

Evaluation of Technology Transfer and Impact Among Fishermen

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Balasubramaniam, S., Kandoran, M.K., Braj Mohan and Bankey Bihari., 1998. Evaluation of technology transfer and impact among fishermen. pp. 467-477. In : M.S. Hameed and B.M. Kurup (Eds.) *Technological Advancements in Fisheries*. Publ. no. 1-School Indl. Fish., Cochin University of Science and Technology., Cochin.

Abstract : This paper presents the evaluation of technology transfer and impact in terms of the adoption behaviour and communication behaviour of the clientele system. The fishermen operating plankbuilt crafts in Kerala had higher mean scores than the fishermen operating catamarans. Among the samples from Tamilnadu, the adoption behaviour did not differ significantly though the communication behaviour components differed significantly between the fishermen categories. In the multiple regression analyses, the R^2 values revealed that 59.62% to 60.19% variations in the communication behaviour and 79.73% to 90.74% variations in the adoption behaviour were jointly influenced by the selected independent variables among the fishermen operating plankbuilt crafts. The extent of adoption of technological practices (44.23% to 59.52%) in all categories revealed the scope to improve the technological adoption through comprehensive marine fisheries extension schemes.

Introduction

The systems approach in technology transfer emphasizes the role of various systems in achieving efficiency in the technology transfer efforts. The Central Institute of Fisheries Technology, Cochin conducts research and extension activities in the various specialised fields of Fishery Technology. In order to increase the catch per unit effort and to achieve technological advancement in the artisanal fisheries sector, several first line technology transfer programmes and collaborative projects have been conducted for the benefit of artisanal fishermen.

Technology transfer through various systems ultimately improves the communication behaviour and adoption behaviour of the clientele system. In this context, an evaluation project has been undertaken to determine the impact of technology transfer in terms of the communication behaviour and adoption behaviour of the clientele system, and

the variable associated with these dependent variables.

Materials and Methods

The project work was undertaken among the stratified samples of artisanal fishermen operating catamarans and plankbuilt crafts in two districts of Kerala viz, Thiruvananthapuram and Quilon, and also two districts of Tamilnadu viz, Kanyakumari and Ramanathapuram. These districts were selected taking into consideration the activities of concerned State Fisheries Departments, Non-Government Organizations like the South Indian Federation of Fishermen Societies (SIFFS) and other Voluntary organisations, and their linkages with CIFT. Here, communication behaviour was measured in terms of the standard scores obtained on the components such as information source utilisation, credibility perception of channels and communication output pattern. Adoption behaviour was measured by an adoption index developed for the study.

Table 1. Socio-economic variables of fishermen operating Catamarans and Plankbuilt crafts

Variables	Kerala						Tamilnadu					
	Catamaran Respondents (n ₁ :31)			Plankbuilt craft Respondents (n ₂ :42)			Catamaran Respondents (n ₁ :34)			Plankbuilt craft Respondents (n ₂ :46)		
	Mean	SD	t	Mean	SD	t	Mean	SD	t	Mean	SD	t
Age (years)	41.70	9.42		41.38	11.96	0.12	43.41	10.63		41.65	10.71	0.72
Education (Scores)	2.19	1.01		2.80	1.04	2.52*	2.14	1.07		1.71	0.77	2.07*
Experience (yrs)	25.83	10.62		25.40	13.09	0.15	26.85	11.16		24.91	10.54	0.79
No. of fishing days	248.54	50.58		232.73	52.03	1.29	247.64	33.55		229.45	33.96	2.38*
Size of craft (metres)	6.92	1.23		7.59	2.43	1.39	5.75	0.95		7.96	1.96	6.06**
Social participation (Scores)	1.96	1.01		1.73	0.88	1.03	2.35	1.12		2.63	1.41	0.94
Radio & Newspaper Utilisation (Scores)	4.77	3.26		4.35	2.75	0.58	4.00	2.52		3.43	1.72	1.19
Information need (Index)	59.13	14.29		64.28	15.06	1.44	54.28	10.49		55.11	10.90	0.34
No. of Crew	2.67	0.65		13.16	12.57	4.63**	3.00	1.04		18.06	18.13	4.83**
No. of members in the family	5.96	1.32		6.45	2.21	1.08	6.26	2.03		7.52	2.56	2.36*
No. of members employed in fishing	1.29	0.64		1.66	0.84	2.07*	1.55	0.82		1.67	0.73	0.65
Investment on fishing craft (Rs)	4964.51	2449.29		15647.02	13452.09	4.36**	4882.35	3211.95		24913.04	17445.24	6.47**
Investment on fishing nets (Rs)	15080.64	10060.52		37888.09	29978.73	4.06**	15258.82	11354.27		43510.86	34193.25	4.62**
Investment on engine (Rs)	-	-		15077.45	12952.20	-	-	-		5413.04	10069.37	-
Annual income (Rs)	9529.03	5329.11		20529.76	19064.57	3.12**	13320.58	6574.36		36825.00	42536.40	3.19

