Proceedings of the National Seminar on Riverine and Reservoir Fisheries - Challenges and Strategies, 23-24 May 2001, Cochin India,426-432,

Socio-economic Variables of Fishermen in Hirakud Reservoir and the Technological Adoption

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This paper deals with the socio-economic variables of reservoir fishermen, their levels of attitude, knowledge and adoption, and the variables associated with the extent of adoption of technology practices. The study was conducted in two fishing villages viz., Larbhanga and Sanutikira in Hirakud reservoir area. The average annual income of fishermen in Sanutikira centre (mean: Rs. 52,900) was significantly higher than the fishermen in Larbhanga centre (mean: Rs. 34,500). Of the 13 variables, fishermen in the two villages had differed significantly only on 6 variables. The extent of adoption of technological practices in the two villages did not differ significantly. About 27 % of the respondents in Larbhanga and 11 % in Sanutikira did not own any fishing craft, and all the respondents had owned fishing gear. The differential characteristics of reservoir fishermen operating three categories of nets, *viz.*, gill nets, shore seines, and gill net combinations were evaluated. Investment on fishing craft and fishing nets, number of family members and risk preference were found to have positive and significant correlation with the extent of adoption of technological practices.

Key words : Socio-economic variables, technological adoption, reservoir fishermen, Hirakud reservoir.

Technology transfer activities are important to increase the catch per unit effort from reservoir fisheries and to improve the socio-economic conditions of fishermen. As reservoir fishing is mainly of subsistence level, planned extension interventions by the development organizations are essential to increase the fishing efficiency and employment opportunities. In this context, the present study was undertaken with the following specific objectives: (i) to evaluate the socio-economic variables of reservoir fishermen and their levels of attitude, knowledge and adoption (ii) to find out the differential characteristics of reservoir fishermen operating different types of fishing gear and (iii) to determine the association between the selected socio-economic variables and extent of adoption of improved practices.

Materials and Methods

The work was conducted in two fishing villages such as Larbhanga and

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Sanutikira in Hirakud reservoir area near the CIFT Research Centre at Burla, Orissa. By employing random sampling procedures 44 respondents were selected in each of the two fishing villages. Data were collected from these fishermen respondents by using structured interview schedules. Thirteen variables (Table 1) were measured and analyzed. Attitude towards improved reservoir fishing techniques was measured through an attitude scale developed for the purpose based on the equal appearing interval method (Thurstone & Chave, 1929) with slight modifications in the final rating, as given in Edwards (1969). Independent variables such as risk preference and cosmopoliteness- localiteness were measured through different rating scales and corresponding index scores were calculated. The extent of adoption was calculated for each respondent by using a two point rating scale for measuring the adoption of five technological practices such as the use of appropriate fishing craft, improved fishing nets, appropriate depth of fishing, appropriate time lag in the disposal of fish catch and the use of ice for preservation of fish. The adoption index score was recalculated by the ratio of actual score obtained to the maximum score possible and expressed in percentage (Balasubramaniam *et al.*, 1992). Statistical techniques such as mean, standard deviation, percentage analysis, *t*-test, *F*-test, and simple correlation coefficient (r) were calculated to analyze the data.

Table 1 : Socio-economic variables of reservoir fishermen in two villages

Variables	Larbhanga (n:44)		Sanutikira (n:44)		*t*
	Mean	SD	Mean	SD	
Age (yrs)	43.2	11.5	38.0	11.3	1.97
No. of days employed in a year	300.2	36.8	301.6	26.8	0.18
Experience (yrs)	23.7	11.1	21.7	10.0	0.80
No. of family members	6.5	2.7	5.5	2.1	1.81
Investment on fishing craft (Rs.)	5727.3	3822.3	8772.7	4798.8	3.30**
Investment on fishing nets (Rs.)	10811.4	6824.4	14818.2	7072.8	2.74*
Total annual income (x1000 Rs.)	34.5	14.3	52.9	20.9	4.85**
Risk preference index (index scores)	77.0	6.0	77.9	8.9	0.52
Attitude towards improved reservoir fishing techniques (index scores)	81.7	10.1	81.3	13.6	0.19
Cosmopoliteness-localiteness index	60.1	21.3	78.0	19.6	4.58**
Knowledge about reservoir fishing techniques (index scores)	70.1	5.9	75.1	5.0	4.26**
Time lag in disposal of catch (h)	1.3	0.5	1.7	0.4	4.49
Extent of adoption (index scores)	70.9	14.6	71.8	17.8	0.26

* Significant at 5% level; ** Significant at 1% level.

Results and Discussion

Table 1 presents the socio-economic variables of reservoir fishermen in the two villages near Hirakud reservoir. The results revealed that the respondents were employed for about 300 days in a year including the days spent on subsidiary occupation. Though 38.63% of respondents in Larbhanga and 13.63% in Sanutikira were involved in cultivation oriented activities and other avocations, the average annual income of fishermen in Sanutikira Centre (mean = Rs. 52,900) was found to be significantly higher than the respondents in Larbhanga Centre (mean = Rs. 34,500).

