Adoption of Improved Practices and Annual Fish Catches among Mechanised Boat Owners

S. Balasubramaniam, P. Pravin, J.M. Sreevalsan and Braj Mohan
Central Institute of Fisheries Technology
Cochin - 682 029, India

This paper deals with the adoption of improved practices and annual fish catches among mechanized fishing boat owners in six fishing centers. The results revealed that in Gujarat, Veraval center had higher adoption of improved technologies (61.16%), followed by Mangrol (56.64%) and Porbundar (49.92%). The adoption scores in the Kerala fishing centers were in the high category (>85%). The annual average fish catches in the fishing centers of Gujarat were found to be above 78 t and in Kerala, it was higher in Cochin (95.29 t) followed by Kozhikode (39.47 t) and Quilon (28.90 t). Regression analyses on the adoption scores among Gujarat respondents revealed that three variables viz., investment on boat, number of trawl nets operated and awareness about improved practices would have to be strengthened to increase the extent of adoption of improved practices. Further, sixteen socio-personal and technological variables were found to have significant joint influence (>81%) on the annual fish catches in the three fishing centers.

Key words: Technological variables, technology adoption, mechanised fishing, information need

Social research studies on the adoption of technologies in the field of fisheries generally reveal the level of technological adoption in a place or region and indicate the areas for further development efforts. Besides adoption, annual fish catch is another dimension which needs to be periodically monitored. The association between annual fish catches and the socio-personal and technological variables have to be determined for assessing the management of fishery resources, and to identify the areas for government sponsored technological interventions.

With this view, a research study was conducted with the following specific objectives: (i) To determine the extent of adoption of improved practices and the extent of annual fish catches among the mechanized boat owners in the selected fishing centers. (ii) To analyse the variables influencing the adoption scores as well as the annual fish catches of mechanized boat owners in the selected fishing centers.

Materials and Methods

The work was conducted among the mechanized boat owners in the three fishing centers of Kerala viz., Cochin, Quilon and Kozhikode, and three fishing centers of Gujarat viz., Veraval, Porbundar and Mangrol. Multi-stage random sampling procedures were used to collect data from owners of two categories of boats (9.12-12.16m and 12.17-15.20m LOA) in more or less equal numbers. Data were collected from 30 respondents in each center except Kozhikode (n:21) by using structured interview schedules. Sixteen independent variables (Table 1) were measured and analysed. Information need was measured through a three point rating scale on ten subject areas. The maximum information need score that could be obtained was 20 and the information need quotient for each respondent was calculated as a percentage of actual score obtained to the maximum score possible. Risk preference index referred to the degree to which a respondent was oriented towards encountering risks and uncertainty in adopting any new ideas in his

occupation and it was measured through a scale developed for the purpose (Bihari *et al.*, 1997). Awareness index was measured through a two point rating scale and was calculated on the basis of actual score obtained to the maximum score possible and expressed in percentage. Two dependent variables such as adoption index (%) and annual fish catch (tonnes/year) were also studied. Adoption index was calculated for each respondent by using a three point rating scale for measuring the adoption of seven practices such as the use of recommended wood materials, use of hull sheathing materials, use of improved painting schedule, use of engine of appropriate horse power, use of ice on board the vessels, use of tickler chain and use of appropriate shrimp trawl nets for trawling operations. It was calculated 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 deviations, percentage analyses, F tests, simple correlation coefficients, multiple regression coefficient, t-tests and R values were calculated to analyse the data. For multiple regression analysis, the data from Kozhikode (n:21) was not included.

Results and Discussion

The socio-personal and technological variables of mechanized boat owners in Veraval, Porbundar and Mangrol (in Gujarat) are given in Table 1. It was seen that of the 16 variables, only six variables such as investment on engine, annual income, horse power of engine, number of fishing days in a year, awareness index and size of shrimp trawl showed significant differences among the boat owners in the three centers.

Further, the results in Table 1 revealed that on an average, in all the three centers of Gujarat, the boat owners were relatively younger (34.13 to 38.10 yrs), and operated

Table 1. Socio-personal and technological variables of mechanized boat owners in Gujarat fishing centers

