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Technological Gaps Among Fishermen Operating Motorised and Non-motorised Fishing Crafts

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This study was conducted in six districts of Kerala state to monitor the technological gaps among fishermen. Among the fishermen operating motorised fishing crafts, the technological gap was wider among those operating plankbuilt crafts (34.65%). The catamaran operators had wider technologicl gap (45.60%) among the non-motorised categories. Out of 18 independent variables, three variables viz, the size of craft operated, number of nets used and mass media exposure were found to be key variables among fishermen operating non-motorised crafts. In the regression analyses, the R^2 values were found to be high and significant among all the categories. The fishing craft-gear combinations used by different categories of fishermen were recorded.

Key words : Technological gaps, traditional fishermen, Kerala

As the traditional fishing sector contributes about 70% to total fish landings in Kerala (Anon, 1990), the techniques for spreading the adoption of technologies and the development of new technologies to suit the emerging needs merit priority in technological research. Technological gap studies (Supe *et al.* 1983; Dangi & Intodia, 1990; Balasubramaniam *et al.*, 1991) provide feedback information on the technologies used, and could forecast the potential areas for further research and extension services. In this context, the present study was undertaken with the following specific objectives: i) to evaluate the technological gaps among fishermen operating non-motorised and motorised fishing crafts, and ii) to find out the variables influencing the technological gaps.

Materials and Methods

Six districts of Kerala State viz., Trivandrum, Quilon, Alleppey, Ernakulam, Trichur and Malappuram were selected for the study. The respondents were selected through multi-stage random sampling and a total of 119 fishermen operating non-motorised fishing crafts and 114 fishermen operating motorised fishing crafts were selected. Structured interview schedules were used to collect the data from the respondents. Technological gaps were measured through a 3 point rating scale for technological practices such as fishing craft, materials used, size of craft used, application of wood preservatives, operation of nylon monofilament and multifilament fishing nets, number of nets used, use of ice on-board the craft, time lag between catch and disposal of fish, mesh sizes of fishing nets and hp of engine used. The technological gap score for each respondent was measured through an index developed for the study. Analyses of correlation and regression were done using standard statistical techniques (Snedecor & Cochran, 1971).

Results and Discussion

The mean and standard deviations of selected variables of fishermen operating non-motorised and motorised fishing crafts are presented in Tables 1 and 2.

Table 1. Mean scores on technological gaps and associated variables of fishermen operating non-motorised fishing crafts

Variables	Plank built craft (n_1 = 35)		Dugout canoes (n_2 = 34)		Catamarans (n_3 = 50)	
	Mean	SD	Mean	SD	Mean	SD
Technological gap index	31.71	8.13	36.62	6.60	45.60	7.47
Impact perception, scores	52.57	15.31	59.26	22.70	59.90	15.73
Age, years	43.51	11.45	41.18	7.84	39.50	12.04
Education, scores	3.80	2.54	3.79	2.86	3.34	2.83
No. of family members	6.60	2.13	7.15	2.65	5.66	1.85
Experience in fishing, years	25.97	12.37	24.44	7.59	22.92	12.03
Size of fishing craft operated, m	7.48	1.44	5.93	1.30	5.15	1.44
No. of fishing nets used	2.40	0.95	2.44	0.96	2.74	0.94
No. of crew members	9.63	9.65	2.94	1.74	2.20	1.93
No. of fishing days	218.29	56.15	262.94	54.27	247.40	53.60
Total investment, Rs.	54877	49341	17807	7184	15546	7449
Investment on fishing craft, Rs.	19800	18008	7050	24.85	3759	2006
Investment on fishing nets, Rs.	35077	33430	10757	5838	11787	6774
Maintenance cost of craft year^{-1}, Rs.	1457	1571	585	517	436	391
Expenditure on repair of nets year^{-1}, Rs.	2559	3104	844	450	1239	1032
Expenditure on preservatives year^{-1}, Rs.	564	574	197	198	Nil	Nil
Annual Income, Rs.	10377	3889	8644	2566	9197	5391
Mass media exposure, scores	46	22.89	63.40	24.24	42.00	22.82
Special participation, scores	2.60	1.70	2.00	0.85	2.16	1.36
No. of communication channels used	3.66	1.73	3.68	1.15	2.72	1.59