The average investment on fishing craft (Rs. 8772.7) and also on fishing nets (Rs. 14818.2) were found to be significantly higher in Sanutikira than in the Larbhanga village (Rs. 5727.3. and Rs. 10811.4, respectively). Here, it was seen that though in both villages, the respondents were engaged in reservoir fishing on a small-scale level, the higher investment made in Sanutikira on fishing craft and gear could be a possible reason for their higher income.

The results also revealed that the respondents' risk preference (77% & 77.9%), their attitude towards improved reservoir fishing techniques (81.7% & 81.3%), and their extent of cosmopolite contacts with other systems outside their villages (60.1% and 78%) were found to be on the higher level, in both the villages studied. The knowledge index scores and adoption index scores were also above 70%, in the two villages. These results showed that extension educational activities regarding improved fishing techniques could be further activated to increase their level of knowledge and adoption especially on the use of framed gillnets and trammel nets, use of appropriate mesh and twine sizes, conservation measures to eliminate juvenile catches in shore seines and on the use of a combination of fishing nets to catch multi-species fisheries.

The *t*-values revealed that of the 13 variables, fishermen in the two villages did not vary significantly in respect of several variables such as age, number of days employed in a year, experience, number of family members, risk preference, attitude towards improved reservoir fishing techniques, and extent of adoption. On only six variables such as investment on craft, investment on nets, annual income, cosmopoliteness-localiteness, knowledge about reservoir fishing techniques and time lag in disposal of fish catch, there were significant differences between the fishermen in these two village settings. It was seen that in spite of the significant difference on the above six key variables, the extent of adoption of technological practices in the two villages did not differ significantly.

The qualitative variables of reservoir fishermen in the two villages are given in Table 2. The results showed that more than 40% of the respondents did not have any formal education and another 45-52% of them had only primary education and most of them (96.6%) belonged to the scheduled caste/sched-

Table 2: Qualitative variables of reservoir fishermen in two villages

Qualitative variables	Larbhanga (n:44)		Sanutikira (n:44)	
	Number	%	Number	%
1. Educational				
1.1 Illiterates	21	47.73	18	40. 91
1.2 Primary education	20	45.45	23	52.27
1.3 High school education	3	6.82	3	6.82
2. Number of information sources used				
2.1 Sources 1-2	31	70.45	9	20.45
2.2 Sources 3-5	13	29.55	35	79.55
3. Fishing craft owned				
3.1 Not owned	12	27.27	5	11.37
3.2 Shareholder	3	6.82	1	2.27
3.3 Owned	29	65.91	38	86.36
4. Fishing nets owned (Categories not exclusive)				
4.1 Drag net	18	40.91	7	15.91
4.2 Shore seine	20	45.45	33	75.00
4.3 Gill nets	28	63.64	35	79.55
4.4 Other nets	7	15.91	5	11.36
5. Radio ownership				
5.1 Not owned	18	40.91	6	13.64
5.2 Owned	26	59.09	38	86.36

uled tribe communities. The number of information sources used (3 to 5) were found to be lesser among the respondents in Larbhanga (29.55%) than in Sanutikira (79.55%).

The results in Table 2 also revealed that about 27% of respondents in Larbhanga and 11% in Sanutikira did not own any fishing craft, though they had owned fishing gear. The data also showed that the fishermen had used plank-built canoes mostly made of *sal* wood (*Shorea robusta*) and the dimensions of these canoes ranged from 5.6 to 8.2 m in length and 0.43 to 1 m in breadth. The fishing gear used were mainly dragnets, shore seines and gillnets. The dragnets were used in the shallow marginal areas of the reservoir area while gillnets were operated in the reservoir as surface column and bottom set nets. Gillnets and shore seines were used by more number of respondents in Sanutikira than in Larbhanga. It was found that though George *et al.* (1982) had introduced trawling in Hirakud reservoir long back, none of the fishermen had used trawls, as it involved larger investment. About 59% of respondents in Larbhanga and 86% in Sanutikira had owned radio sets for information.

Table 3 presents the differential characteristics of reservoir fishermen operating gill nets, shore seines and gill

Table 3: Differential characteristics of reservoir fishermen operating gillnets, shore seines and gillnet combinations

Variables	Operating Gill nets (n:13)		Operating shore seines (n:13)		Operating Gill net combinations (n:50)		*F*-value
	Mean	SD	Mean	SD	Mean	SD	
Age (yrs)	39.46	16.25	35.23	6.52	41.46	11.63	1.43
Number of days employed in a year	300.00	41.43	301.53	49.30	300.00	23.29	0.01
Experience (yrs)	21.76	15. 31	16.30	7.29	23.76	9.88	2.54
Number of family members	5.84	2.67	5.53	2.50	6.42	2.98	0.59**
Investment on fishing craft (Rs)	7384.61	2807.38	4307.69	5072.55	9040.00	3807.67	7.73**
Investment on fishing nets	7692.30	3198.55	11653.84	6018.66	15680.00	6649.96	9.63
Total annual income (x1000 Rs.)	37.53	13.59	39.76	15.55	49.28	21.67	2.54
Risk preference index	82.30	6.07	75.57	7.91	77.10	7.94	3.00
Attitude towards improved reservoir fishing techniques (index scores)	80.07	11.46	80 .15	11.81	83.36	12.61	0.59
Cosmopoliteness-localiteness index	74.86	20.38	73.84	13.72	69.46	24.42	0.41
Knowledge about reservoir fishing techniques (index scores)	71.53	8.51	73.07	6.30	73.20	5.51	0.37
Time lag in the disposal of catch (h)	1.30	0.32	1.53	0.47	1.54	0.49	0.53
Extent of adoption Index	78.46	5.54	46.15	17.09	79.60	2.82	101.75**

