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Adoption of Hygienic Practices at Fish Landing Centres and Markets

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The study was conducted at the fish landing centres in selected four districts of Kerala viz., Trichur, Alleppey, Ernakulam and Kannur, and the fish markets in Ernakulam district. In the case of landing centres, of the six practices evaluated among the fishermen, the adoption score was higher for only one practice viz., use of clean containers for fish handling (81.03%). Low level of adoption was observed on two practices viz., use of adequate clean water for washing fish (39.49%) and prompt system of waste disposal (40.00%). The overall adoption index was 54.96%. The 'F' test results revealed that the extent of adoption varied significantly among the fishermen in the four districts. The perception index for the impact of popularization efforts undertaken among fishermen was 55.26%. The R^2 value indicated that all the variables put together served as a cause of 71.60% variation in the adoption level. In case of fish markets, the overall index for the availability of infrastructural facilities was 79.74%. The fish marketing personnel were well aware of all the seven hygienic practices studied, with the overall awareness index of 93.60%. Of the six hygienic practices measured, practices such as the use of clean containers or polythene sheets for keeping fish (89.55%), using adequate clean water for washing (98.51%), sorting of fish hygienically in a clean place (84.33%), using adequate ice for preventing fish spoilage (98.51%) and maintaining personal cleanliness and handling of the fish hygienically (94.78%), were adopted by majority of the respondents. Lower adoption was observed in the case of using prompt methods of waste disposal (68.66%). The regression analyses revealed that education positively influenced the extent of adoption among the fish marketing personnel.

Key words : Adoption, awareness, fish landing centres, fish markets, hygiene, sanitation, fish handling, impact.

Consumers' greatest concern is the quality and safety of food they eat. To achieve these, it is important to popularize good hygienic practices in harvesting and post harvest handling. The post harvest handling of catch is the most important step in the production of a high quality finished product (Devadasan, 2004). To achieve 'safe fish', the primary fish handlers viz., crew of fishing vessels, workers at fishing harbour and fish retailers must be educated on good hygiene and sanitation practices. Most of them are unaware that they are potential carriers of pathogenic microorganisms and that poor personal hygiene makes the fish unsafe for human consumption (Madhusudana *et al*, 2005).

The aim of the present work was to study the socio-economic profile of fishermen and fish marketing personnel, to find out the extent of awareness and adoption of hygienic practices followed in fish landing centres and fish markets, and to identify the operational constraints in adoption of hygienic practices.

Materials and Methods

The study was conducted during 2003-06 among the fishermen in the fish landing centres of four districts of Kerala viz., Trichur, Alleppey, Ernakulam and Kannur, and among the fish marketing personnel in Ernakulam. The data were collected from

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random samples of 65 fishermen and 67 fish marketing personnel. For measuring the extent of adoption, six hygienic practices were selected viz., use of clean water, maintenance of personal cleanliness, waste disposal, use of ice, sorting of the catch hygienically and use of clean containers. Using structured interview schedules and observation methods, the data were collected from the respondents. In case of fishermen, the awareness about each hygienic practice was measured on a two-point scale viz., 'aware' and 'not aware', having scores of 2 and 1 respectively. The adoption and impact of popularization efforts were measured on a three point scale viz., 'adopted', 'partially adopted' and 'not adopted' for adoption and 'strongly agree', 'agree' and 'do not agree' for impact, having scores of 3, 2 and 1 respectively (Balasubramaniam and Krishna, 2003). Apart from this, data on the socio-economic variables viz., age, education, experience, investment, ownership, number of fishing days in a year, annual income, membership in social organizations, training need and number of marketing personnel in landing centres and on the constraints in the adoption of hygienic practices were collected.

In the case of marketing personnel, the availability of infrastructural facilities, awareness and adoption of hygienic practices were measured through the indices as used in the case of fishermen respondents. Data on the variables viz., age, education, experience, investment, number of working days in a year, annual income and number of marketing personnel and the constraints in the adoption of hygienic practices were also collected. The data were analyzed statistically for percentage, mean, standard deviation, correlation, regression, 't' test and 'F' test, using SPSS.

Results and Discussion

The results on socio-economic profile of the fishermen studied are given in Table 1. The average age of fishermen was 45 years. Most of them had education up to primary

Table 1. Socio-economic profile of fishermen

S.No.	Variables	Overall (n=65) Mean±SD	Trichur (n_1=20) Mean±SD	Alleppey (n_2=20) Mean±SD	Ernakulam (n_3=17) Mean±SD	Kannur (n_4=8) Mean±SD	'F' value
1.	Age (years)	44.74±7.67	43.50±8.30	49.90±5.95	39.47±5.30	46.13±6.20	7.883**
2.	Education (scores)	2.45±0.94	2.85±1.23	2.10±0.31	2.41±0.71	2.38±1.30	2.310
3.	Experience (years)	24.51±8.76	22.05±9.33	30.55±6.66	18.06±4.99	29.25±6.32	11.125**
4.	Investment (Rs. in Lakhs)	1.75±1.98	0.33±0.29	4.56±0.25	0.15±0.06	1.71±1.06	458.891**
5.	Ownership (scores)	2.45±0.50	2.00±0.00	3.00±0.00	2.29±0.47	2.50±0.53	38.730**
6.	No. of fishing days in a year	241.78±28.03	242.25±43.03	232.05±11.23	257.65±11.74	231.25±22.16	3.324*
7.	Annual income (Rs.)	34061.54± 30177.41	9850.00± 3494.73	66600.00± 8952.51	10000.00± 2000.00	64375.00± 30170.65	124.354**
8.	Membership in social organizations (scores)	0.37±0.49	0.05±0.22	1.00±0.00	0.00±0.00	0.38±0.52	88.628**
9.	Training need (scores)	0.31±0.47	0.00±0.0	1.00±0.00	0.00±0.00	0.00±0.00	-
10.	Number of marketing personnel in landing centre	154.35±194.82	87.00±102.97	187.50±42.53	20.18±6.1	525.00±310.53	33.861**

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

school level and had an experience of 24 years in fishing. Majority of them were owners of fishing crafts and invested, on an average, Rs. 1.75 lakhs in fishing. The average number of fishing days in a year was 241. The average annual income was Rs.0.34 lakhs. Most of them were not members in any social organizations and their training need was very low with reference to fishing technologies. The average number of marketing personnel in each landing centre was 154. The F values showed that there were highly significant differences among the fishermen of the four districts on the variables such as age, experience, investment, ownership, annual income, membership in social organizations and number of marketing personnel in landing centre.