* Significant at 0.05 level of probability

** Significant at 0.01 level of probability

Seven improved technological practices such as the use of recommended boat building materials, use of ice, use of inboard/outboard engines, use of nylon monofilament nets, no. of fishing nets used, use of fishing craft of appropriate size, and correct timelag between catching and disposal of fish were considered for measuring the adoption index.

Sixteen socio-economic and technological variables were also selected and measured. In the selected fishing villages of the study area, the respondents were selected through multistage random sampling. Accordingly, 31 fishermen respondents operating catamarans and 42 fishermen respondents operating plankbuilt crafts were selected in Kerala, and 34 fishermen respondents operating catamarans and 46 fishermen respondents operating plankbuilt crafts were selected in Tamilnadu. Data were collected from the respondents through structured interview schedules and the collected data were analysed.

Results

Table 1 presents the socio-economic variables of fishermen operating catamarans and plankbuilt crafts in the selected study area. The results revealed that in the samples from Kerala, significant mean differences were found on seven variables such as education, no. of crew, no. of family members employed in fishing, annual income, and investment on fishing craft, fishing nets and engine (Table 1).

In the samples from Tamilnadu, the differences between the two categories of fishermen were found to be on the variables such as education, no. of fishing days, size of craft, no. of crew, no. of members in the family, annual income,

and investments on fishing craft, nets and engine.

Table 2 revealed that in Kerala, the fishermen operating catamarans had used smaller gill nets (93.54%) followed by trammel nets (35.48%), nylon monofilament nets (32.25%), and two other types of gears (22.57%), while the fishermen operating plankbuilt crafts had used larger gill nets (64.28%), followed by ring seines (19.04%), shore seines (11.90%) and five other types of gears. In Tamilnadu, (Table 2) the fishermen operating catamarans had used smaller gill nets (91.17%) followed by trammel nets (67.64%), nylon monofilament nets (41.17%) and other types of gears. The fishermen operating plankbuilt crafts had used gill nets (67.38%), shore seines (47.82%), hooks & lines (15.21%) and trammel nets (2.17%).

The results in Table 3 revealed that of the three communication behaviour components, information source utilisation mean scores were found to be low among both categories of fishermen in Kerala (22.59 and 25.70%). On the other two components such as credibility perception of communication channels and communication output pattern, the overall mean scores were found to be high. Among both categories of respondents, the adoption behaviour mean scores were in the 'medium' category (44.23 and 59.52%) though the plankbuilt craft operators had significantly higher mean scores (Table 3).

In the samples from Tamilnadu, it was seen that the fishermen operating plankbuilt crafts had significantly higher mean scores on all the three components of communication

Table 2. Fishing gears used by fishermen operating catamarans and plankbuilt crafts

Fishing gears used	Kerala						Tamilnadu					
	Catamaran-fishermen (n ₁ : 31)			Plankbuilt Craft Fishermen (n ₂ = 46)			Operating Catamarans (n ₁ : 34)			Operating Plankbuilt crafts (n ₂ = 46)		
	No	%	No	%	No	%	No	%	No	%		
Gill nets	29	93.54	27	64.28	31	91.17	31	67.38				
Trammel Nets	11	35.48	4	09.52	23	67.64	1	2.17				
Nylon monofilament nets	10	32.25	1	2.38	14	41.17						
Ring seines	-	-	8	19.04	-	-	-	-				
Shore seines	-	-	5	11.90	-	-	22	47.82				
Boat seines	2	6.45	1	2.38	7	20.58	-	-				
Hook & lines	5	16.12	4	9.52	14	41.17	7	15.21				
Others	-	-	2	4.76	2	5.88	-	-				