Variables	Veraval (n:30)		Porbundar (n:30)		Mangrol (n:30)		F values
	Mean	SD	Mean	SD	Mean	SD	
Age (yrs)	34.13	8.02	38.1	8.71	37.83	8.89	2.01
Investment on boat (Rs. in lakhs)	3.47	2.64	4.34	3.77	5.00	3.34	1.64
Investment on engine (Rs. in lakhs)	1.47	0.74	1.47	0.57	1.93	0.71	4.51*
Investment on fishing nets (Rs. in lakhs)	0.95	0.43	0.78	0.45	0.89	0.60	0.97
Annual income (Rs. in lakhs)	5.00	1.43	6.65	2.27	5.60	1.31	6.91**
Size of boat (m)	12.34	1.92	13.47	1.74	13.08	2.00	2.75
Engine horse-power (hp)	95.67	10.05	99.90	14.73	102.93	7.39	3.21*
Number of net units operated	7.03	2.28	7.70	4.26	7.73	4.51	0.32
Size of crew (No.)	5.60	1.73	5.57	1.19	5.47	0.81	0.08
Experience in fishing (yrs)	17.06	7.01	17.17	8.48	21.26	9.40	2.46
No. of fishing days in a year	187	40.8	196.83	28.84	208.73	11.50	4.05*
Information need quotient	38.5	18.57	42.67	10.80	35.83	19.78	1.25
Risk preference index	47	7.75	47.25	5.30	49.17	8.28	0.80
Awareness index	62.26	8.29	66.19	7.45	61.39	7.65	3.21*
Size of shrimp trawl (head rope, m)	24.83	4.28	25.33	2.59	29.5	8.18	6.42**
Operating hours of engine per day	16.16	6.85	13.53	3.47	14.06	6.54	1.71

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

Table 2. Socio-personal and technological variables of mechanized boat owners in Kerala fishing centers.

Variables	Cochin (n : 30)		Quilon (n : 30)		Kozhikode (n : 21)		F values
	Mean	SD	Mean	SD	Mean	SD	
Age (yrs)	39.73	9.68	40.13	9.81	37.04	8.31	0.74
Investment on boat (Rs. in lakhs)	6.08	3.27	3.75	2.32	4.60	2.80	5.13**
Investment on engine (Rs. in lakhs)	2.07	0.73	1.80	0.77	1.98	0.86	0.91
Investment on fishing nets (Rs. in lakhs)	0.71	0.35	0.51	0.15	0.85	0.21	11.25**
Annual income (Rs. in lakhs)	5.73	9.37	0.59	0.30	0.52	0.43	7.70**
Size of boat (m)	12.21	1.39	11.31	0.89	11.64	1.48	3.89*
Engine horse-power (hp)	122.80	76.50	95.60	10.71	103.33	8.48	2.59
Number of net units operated	7.63	3.35	7.10	1.53	10.76	3.04	12.31**
Size of crew (No.)	6.00	0.45	5.30	0.46	6.04	0.21	28.86**
Experience in fishing (yrs)	9.23	8.52	11.23	6.72	6.69	3.38	2.72
No. of fishing days in a year	211.66	38.31	190.83	19.69	193.81	30.61	3.96*
Information need quotient	67.16	20.74	49.00	17.78	65.00	20.06	7.47**
Risk preference index	67.25	10.17	67.50	7.51	72.73	7.15	3.08
Awareness index	69.52	13.90	64.76	8.98	84.35	4.29	23.21**
Size of shrimp trawl (head rope, m)	24.56	5.13	36.15	5.07	28.02	0.84	53.68**
Operating hours of engine per day	16.21	3.69	11.70	1.36	14.61	1.02	25.83**

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

12.34 to 13.47 m LOA boats with an investment of about Rs. 6.0 to 7.8 lakhs on boat, engine and nets. Number of fishing days per year was found to range from 187 to 210. They operated mostly 25 to 30 m medium size trawl nets with an engine of 95 to 102 hp. It was also seen that the information need requirement was low (35 to 42%) and the risk preference perception was in the medium category (47 to 49%). On an average, the awareness about improved practices was found to be about 61 to 66%, indicating the scope for information dissemination and utilization of communication channels.

Table 3. Extent of adoption of improved practices and annual fish catches among mechanized boat owners

Fishing centers	n	Extent of Adoption		Annual fish catch (tonnes)		r
		Mean	SD	Mean	SD	
Gujarat						
Veraval	30	61.16	10.21	78.66	47.20	0.02 NS
Porbundar	30	49.92	12.70	78.97	27.26	0.16 NS
Mangrol	30	56.64	12.30	100.57	50.65	0.001 NS
F		6.90**		2.54**		
Kerala						
Cochin	30	85.47	6.88	95.29	94.26	-0.08 NS
Quilon	30	85.23	4.57	28.90	10.63	-0.04 NS
Kozhikode	21	87.41	4.46	39.47	9.28	0.40 NS
F		1.09 NS		10.99**		

**Significant at 1% level; NS - Not significant

Table 4. Variables influencing the adoption index scores of mechanized fishing boat owners in Gujarat