It is evident from Table 1 that among the fishermen operating non-motorised fishing crafts, the mean technological gap index was widest in fishermen operating catamarans (45.60%) followed by fishermen operating dugout canoes (36.61%) and least in plankbuilt crafts (31.71%). It was seen that in variables such as age, education, number of family members, experience in fishing, extent of social participation, number of communication sources used, number of fishing nets used and impact perception due to technology transfer, there were not many differences among the three categories of fishermen. But, in the variables such as total investment, number of fishing days, annual income, number of crew engaged, size of craft used, and maintenance cost of craft and nets, there were significant mean differences among the three categories of fishermen.

Among the fishermen operating motorised crafts, plankbuilt crafts had

Table 2. Mean scores on technological gaps and associated variables of fishermen operating motorised fishing crafts

Variables	Plywood craft (n_1 = 33)		Plank built craft (n_2 = 43)		Dugout canoes (n_3 = 38)	
	Mean	SD	Mean	SD	Mean	SD
Technological gap index	23.33	7.47	34.65	9.15	23.42	4.21
Impact perception, scores	69.39	12.17	75.35	14.57	74.08	17.47
Age, years	37.24	10.12	42.42	13.28	39.92	10.84
Education, scores	3.67	2.61	3.74	3.67	3.58	3.41
No. of family members	7.15	2.74	8.05	3.34	7.89	3.11
Experience in fishing, years	22.27	10.74	24.98	12.52	22.67	10.75
Size of craft operated, m	7.59	1.23	13.82	6.39	8.79	1.05
No. of fishing nets used	4.15	1.86	1.79	1.01	3.74	1.48
No. of crew members	5.30	0.92	13.00	9.25	4.92	0.27
No. of fishing days	268.48	41.86	213.84	63.04	232.63	55.10
Operating hrs. of engine per day	7.97	2.59	9.44	2.93	8.18	2.51
Fuel consumption per day, l	54.94	20.28	103.12	83.45	49.63	29.74
Total investment, Rs.	109937	43002	190918	163896	79410	24426
Investment on fishing craft, Rs.	32721	16010	35226	27641	16816	7380
Investment on engine, Rs.	30956	10013	53576	51325	31645	13355
Investment on fishing nets, Rs.	46867	27316	102117	94443	30949	22458
Maintenance cost of craft, Rs.	3245	2415	2767	2885	3418	2122
Repair cost of engine year^{-1}, Rs.	3736	2443	3594	2842	5582	3896
Expenditure on repair of nets year^{-1}, Rs.	3905	2506	8801	8962	3480	2034
Annual income, Rs.	10230	6689	7340	4495	14355	2887
Mass media exposure, scores	38.72	21.36	50.90	24.15	55.85	21.38
Social participation, scores	2.61	1.84	1.84	1.27	2.32	0.84
No. of communication, channels used	3.24	1.23	3.09	1.48	4.24	1.20

wider technological gap score (Table 2) due to non-adoption of recommended technologies than the fishermen operating motorised dugout canoes or plywood crafts. They also had higher scores on total investment, number of crew, daily fuel consumption, size of craft operated and expenditure on repair of nets.

In the variables such as age, education, number of family members, experience, maintenance cost of craft, operating

Table 3. Extent of adoption of selected technological practices among fishermen operating motorised and non-motorised crafts

Selected practices	Extent of adoption among					
	Fishermen operating motorised crafts			Fishermen operating non-motorised crafts		
	Plywood crafts, %	Plankbuilt crafts, %	Dugout canoes, %	Plankbuilt crafts, %	Dugout canoes, %	Catamarans, %
Recommended/Alternative craft materials	100.00	97.67	7.89	97.14	14.71	00.00
Fishing craft of appropriate size	100.00	62.79	100.00	100.00	100.00	100.00
Wood preservatives application	48.48	34.88	0	40.00	2.94	00.00
Nylon monofilament fishing nets	18.18	9.30	100.00	65.71	76.47	24.00
Nylon multifilament fishing nets	100.00	81.40	73.68	60.00	94.12	98.00
Number of fishing nets operated (3 & more)	75.76	9.30	71.05	60.00	29.41	66.00
Ice on-board the craft for fish preservation	0	18.60	0	0	0	00.00
Appropriate time-lag between catching and disposal	51.52	65.12	89.47	74.29	76.47	46.00
Fishing nets with standard mesh sizes	100.00	81.40	89.47	100.00	100.00	90.00
Appropriate hp of engine	96.97	67.44	100.00	0	0	0