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Table 3. Communication behaviour and adoption behaviour of fishermen operating Catamarans and Plankbuilt Crafts

Variables	Fishermen operating Catamarans		Fishermen operating Plankbuilt crafts	
	Mean	SD	Mean	SD
Kerala (n₁ : 31 & n₂ : 42)				
Information source utilisation	22.5938	6.7216	25.7045	10.1020
Credibility perception of channels	71.8648	9.3843	72.5459	9.5784
Communication output pattern	62.2580	21.4024	75.2380	13.9665
Adoption behaviour	44.2345	10.6619	59.5214	14.7713
Tamilnadu (n₁ : 34 & n₂:46)				
Information source utilisation	20.8882	5.7494	24.1478	7.8284
Credibility perception of channels	53.6717	16.5604	62.7193	9.0403
Communication output pattern	60.5882	21.5239	70.2173	20.5468
Adoption behaviour	46.2150	13.6465	47.2052	10.3734

* Significant at 0.05 level of probability.

** Significant at 0.01 level of probability.

Table 4. Variables influencing communication behaviour among fishermen operating catamarans and plankbuilt crafts in Kerala

Variables	Fishermen Operating Catamarans (n ₁ = 31)			Fishermen Operating Plankbuilt crafts (n ₁ = 42)		
	Cor. Coeff (r)	Reg. Coeff (b)	't'	Cor. coeff. (r ₁)	Reg. coeff (b ₁)	't'
Age	-0.3365	-.3811	1.2340	-0.4205**	0.5766	1.5790
Education	0.4339*	-0.7812	0.5390	0.2986	-1.0691	0.9510
Experience	-0.3106	0.1651	0.8590	-0.4757**	0.6783	1.9260
No. of fishing days in a year	0.3401	0.0021	0.1250	0.2631	0.0034	0.1570
Size of fishing craft	0.3134	0.5449	0.6520	0.3352*	0.4174	0.7850
Investment on craft	0.3131	-0.0006	1.3830	-0.1999	-0.0000	0.1040
Investment on fishing nets	0.0164	-0.0001	1.3590	-0.2476	-0.0000	0.1020
No. of crew	0.2828	1.7378	1.2680	0.0391	0.0318	0.1730
No. of members in the family	-0.2622	0.0186	0.330	-0.3139*	-0.9621	1.5500
No. employed in fishing	-0.1095	-2.7139	1.7370	0.0978	2.1825	1.2740
Annual Income	-0.0252	0.0001	0.2510	-0.0111	0.0001	0.5030
Social participation	0.5542**	1.7401	1.9960	0.3681*	2.5029	2.0730*
Radio and Newspaper utilisation	0.5321**	0.2491	0.6910	0.3083*	-0.0559	0.1180
Information need	0.2699	0.1051	1.4250	0.0774	-0.0251	0.2520
Adoption behaviour	0.1634	0.0125	0.1540	0.2026	0.1835	1.7680
Investment on engine	-	-	-	0.0064	0.0001	1.3520

* Significant at 5% level ** Significant at 1% level R² = 0.6380; F = 1.7630 R² = 0.5962, F = 2.3070*

behaviour than the fishermen operating catamarans. But inspite of their higher communication behaviour scores, the plankbuilt craft operators' adoption behaviour mean score did not vary much from the catamaran operators (46.21 and 47.20%).

Table 4 presents the correlation and regression analyses between the independent variables and communication behaviour among fishermen operating catamarans and plankbuilt crafts in Kerala (Table 4).