Independent variables	Veraval			Porbundar			Mangrol		
	r	b	t	r	b	t	r	b	t
Age	0.11	0.18	0.49	0.01	0.85	1.27	0.09	0.28	1.56
Investment on boat	0.44*	1.54	1.06	0.41*	-0.70	0.37	0.83**	2.04	3.78**
Investment on engine	0.27	-5.59	1.71	0.45*	7.20	0.60	0.60**	_0.76	0.52
Investment on fishing nets	0.44*	-6.51	1.06	0.56**	3.61	0.20	0.32	-11.55	2.86*
Annual income	0.48**	-2.37	1.14	0.49**	-2.80	1.19	0.53**	0.29	0.38
Size of boat	0.50**	0.84	0.61	0.49**	2.91	1.19	0.69**	-1.10	1.32
Engine hp	0.39*	-0.22	0.91	0.63**	0.28	0.81	0.37*	-0.23	1.78
Number of net units operated	0.65**	2.26	1.79	0.49**	1.21	0.79	0.37*	1.00	2.12*
Size of crew	0.58**	5.14	1.59	0.26	0.20	0.04	0.70**	2.49	1.02
Experience in fishing	0.04	-0.06	0.18	-0.01	-0.47	0.78	0.01	-0.15	0.90
No. of fishing days in a year	0.11	0.01	0.09	-0.49**	0.09	0.32	0.22	0.01	0.20
Information need quotient	0.45*	0.15	1.14	0.09	0.01	0.05	0.79**	0.01	0.09
Risk preference index	0.05	-0.07	0.36	0.11	-0.39	0.40	-0.14	0.15	1.80
Awareness index	0.15	0.59	1.94	0.16	-0.08	0.15	0.84**	0.58	2.33*
Size of shrimp trawl	-0.14	-0.55	1.28	0.08	0.38	0.33	0.49**	0.24	0.99
Operating hours of engine per day	0.42*	-0.24	0.35	0.55**	1.91	0.95	0.86**	0.49	1.74

*Significant at 5% level	R^2 = 0.80			R^2 = 0.67			R^2 = 0.97		
**Significant at 1% level	F = 3.30*			F = 1.70			F = 28.47**		

The nature of socio-personal and technological variables of fishing boat owners in three fishing centers of Kerala viz., Cochin, Quilon and Kozhikode are presented in Table 2. It was seen that among the boat owners in the three centers, there were no significant differences on five variables such as age, investment on engine, horse power of engine, experience and risk preference, and in all the other 11 variables, the F values were significant.

The results also showed that the mean size of boat operated in these centers varied from 11.31 to 12.21 m LOA. The size of shrimp trawl ranged from 24 to 36 m and these trawls were comparatively bigger than the trawls used in the three centers in Gujarat. The horse power of engine varied from 95 to 123 and the average number of fishing days varied from 190 to 212 per year. The mean awareness about improved practices was found to be higher at Kozhikode (84.35%), followed by Cochin (69.52) and Quilon (64.76%).

The extent of adoption of improved practices and the annual fish catches among mechanized boat owners are given in Table 3. In Gujarat, the extent of adoption scores were in the 'medium' category and the F values showed that the extent of adoption varied significantly between the three fishing centers. Among them, Veraval had highest score (61.16%) followed by Mangrol (56.64%) and Porbundar (49.92%). It was observed that none of the boat owners in these places had used aluminium sheathing for the protection of hulls of fishing boats. Similarly use of tickler chain was not extensive.

Among the three fishing centers in Kerala, the extent of adoption did not vary much, as the F value was non-significant. The adoption scores were in the high category (>85%). Further, the correlation coefficients calculated between the extent of adoption and annual fish catches were found to be non-significant in all the fishing centers. This was because of the fact that, of the seven practices evaluated for adoption, only two practices viz., the use of shrimp trawl of appropriate size and the use of tickler chain, might be related to the productivity. Some of the new technologies

Table 5. Variables influencing the adoption index scores of mechanized fishing boat owners in Kerala