hours of engine, social participation, number of communication sources used and perception of impact due to technology transfer there were not many differences amongst the fishermen operating the three types of motorised crafts.

The extent of adoption of selected technological practices among fishermen operating motorised and non-motorised crafts are given in Table 3. It was seen that among the fishermen operating motorised fishing crafts, the extent of adoption of individual practices were higher among the fishermen operating plywood crafts and lower among the fishermen operating motorised plankbuilt crafts. Among the non-motorised craft categories, those operating plankbuilt ones had higher adoption percentages than the other two craft categories. It was also evident that among the non-adopters in all categories, practices such as the use of ice on-board the craft, application of wood preservatives, use of nylon monofilament nets, use of recommended/alternative craft materials, more number of fishing nets and motorisation of crafts would require more dissemination of information and supply in inputs to improve their extent of adoption.

The results of correlation and regression analyses computed between the independent variables and the technological gap indices of fishermen operating non-motorised fishing crafts are given in Table 4. It was the seen that the R^2 was high (93.69%) and the *F* value highly significant for the fishermen opering non-motorised plankbuilt crafts. The two variables viz.,

Table 4. Influence of independent variables on the technological gaps indices of the fishermen operating non-motorised fishing crafts

Variables	Plankbuilt craft (n_1 = 35)			Dugout canoes (n_2 = 34)			Catamaran (n_3 = 50)		
	'r'	'b'	't'	'r'	'b'	't'	'r'	'b'	't'
Age	0.4341**	0.0315	0.104	0.0763	0.4712	1.245	0.2542	-0.2666	0.841
Education	-0.2676	0.8122	2.152**	-0.2871	-0.3064	0.795	-0.1936	0.2460	0.675
No. of family members	0.1850	-0.6745	1.691	-0.0659	-0.8529	2.243*	-0.1624	-0.5624	1.175
Investment on fishing craft	0.2565	0.0003	2.089	0.2324	0.0006	1.661	0.0936	-0.0004	0.721
Investment on fishing nets	0.2090	-0.0001	2.125*	-0.0648	-0.0002	0.847	-0.5146**	0.0001	1.153
No. of crew	0.2145	0.1027	0.455	-0.0310	0.7478	0.611	0.0978	1.0049	1.327
Experience in fishing	0.2652	0.0456	0.153	0.0579	-0.6266	1.518	0.2378	0.2750	0.818
No. of fishing days	-0.1335	-0.0079	0.409	-0.3014	0.0222	0.848	-0.2943*	-0.0509	2.364*
Annual income	-0.2779	0.0001	0.386	-0.3220	-0.0002	0.797	-0.1642	-0.0003	1.578
Maintenance cost of craft per year	0.2131	-0.0034	3.074**	-0.1659	-0.0021	1.001	0.5849**	0.0047	1.769
Mass media exposure	-0.6033**	-0.0941	1.591	-0.4713**	-0.1447	2.762*	-0.1110	-0.0584	1.525
Social participation	-0.6188**	0.4553	.594	-0.0808	1.1193	0.855	0.3920**	1.3698	1.908
No. of communication channels used	-0.1451	-0.5270	0.839	-0.3891*	-1.1071	1.475	0.1604	-0.6610	0.897
Expenditure on wood preservatives/year	-0.7004**	-0.0034	1.486	0.0334	-0.0002	0.044	-	-	-
Expenditure on repair of nets/year	0.2223	-0.0006	1.598	-0.0298	0.0010	0.408	0.1880	0.00292	2.709**
Size of fishing craft operated	0.4890**	3.2884	2.793*	0.5767**	2.1068	2.711*	0.1158	-0.9056	0.963*
No. of fishing nets used	-0.7039**	-6.6462	6.655**	-0.4752**	-3.0346	3.355**	-0.3105	4.8953	3.442*
Impact perception	-0.3495*	-0.0796	1.084	0.2661	0.0350	0.991	0.1786	0.0528	0.803
	R^2 = .9369; F = 13.211**			R^2 = .9160; F = 9.092**			R^2 = .7554 F = 5.811**		