The correlation analysis revealed that the variables such as education, social participation and radio and newspaper utilisation had significant positive correlation with the communication behaviour of fishermen operating catamarans. But, the partial regression coefficients computed were not significant for this category of fishermen. The R^2 was also found to be 0.6380 with a non-significant F value. For the fishermen operating plankbuilt crafts in Kerala, the variable such as social participation, radio and newspaper utilisation, and size of fishing craft were found to have positive correlation while variables such as age, experience and no. of members in the family were found to have negative correlation with their communication behaviour. Among the regression coefficients, the regression coefficient of social participation was found to be significant. The R^2 was 0.5962 with a significant F value.

The correlation and regression analyses on the communication behaviour of the fishermen respondents in Tamilnadu are given in Table 5. It is evident that for the fishermen operating catamarans, none of the correlation coefficient was significant. Among the

regression coefficients, the regression coefficient of the variable 'education' was positively significant while the regression coefficient of the variable 'investment on fishing nets' was negatively significant. Though, the R^2 was 0.5637, the F was not significant. But, (Table 5) for the fishermen operating plankbuilt crafts in Tamilnadu, the R^2 was 0.6019 with a significant F value.

Table 6 presents the extent of influence of the variables on the adoption behaviour of fishermen operating catamarans and plankbuilt crafts in Kerala. The results revealed that the correlation and regression coefficients were not significant for the fishermen operating catamarans. Though, the R^2 was high (0.6357), it was not significant. Among the fishermen operating plankbuilt crafts, communication output pattern had shown significant positive influence ($b_{1,7} = 0.4411$) while no. of crew had shown significant negative influence ($b_{1,8} = -0.9881$) on their adoption behaviour. The R^2 was 0.7973 and found to be highly significant (Table 6).

For the fishermen operating catamarans and plankbuilt crafts in Tamilnadu, the simple correlation coefficients and partial regression coefficients calculated between the adoption behaviour and the independent variables are given in table 7 (Table 7).

Of the 17 variables of fishermen operating catamarans, two variables such as investment on fishing nets and communication output pattern were found to have significant positive regression coefficients ($b_7 = .0011$; $b_{17} = .5091$) while the variable education had significant negative regression coefficient ($b_2 = -7.0146$). The R^2 was high (0.8475) and found to be significant

Table 5. Variables influencing communication behaviour among fishermen operating catamarans and plankbuilt crafts in Tamilnadu

Variables	Fishermen Operating Catamarans (n ₁ = 34)			Fishermen Operating Plankbuilt crafts (n ₂ = 46)		
	Cor. Coeff (r)	Reg. Coeff (b)	't'	Cor. coeff. (r)	Reg. coeff (b)	't'
Age	-0.2954	-0.2283	.4550	-.0389	-.1890	1.3090
Education	0.2181	3.8524	2.1740*	-.0012	.0036	0.0027
Experience	-0.2619	.1953	.4310	.0024	.2575	1.8330
No. of fishing days in a year	-.0105	-.0248	.5120	.2214	.0374	1.3130
Size of fishing craft	-.1463	-.4954	.3310	.0439	-.9277	1.1440
Investment on craft	-.1106	.0005	.8820	-.0029	-.0001	.9540
Investment on fishing nets	-.3106	-.0006	2.7210*	.2575	.0001	1.5550
No. of crew	-.2001	-.5701	.3300	-.2146	.0290	0.3650
No. of members in the family	.0177	.1717	.1850	-.2414	-.6397	1.1420
No. employed in fishing	-.0149	.9003	.3330	-.1948	-1.541	0.5330
Annual Income	.2487	.0003	1.0030	.0276	-.0000	0.5910
Social participation	.2753	.9164	.6590	.3692*	1.0412	1.5790
Radio and Newspaper utilisation	.0560	-1.5954	1.8600	.1064	.7291	1.1550
Information need	.0967	.1979	1.5440	-.1426	-.0499	0.5050
Adoption behaviour	-.0555	.3028	1.7960	.0838	-.2524	1.5690
Investment on engine	-	-	-	0.3878**	.0004	2.7500*

Significant at 5% level ** Significant at 1% level R² = 0.5637; F = 1.5510 R² = 0.6019; F = 2.7400*

Table 6. Variables influencing adoption behaviour among fishermen operating catamarans and plankbuilt crafts in Kerala