Independent variables	Cochin			Quilon		
	r	b	t	r	b	t
Age	0.05	0.12	0.75	-0.22	-0.24	1.09
Investment on boat	0.02	0.10	0.18	-0.17	-0.55	0.53
Investment on engine	0.004	-0.62	0.28	0.01	-1.48	0.36
Investment on fishing nets	0.18	-0.65	0.15	-0.21	7.18	0.51
Annual income	0.04	0.01	0.04	-0.46**	-3.68	0.65
Size of boat	0.22	-0.78	0.55	-0.13	2.44	1.03
Engine hp	-0.24	-0.04	2.14*	-0.11	0.11	0.75
Number of net units operated	0.14	0.23	0.59	-0.30	-0.76	0.49
Size of crew	0	0.52	0.16	-0.04	-2.23	0.55
Experience in fishing	0.19	0.13	0.92	-0.08	0.11	0.54
No. of fishing days in a year	-0.15	-0.02	0.40	-0.35	-0.02	0.24
Information need quotient	0.45*	0.11	1.86	-0.35	-0.12	1.18
Risk preference index	0.12	0.12	0.87	0	0.17	0.87
Awareness index	0.54**	0.29	2.78**	0.17	-0.02	0.15
Size of shrimp trawl	0.02	-0.11	0.30	-0.39	-0.20	1.24
Operating hours of engine per day	-0.22	-0.37	1.12	0.05	0.26	0.29

Significant at 5% level $R^2 = 0.71$ F = 1.95 $R^2 = 0.54$ F = 0.97
**Significant at 1% level

recommended are aimed at reducing the maintenance expenditure of fishing boats and thus, as reported by FAO (1989), they tend to lower the production costs without lowering product prices and might not have significant relationship with the annual fish catches.

Further, the results in Table 3 revealed that the annual fish catches in the fishing centers of Gujarat were found to be above 78 t per year and the fish catches varied significantly between the fishing centers. In Kerala also, the fish catches varied significantly from fishing center to center and the

Table 6. Variables influencing the annual fish catches of mechanized boat owners in Gujarat

Independent variables	Veraval			Porbundar			Mangrol		
	r	b	t	r	b	t	r	b	t
Age	0.25	3.74	1.48	-0.01	-0.81	0.75	0.30	3.80	2.04
Investment on boat	0.05	5.80	0.60	-0.08	-0.63	0.21	0.21	0.54	0.09
Investment on engine	0.41*	30.07	1.38	-0.05	-0.25	0.01	0.35	19.90	1.32
Investment on fishing nets	0.46**	58.03	1.42	0.25	35.48	1.24	0.68**	151.51	3.66**
Annual income	0.30	-5.19	0.37	-0.14	6.10	1.61	0.35	21.75	2.69*
Size of boat	0.28	1.56	0.17	-0.21	-2.04	0.51	0.07	-1.97	0.22
Engine hp	0.33	1.44	0.88	0.15	0.78	1.38	0.22	-1.03	0.75
Number of net units operated	0.20	-8.59	1.02	-0.11	-4.93	2.01	0.58**	-13.05	2.69**
Size of crew	0.36*	1.74	0.08	-0.43*	-5.73	0.84	0.40**	-13.65	0.54
Experience in fishing	0.01	-1.15	0.48	-0.23	0.32	0.33	0.21	-2.70	1.48
No. of fishing days in a year	0.29	-0.45	0.85	-0.36*	-0.04	0.11	0.30	0.54	0.69
Information need quotient	0.04	-1.24	1.34	0.30	0.11	0.23	0.08	-0.33	0.49
Risk preference index	0.12	-0.67	0.46	-0.58**	-1.54	0.97	-0.14	0.49	0.56
Awareness index	0.36*	1.77	0.86	0.62**	1.68	1.92	-0.12	1.39	0.54
Size of shrimp trawl	0.13	-2.30	0.80	-0.01	3.29	1.76	0.46**	0.07	0.02
Operating hours of engine per day	0.32	-1.10	0.24	0.05	-4.15	1.28	-0.01	-4.76	1.62

*Significant at 5% level $R^2 = 0.58$ $R^2 = 0.81$ $R^2 = 0.82$
Significant at 1% level F = 1.16 F = 3.65 F = 3.89**

Table 7. Variables influencing the annual fish catches of mechanized boat owners in Kerala centres

Independent variables	Cochin			Quilon		
	r	b	t	r	b	t
Age	0.22	4.06	1.65	-0.47**	-0.23	1.07
Investment on boat	0.14	14.28	1.70	0.79**	1.99	1.90
Investment on engine	-0.07	-70.88	2.20*	0.75**	-0.71	0.17
Investment on fishing nets	0.06	-48.83	0.77	0.46**	33.85	2.45*
Annual income	0.24	3.02	1.20	0.31	15.57	2.77**
Size of boat	0.04	5.56	0.27	0.74**	3.66	1.56
Engine hp	0.01	-0.27	0.96	0.35	0.02	0.13
Number of net units operated	-0.05	-6.63	1.14	0.13	-1.50	0.96
Size of crew	0.26	14.93	0.32	0.67**	0.81	0.20
Experience in fishing	0.22	2.09	0.97	-0.32	0.06	0.32
No. of fishing days in a year	0.34	1.58	1.95	0.34	-0.04	0.59
Information need quotient	0.01	0.59	0.67	0.24	-0.14	1.35
Risk preference index	0.04	-2.33	1.08	0.15	0.15	0.78
Awareness index	-0.08	-1.83	1.21	0.07	0.13	0.87
Size of shrimp trawl	-0.02	8.95	1.64	0.18	-0.33	1.99
Operating hours of engine per day	-0.15	-13.42	2.76**	0.02	-0.55	0.62