* Significant at 5 per cent level; ** Significant at 1 per cent level

education and size of fishing craft used had shown significant positive influence while three other variables such as investment on fishing nets, maintenance cost of craft and number of fishing nets used had shown significant negative influence over the technological gap index scores. The R^2 was also found to be high (91.60%) with a significant *F* value for the fishermen operating non-motorised dugout canoes. The variables 'size of craft used' had shown positive influence over the technological gap scores while the variables, number of family members, mass media exposure and number of fishing nets used had shown negative influence.

Among the fishermen operating non-motorised catamarans, number of nets used and number fishing days exerted negative influence on the technological gap. But the expenditure on fishing nets was seen to positively influence the technological gap. It was seen that among all the three categories, 18 independent variables explained more than 75% of variation in the technological gap scores. Out of the 18 variables, three variables, viz., size of craft operated, number of nets used and mass media exposure were found to be key variables. Thus, it was evident that technological gap among fishermen operating non-motorised crafts increased wih the

Table 5. Influence of independent variables on the technological gaps indices of the fishermen operating motorised fishing crafts

Variables	Plywood craft (n_1 = 35)			Plankbuilt craft (n_2 = 34)			Dugout canoes (n_3 = 50)		
	'r'	'b'	't'	'r'	'b'	't'	'r'	'b'	't'
Age	-0.1952**	-0.0281	0.157	-0.1907	-0.1030	0.351	0.5865**	-0.3045	1.123
Education	-0.2757	0.0926	0.318	-0.0912	-0.0233	-0.045	0.4237**	-0.4594	1.222
No. of family members	0.1502	0.6464	2.776*	0.0433	0.3692	1.134	-0.2712	-0.4345	2.138*
Investment on fishing craft	0.3609*	0.00003	0.529	0.4541**	0.0001	0.426	0.2079	0.0001	2.318*
Investment on engine	0.0219	-0.00006	0.452	0.5404**	0.0001	1.993	0.5524**	0.0001	2.004
Investment on fishing nets	-0.4368*	0.00003	0.884	0.5729**	0.0001	2.092*	-0.3776*	-0.0001	1.096
No. of crew	-0.0836	0.1873	0.274	0.4767**	-1.2939	2.564*	0.4762**	7.0744	2.631*
Experience in fishing	-0.2494	-0.1298	0.665	-0.2482	0.0456	0.148	-0.5729**	0.2081	0.751
No. of fishing days	-0.0733	0.0051	0.257	-0.4772**	-0.0465	2.288*	-0.2438	0.0022	0.152
Annual income	0.0017	-0.0003	2.055	0.3072*	-0.0008	2.291*	0.0140	-0.0001	0.417
Maintenance cost of craft	0.0502	-0.0002	0.646	0.2007	0.00003	0.077	-0.0783	0.0001	0.223
Operating hrs of engine per day	-0.1642	-0.1495	0.476	0.1479	-0.8777	1.458	-0.1889	-0.4173	1.549
Fuel consumption day^{-1}	0.3815*	0.0718	2.192*	0.5337**	0.0635	2.571*	0.0186	0.0532	1.947
Repair cost of engine	0.3968*	0.0004	1.466	-0.0554	0.0001	0.196	-0.1724	-0.0001	0.782
Mass media exposure	-0.5625**	-0.0751	2.000	-0.1750	-0.0073	0.098	0.2723	0.1528	2.064
Social participation	0.1557	0.1371	0.322	0.0257	-0.3344	0.367	0.0301	0.1565	0.205
No. of communication channels used	0.5237**	0.4964	0.477	0.1345	1.1676	1.169	0.3181	-1.9147	1.902
Impact perception	0.2293	0.1110	1.201	0.1080	-0.0029	0.027	-0.0203	-0.0794	1.530
Expenditure on repair of nets year^{-1}	-0.3992*	-0.0003	1.155	0.5463**	0.0002	1.077	-0.0116	-0.0002	0.560
Size of fishing craft operated	0.3872*	0.1394	0.469	0.5069**	-0.0390	0.070	-0.2077	0.5847	0.762
No. of fishing nets used	-0.8833**	-2.2360	4.540**	-0.3931**	-5.3629	5.427**	-0.4148**	-0.0191	0.025
	R^2 = .9765; F = 21.770**			R^2 = 0.8539; F = 5.8490**			R^2 = 0.8230 F = 3.544**		