Variables	Fishermen Operating Catamarans (n ₁ = 42)			Fishermen Operating Plankbuilt crafts (n ₁ = 46)		
	Cor. Coeff (r)	Reg. Coeff (b)	't'	Cor. coeff. (r ₁)	Reg. coeff (b ₁)	't'
Age	-1.095	1.2111	0.9860	-0.0032	-1.0661	1.6830
Education	-.0256	5.8879	1.1930	0.1434	-0.2081	0.1020
Experience	-.0609	-0.5894	-0.7980	-0.0087	1.0549	1.6960
No. of fishing days in a year	-.1993	0.0171	0.2560	0.2475	0.0101	0.2520
Size of fishing craft	-2079	-1.6707	-0.5550	-0.1001	1.4787	1.5020
Investment on craft	-1.330	-.0008	0.5150	-0.1854	-0.0005	2.0090
Investment on fishing nets	.2863	.0004	1.3580	0.1091	0.0001	1.2460
No of crew	2031	1.3455	0.2590	-0.6644**	-0.9881	3.0480**
No. of members in the family	-.2319	-2.1551	1.2300	-0.1511	1.5043	1.3230
No. employed in fishing	-.2690	1.9871	0.2530	0.0185	-5.6945	1.8490
Annual income	-.3192	-0.0014	1.8520	-0.2031	0.0001	0.9340
Social participation	.0042	0.9575	0.3080	0.1821	2.9029	1.2590
Radio & Newspaper utilization	0640	2.2551	1.9160	-0.1069	0.0655	0.0770
Information source utilisation index	-.0597	-0.2112	0.6250	0.1841	-0.1961	0.8850
Credibility perception of channels	-.0253	0.2417	0.4660	-0.0701	0.3561	1.7130
Communication output index	.2676	0.6267	1.3840	0.2675	0.4411	2.1710*
Investment on engine	-	-	-	0.7329**	0.0002	1.0090

* Significant at 5% level; ** Significant at 1% level R² = 6357; F = 1.3350; R² = 0.7973; F = 5.0270**

($F = 5.23$). Similarly, for the fishermen operating plankbuilt crafts in Tamilnadu, the R^2 was 0.9074 and found to be highly significant. Among the regression coefficients, only investment on engine was found to have significant positive value ($b_{18} = .0007$).

Discussion

The profiles of socio-economic variables of the fishermen operating catamarans and plankbuilt crafts (Table 1) revealed that the differences among them were found to be more on the economic variables such as no. of crew, total investment and annual income than on the social variables. Probably, due to less operational expenses, the fishermen operating catamarans had more number of fishing days in a year (Mean: 248 days) than the plankbuilt craft operators (Mean : 230 days). In the technological variable such as the use of fishing gear (Table 2), the fishermen operating catamarans were found to have used nylon gill nets, trammel nets and hooks and lines, while the fishermen operating plankbuilt crafts had used nylon gill nets followed by shore seines and other passive gears. Among both categories of fishermen, technological improvements were observed in the fishing nets such as gill nets, trammel nets and ring seines due to the use of improved net materials and designs.

The results on communication behaviour (Table 3) implied that the information source utilization among fishermen would have to be increased further by strengthening the use of more institutional sources of information with appropriate linkages to mass media sources and interpersonal sources of communication. As the adoption behaviour mean scores were in

the medium category (44.23 - 59.52%), it implied that the impact of technology transfer efforts was not high in the study area and indicated the scope for further technological advancement.

Braj Mohan *et al.* (1993) reported that the mean impact perception of the fishermen in Ernakulam District of Kerala was in the medium level (34.52 ± 8.13). The study also revealed that the fishermen did not agree positively with many of the technological and economical impact items, probably, due to less significant benefits to each of them. In contrast, among the fish farmers, the impact of technology transfer was perceived as high (72.91 ± 14.67) in an earlier study by Balasubramaniam and Perumal (1990). Hence, for wider coverage of fishermen, comprehensive marine fisheries extension schemes are suggested to diffuse the adoption of selected fishery technologies among the artisanal fishermen.

