cooking fodder, they use only firewood which is a cheap source of fuel. Sanitation is one of the important indicators of rural development. More than 70 percent of farmers in all the PFCS have access to a pucca toilet facility.

#### Gini Measures of Income Inequality across the Fish Framers of PFCS

In this section, income inequality across these six PFCS has been evaluated. Table 5 depicts the Gini measures of income inequality calculated for both fisheries-led income and total source of income. The Gini concentration measures the degree of homogeneity or heterogeneity in the economic condition of the fish farmers of the respective members of PFCS.

**Table 4.** Access to Basic Amenities to PFCS Members

	Upper Sribadam	Uttarey	Upper Rimbik	Chujachen	Mangshilla	Dalep
<b>House Type</b>						
Pucca	75	61.9	42.1	60	64.3	57.1
Semi pucca	16.7	23.8	31.6	30	28.6	28.5
Kachha	8.3	14.3	15.8	10	7.1	14.3
<b>Electricity</b>	100	100	100	100	100	100
<b>Drinking water</b>						
Owned source	75	76.2	78.9	70	57.1	64.3
Owned +Govt. Supply	25	23.8	21.1	30	28.6	21.4
<b>Fuel Sources</b>						
Firewood	0	9.5	10.5	15	14.3	7.1
LPG + Firewood	100	90.5	89.5	85	85.7	92.9
<b>Toilet Type</b>						
Pucca	83.3	80.9	73.7	85	85.7	78.6
Kachha	16.7	19.1	26.3	15	14.3	21.3

*Source:* Computed by Author based on Primary Data

**Table 5.** Gini Measures of Income Inequality for PFCS

PFCS	Gini coefficient calculated from fishery-led income	Gini coefficient calculated from total income
Upper Sribadam	0.324	0.505
Uttarey	0.227	0.203
Upper Rimbik	0.290	0.227
Chujachen	0.339	0.492
Mangshilla	0.268	0.374
Dalep	0.280	0.304

*Source:* Computed by Author based on Primary Data

The Gini coefficient calculated from the fishery-led income was not much different and severe across the PFCS except a little higher in the case of Upper Sribadam and Chujachen. This implies that there existed some extent of income inequality amongst the members of PFCS, which was a little bit higher in the above-stated two cooperatives. Similarly, when we observed the Gini coefficient from the total source of income, there was some heterogeneity amongst the members of PFCS, the highest being observed for Upper Sribadam and Chujachen followed by Mangshilla and Dalep while the lowest was for Uttarey and Upper Rimbik. If we compare Gini coefficients from both parts, it has been found that Upper Sribadam and Chujachen have higher income inequality amongst the members as compared to the rest of the cooperatives and this is because there was a huge difference in the fish production among the members and there also existed a difference in their other occupations apart from the fishing activity.

#### **Fish Farmers' Perception Regarding the Improvement in the Living Condition of the PFCS**

Logit analysis has been carried out to explain the fish farmers' perception on improvement or non improvement in living conditions compared to the previous few years. Table 6 represents the result of the logit estimation to the perceived state of the socio-economic living condition of members of PFCS. *pcmi* is statistically significant at 5 percent level signifying a positive relationship with the perceived socio-economic condition of the members of PFCS. An increase in the per capita income of the household members of PFCS leads to an increase in the estimated perceived socio-economic condition of the members.

**Table 6.** Logit Estimation of Socio-Economic Living Condition of Members of the PFCS

Explanatory Variables	Coefficients	Standard Error	Z-statistics
<i>pcmi</i>	0.0024711**	0.000987	2.50
<i>nfm</i>	-0.248	0.162	-0.53
<i>age</i>	0.023	0.034	0.69
<i>ht</i>	0.607**	0.378	2.38
<i>rpetm</i>	1.436*	1.573	1.62
constant	0.964	1.861	0.52
No. of Obs. = 100 , LR $\chi^2(5) = 48.09$ Prob> $\chi^2 = 0.0000$			
Pseudo R2 = 0.3192 Log Likelihood = -92.152			
No. of correct predictions = 71 Count R2 = 0.71			

*Source:* Estimated by Author based on Primary Data

Note: \*\*\*, \*\*, \* represents significant level at 1 %, 5 % and 10 % level of significance.

It has been found that conditions of the house are statistically significant at 5 percent level representing a positive relationship with the perceived view regarding better socio-economic status. The result suggested that better housing status improves the estimated perceived socio-economic conditions of the household. Furthermore, the ratio of above primary education to total members is also found to be significant at 10 percent level with a positive relationship with the dependent variable implying that an increase in the educational level among the family members improves the estimated perceived socioeconomic status. The number of correct predictions is 71 with the value of count  $R^2$  being 0.71. The implication is that in 71% of the cases the finding of marginal probabilities supports the actual perceptions. The significant value of count  $R^2$  indicates that the considered socio-economic variables adequately influence the perception of the living conditions of the fish farmers.

#### 4. Conclusion

The results revealed that most of the farmers of the members of PFCS have realised progress in their economic condition. All the fish farmers of the PFCS had access to basic minimum civic amenities like potable drinking water, sanitation, cooking fuels, electricity and housing etc. This sector is traditionally dominated by male members hence more female members should be encouraged to participate in this activity. The productive and economically active age groups between 31-40 and 41-50 were actively involved in this activity. Communities such as ST and OBC (CL) were actively participating in all the PFCS and they belonged to Rai, Limbo, Bhutia, and Lepcha. The study revealed that maximum tribal and backward classes have benefited from government schemes and projects. Therefore, it is recommended that more people from other communities should take part in fish farming and the government should also encourage and provide support to other communities as well. The maximum respondents have obtained either a primary or secondary level of education and graduate people are also taking interest in this activity. Fisheries, allied activities and agriculture were their primary occupations. The majority of the farmers were well experienced and trained. The logit results revealed that per capita income, housing condition and family members who attained education level above the primary were the major factors that affect the estimated perceived socio-economic conditions of the households. To strengthen and enhance their level of income and living conditions in general and in fish farming in particular, more need-based infrastructural and institutional support should be extended by the government to encourage more people in farming activity.

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#### 6. Declaration:

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