* Significant at 5% level, ** Significant at 1% level.

net combinations in the two villages combined together. The results showed that of the 13 variables, the mean values of 10 variables did not differ significantly between the three categories of respondents. It was found that the significant differential characteristics were the investment on craft and gear, and extent of adoption. As shore seines were mostly employed by a group of shareholder fishermen in the shallower waters along the shore line in the middle reaches of the reservoir, the investment on fishing craft was found to be lesser (mean = Rs. 4307.69) than the fishermen operating the other two categories of nets. Fishermen who used gillnets and other nets, had invested more on craft and gear than the fishermen who used only gillnets or shore seines. Though these fishermen who had used more than one net had obtained higher annual income (mean= Rs. 49,280), the *F*-value was not found to be significant.

Thus, it could be interpreted that though a combination of fishing nets would be always desirable to bring in more fish catch and income, any over investment would not result in the corresponding increase in the income as the fish production in the reservoir itself might be of limited scale. According to Khan *et al.* (1992), the fish production of Hirakud reservoir was estimated to be only 15.0 $kg.ha^{-1}.yr^{-1}$.

The correlation coefficients computed between the selected socio-economic variables and the adoption index scores of fishermen are

Table 4: Correlation coefficients between selected variables and extent of adoption of technological practices.

Variables	Respondents of two centers (n: 88)	
	r	*t*
Age	0.1451	1.3599
Number of days employed in a year	-0.0554	0.5145
Experience	0.1702	1.6016
Number of family members	0.2267	2.1584*
Investment on fishing craft	0.5605	6.2767**
Investment on fishing nets	0. 3636	3.6197**
Total annual income	0.2491	2.3853*
Risk preference index	0.2245	2.1366*
Attitude towards improved reservoir fishing techniques	0.1551	1.4559
Cosmopoliteness-localiteness index	0.0923	0.8596
Knowledge about reservoir fishing techniques	0.0575	0.5341
Time lag in the disposal of catch	-0.0044	0.0408

* Significant at 5%; ** Significant at 1% level.

given in Table 4. It was seen that the economic variables such as the investment on fishing craft, investment on fishing nets, total annual income, and number of family members were found to have positive and significant correlation with the extent of adoption of technological practices. Risk preference, a key psychological variable, also had significant correlation with the adoption scores. These results showed that by increasing the investment made on fishing craft and fishing gear through the fishermen's cooperative societies and fisheries department activities, it would be possible to increase the extent of adoption of improved technological practices. Natarajan (1985) reported that by providing the infrastructure facilities such as the suitable boat, efficient gear, seed farms/hatcheries, roads, communication, transport vans, ice-plants and cold storages, the fish yield from reservoirs alone could be raised substantially.

Further, in order to increase the extent of adoption of technologies and to improve the socio-economic conditions of reservoir fishermen, the following suggestions are given: (i) selection of appropriate reservoir fishing technologies for refinement and involvement of local cooperatives and state fisheries department officials in demonstrations, (ii) supply of inputs through fisheries cooperatives and fisheries department, (iii) strengthening of infrastructure facilities, (iv) increasing the number of extension personnel involved in technology transfer and (v) improving the linkages between the research centres and extension functionaries.

Thus, the study has revealed that the reservoir fishermen in two fishing centres had significant differences in their economic and psychological variables such as investment on craft and gear, annual income, cosmopoliteness and knowledge index, though, they did not vary in the extent of adoption of technological practices. However, when the fishermen were categorized based on the type of fishing gear used irrespective of the fishing village, they had differed significantly in their adoption behaviour. The results also showed that the economic variables were found to have significant and positive correlation with the extent of adoption of technological practices.

References

Balasubramaniam, S., Kandoran M. K. & Mohan, B. (1992) *Fish. Technol.* **29**, 67.

Edwards, A. L. (1969) *Technique of Attitude Scale Construction*, Vakils, Fefter and Simons Pvt. Ltd., Bombay.

George, V. C., Dawson, P., Khan, A. A. & Varghese, M. D. (1982) *Fish Technol.* **19**, 1.

Khan, A. A., Dawson, P., Rao, J. S.R. & Varghese, M.D. (1992) *Fishing in Impounded Waters- A Case Study in Hirakud Reservoir, Orissa*, CIFT, Cochin.

Natarajan, A. V. (1985) in *Harvest and Post-harvest Technology of Fish*, p. 14-18, SOFT(I), Cochin.

Thurstone, L.L. & Chave, E.L.(1929) *The Measurement of Attitude*, Univ. of Chicago Press, Chicago.