*Significant at 5% level $R^2 = 0.67$ F = 1.63 $R^2 = 0.92$ F = 8.89**
**Significant at 1% level

mean was higher in Cochin (95.29 t per year) followed by Kozhikode (39.47 t per year) and Quilon (28.90 t per year). These results also revealed that significant increase in the size of trawls especially shrimp trawls as in Quilon (36.15 m) did not result in any significant increase in the average annual fish catches (28.90 t) when compared with Cochin and other fishing centers.

Table 4 presents the correlation and regression coefficients computed between the adoption scores and independent variables of boat owners in Gujarat. Out of 16 variables, correlation coefficients were positively significant for nine variables in Veraval, eight variables in Porbundar and eleven variables in Mangrol fishing center. In the multiple regression analysis for the Veraval center, none of the regression coefficients was significant. But, the R^2 was found to be 0.80 and the F was significant. Thus, the results revealed that when the 16 variables were taken together, they had jointly influenced 80.24% of variation in the adoption scores of boat owners in Veraval. For the sample from Porbundar, though the R^2 was 0.67, the F was not significant. For the sample from Mangrol, the R^2 was 0.97

and the F was highly significant. Here, the independent variables had jointly influenced 97% of the variations in the adoption behaviour. The results also revealed that three variables viz., investment on boat, number of trawl nets operated and awareness about improved practices would have to be strengthened to increase the extent of adoption of practices.

The results of regression analyses on the adoption index scores and the independent variables of respondents in the two fishing centers of Kerala are given in Table 5. It was seen that for both samples from Cochin and Quilon centers, the R^2 values were not significant. Among the regression coefficients, the variable awareness index had significant positive influence while engine horsepower had negative influence over the adoption scores of respondents in Cochin center. Further, the results also revealed that the sixteen variables studied had not significantly explained the variations in the adoption behaviour of boat owners in both fishing centers in Kerala.

The relationship between the annual fish catches and sixteen variables in Gujarat

are given in Table 6. Among the mechanized boat owners in Veraval, four variables such as investment on engine, investment on nets, size of crew, and awareness index were found to have positive correlation with their annual fish catches. In the multiple regression analyses, the regression coefficients and R^2 values were not significant.

As regards the boat owners in Porbundar, the extent of awareness about improved practices was found to have positive correlation with their annual fish catches. Further, in Porbundar sample, though none of the regression coefficients was significant, all the sixteen variables taken together had influenced the dependent variables significantly and 81% of variations in annual fish catches of respondents were explained by the sixteen variables.

Similarly in Mangrol sample, all the independent variables had jointly and significantly influenced 82% of variations in their annual fish catches. Here, it was also seen that though an increase in investment on fishing nets was desirable, any increase in number of net units was not advisable due to its negative influence on fish catches.

The results of correlation and multiple regression analyses on the annual fish catches in Kerala are given in Table 7. It was seen that for the Cochin sample, all the correlation coefficients were not significant The results of multiple regression analysis revealed that the independent variables studied had not significantly influenced the annual fish catches as the R^2 was found to be non-significant.

The results in Table 7 also revealed that among the boat owners from Quilon, five variables such as the investment on boat, engine and nets, size of boat and size of crew was found to have positive relationship with the extent of fish catches. In the regression analysis, the R^2 was 0.92 and highly significant. Therefore, it implied that the selected variables had significantly explained about 92% of variations in annual fish catches of respondents in Quilon fishing center.

The results revealed that the socio-personal and technological variables such as investment on boat, engine and nets, size of boat, number of trawl nets operated, number of fishing days in a year, size of shrimp trawl, operating hours of engine and awareness about improved practices would have to be monitored for their joint influence on the extent of fish catches over a period of time among the boat owners.

References

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

Bihari, B., Balasubramaniam, S. & Kandoran, M.K. (1997) *Fish. Technol.*, **34**, 40

FAO (1989) *Management in Fisheries*, Report 4, vol. 2, Rome, Italy