The correlations analyses (Table 4) revealed that only two variables such as social participation, and radio and newspaper utilisation were found to have positive correlation with the communication behaviour of fishermen operating catamarans and plankbuilt crafts in Kerala. It is also seen that the communication behaviour did not have significant correlation with the adoption behaviour of both categories of fishermen. Further, for the fishermen operating catamarans, the selected 16 variables considered together could not explain the variations in communication behaviour ($F = 1.7630$). Similarly, in Tamilnadu sample also (Table 5) the selected 16 variables could not explain the variation in the communication behaviour through the prediction analy-

Table 7. Variables influencing adoption behaviour among fishermen operating catamarans and plankbuilt crafts in Tamilnadu

Variables	Fishermen Operating Catamarans (n ₁ = 34)		Fishermen Operating Plankbuilt crafts (n ₂ = 46)	
	Cor. Coeft (r)	Reg. Coeft (b)	't' (t)	Reg. coeft (bi)
Age	-.1112	-.0766	.1200	.1386
Education	-.2114	-7.0146	3.2560**	1.4222
Experience	-.0734	-.0547	.0940	.0493
No. of fishing days in a year	.5755**	.0798	1.3270	-.0363
Size of fishing craft	.3395	1.2998	.6860	-1.5888
Investment on craft	.3055	-.0003	.3850	-.0001
Investment on fishing nets	.6652**	.0011	4.4800**	.0001
No of crew	.3643*	.8739	.3950	.1471
No. of members in the family	.2632	1.3835	.9520	-.6732
No. employed in fishing	.0204	-6.0322	1.8860	2.4741
Annual income	.4421**	-.0002	.4390	.0000
Social participation	-.1359	1.3995	.7880	.2172
Radio & Newspaper utilization	-.1257	1.8001	1.5540	-.0726
Information need	-.1162	-.1003	.4450	.0736
Information source utilisation index	-.1032	.0345	.1790	.1572
Credibility perception of channels	-.0394	.1039	.4750	-.3688*
Communication output index	.0300	.5091	2.2050*	.3678*
Investment on engine	-	-	-	.7632**
				.0007

* Significant at 5% level; ** Significant at 1% level R² = 0.8475 ; 5.2300** ; R² = 0.9074 ; F = 14.706**

sis ($F = 1.5510$). But, among the fishermen operating plankbuilt crafts in Kerala, this set of 16 variables had significantly influenced 59.62% of the variation in the communication behaviour ($F = 2.3070^*$). For the fishermen operating plankbuilt crafts in Tamilnadu also, the selected sixteen variables taken together had accounted for 60.19% of the variation in the communication behaviour. Hence, these sixteen variables including key variables viz., social participation and investment on engine would have to be considered for identifying potential communicators and for further extension work to disseminate the technological practices.

The result presented in Table 6 revealed that none of the variables had any association with the adoption behaviour of fishermen operating catamarans in Kerala. Probably, this might be because that they had adopted fishery technological practices as a way of life due to lesser investment. However, the selected 18 variables had explained 79.73% variation on the adoption behaviour of fishermen operating plankbuilt crafts in Kerala. Further, the regression analysis in Table 7 revealed that the selected variables had signifi-

cantly influenced the adoption behaviour of catamaran operators in Tamilnadu ($R^2 = .8475$) and the plankbuilt craft operators ($R^2 = .9074$). Hence, these results revealed that socio-personal factors mostly had joint influence on the adoption behaviour of fishermen and the variables like communication output pattern and investment made were found to have significant positive influence on their adoption behaviour. Again the results also indicate that in order to improve the extent of adoption of technological practices, the marine fisheries extension services have to be strengthened. Haglund Heelas (1994) reported that the strengthening of marine fisheries extension service could be decided based on the experience of extension sub-projects in selected centres. Hence, attempt on this direction, would ultimately increase the productivity levels in fishing enterprises.

Acknowledgements

The authors are thankful to Dr. K. Gopakumar, Director, Central Institute of Fisheries Technology, Cochin for extending facilities to carry out the work. Technical assistance of Shri. V. Gasper is gratefully acknowledged.

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