* Significant at percent level; ** Significant at 1 percent level

increase in the size of fishing craft used and decreased with the increase in the number of fishing nets used and exposure to mass media sources of information.

The extent of influence of 21 selected variables on the technological gaps scores of fishermen operating motorised fishing crafts are given Table 5. The results revealed that among the plywood craft operators, the selected variables accounted for 97.65% of the variation in the technological gap scores. The technological gap in their case could be reduced by operation of more number of fishing nets and lowering fuel consumption. For those fishermen operating plankbuilt crafts, increasing the number of fishing days, reducing of fuel consumption and increasing number of nets appeared to reduce the technological gap. In case of motorised dugout canoes 82.3% of variation in gap scores could be explained by the selected variables. Reduction in crew size and

Table 6. Fishing gears used by fishermen operating motorised and non-motorised crafts

Fishing gears used	% of use among respondents					
	Motorised craft operators			Non-motorised craft operators		
	Plywood (n_1 = 33)	Plankbuilt (n_2 = 43)	Dugout (n_3 = 38)	Plankbuilt (n_1 = 35)	Dugout (n_2 = 34)	Catamarans (n_3 = 50)
Sardine net (*Chala vala*)	63.64	0	76.32	62.86	14.71	80.00
Mackerel net (*Echa vala*)	100.00	6.98	73.68	62.86	17.65	40.00
Anchovy net (*Kacha vala*)	21.21	16.28	5.26	0	2.94	30.00
Drift net (*Ozhukku vala*)	100.00	62.80	0	34.29	82.35	74.00
Trammel net (*Disco vala*)	48.48	0	0	0	0	24.00
Mini trawl net	0	23.26	47.37	0	0	0
Roll vala (*Kangoose vala*)	0	0	0	0	2.94	0
Prawn net (*Chemmen vala*)	39.39	0	26.32	11.43	11.76	8.00
Pomfret net (*Avoli vala*)	0	0	76.32	0	2.94	0
Kolli vala	0	0	10.53	0	0	0
Ring seine net	0	46.51	0	5.71	2.94	4.00
Shore seine net	0	0	23.68	20.00	0	0
Thangu vala	0	13.95	0	0	0	2.00
Thattumadi & other boat seines	0	2.33	10.53	11.43	0	2.00
Other gill nets	0	0	23.68	31.42	0	10.00
Hook & line	27.27	0	0	0	0	0

increased investment on craft and nets would be benificial in their case to reduce the technological gap.

Although the number of family members was found to influence the technological gap for fishermen operating plywood and dugout crafts, the cause of the relationship was not clear and needs further investigation.

Table 6 presents the fishing gears used by fishermen operating motorised and non-motorised crafts. It was seen that fishermen in all categories had used various gear combination with each craft type due to the seasonal and location specific availability of fishery resources. As seen earlier, operation of more number of fishing nets reduced the technological gaps due to their direct and indirect effects on the adoption of improved practices.

It was evident that among different categories, fishermen operating motorised fishing crafts had lower technological gaps due to higher adoption of recommended practices. Further, the operation of more number of fishing nets, reduction in the size of craft operated especially above 15 m LOA, regulation of fuel consumption and savings, increase in the number of days of fishing, frequent use of mass media sources and establishing linkages with the extension agencies need to be encouraged to accelerate the diffusion of innovations.

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