The extent of awareness scores measured for ten improved practices are given in Table 2. The overall awareness index was 85.77±10.35. The awareness scores were higher for all the practices except for the practice of using prompt system of waste disposal in the landing centre (65.38%). This implied that the fishermen were well aware of the hygienic practices to be followed in the fish landing centres. It could be inferred from the F values that except for the three practices viz, using adequate ice before transportation, use of clean containers for fish handling, and packing and loading the fish hygienically, there were highly significant differences among the fishermen in the four districts with reference to their awareness levels on the hygienic practices.

Table 2. Extent of awareness about hygienic practices among the fishermen respondents

S.No.	Hygienic practices	Awareness Indices					'F' value
		Overall (n=65) Mean±SD	Trichur (n_1=20) Mean±SD	Alleppey (n_2=20) Mean±SD	Ernakulam (n_3=17) Mean±SD	Kannur (n_4=8) Mean±SD	
1.	Use of fish landing platform	84.62±0.47	75.00±0.51	87.50±0.44	100.00±0.00	68.75±0.52	6.164**
2.	Use of adequate clean water for washing fish	81.54±0.49	82.50±0.49	62.50±0.44	100.09±0.00	87.50±0.46	11.076**
3.	Sorting of the catch done hygienically in a clean place	92.31±0.36	95.00±0.31	95.00±0.31	97.06±0.24	68.75±0.52	6.482**
4.	Prompt system of waste disposal in the landing centre	65.38±0.47	80.00±0.50	55.00±0.31	61.70±0.44	62.50±0.46	4.897**
5.	Using adequate ice before transportation	100.00±0.00	100.00±0.00	100.00±0.00	100.00±0.00	100.00±0.00	-
6.	Using clean containers for fish handling	100.00±0.00	100.00±0.00	100.00±0.00	100.00±0.00	100.00±0.00	-
7.	Packing and loading of the fish catch are to be done hygienically	90.00±0.40	100.00±0.00	87.50±0.44	85.29±0.47	81.25±0.52	2.767*
8.	Maintaining personal cleanliness in the landing centre	82.31±0.48	100.00±0.00	50.00±0.00	91.18±0.39	100.00±0.00	101.979**
9.	The ground conditions of approaches and surroundings are to be kept clean without any swamps or stagnant water or dumps nearby	80.77±0.49	97.50±0.22	57.50±0.37	85.29±0.47	87.50±0.46	16.342**
10.	Contamination of fish with microorganisms through flies, birds and animals is usually prevented	80.77±0.49	97.50±0.22	60.00±0.41	100.00±0.00	50.00±0.00	55.045**
11.	Overall Awareness Index	85.77±10.35	92.75±5.73	75.50±6.47	92.06±6.63	80.63±10.50	27.883**

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

The extent of adoption scores measured for six hygienic practices in the selected districts are given in Table 3. The average adoption score was higher for only one practice i.e. use of clean containers for fish handling (81.03%). Adoption scores were in the middle category for the remaining five practices. The overall adoption index was 54.96. Braj Mohan *et. al.* (2003) have reported that the low adopters were 7.50%, 7.50%, 5.00%, 2.50% and 2.50% and partial adopters were 67.50%, 45.00%, 42.50%, 37.50% and 2.50% in the adoption of careful handling of catch, use of ice-fish ratio, storage of fish in fish boxes or fish hold with ice, sorting of fish, washing of fish in clean water and ice-water slurry respectively. The 'F' values shown in Table 3 revealed that there were significant differences among the fishermen of four districts in the adoption of all the six hygienic practices.

It is inferred from Table 4 that, the overall impact perception index was 55.26 ± 11.75. The impact index was moderately good for the two impact factors viz., use of clean containers for fish handling (75.90%) and use of adequate ice to preserve the fish (67.69%). In spite of repeated efforts through extension activities, the impact of popularization efforts is yet to be realized for impact factors such as use of clean fish landing platform for handling the catch, use of adequate water for washing the fish, maintaining personal cleanliness in the landing centre, prompt system of waste disposal, sorting of the catch hygienically in a clean place, and packing and loading of the fish catch hygienically. It is observed that the use of critical practices in quality control such as observing personal hygiene, use of adequate water for washing, proper icing of materials, use of cleaning schedule and proper methods of storage had increased due to periodic training of processing workers (Balasubramaniam and Krishna, 2003).

The correlation and regression coefficients calculated between the socio-economic characteristics and adoption scores are given in Table 5. Among the fishermen, the variables such as age, experience, number of fishing days in a year and annual income did not have any association with the adoption while the variables viz., investment, ownership pattern, membership in social organizations and training need were found to have negative correlation with adoption scores.

Table 3. Extent of adoption of hygienic practices among the fishermen respondents

S.No	Hygienic practices	Adoption Indices					'F'value
		Overall (n=65) Mean±SD	Trichur (n_1=20) Mean±SD	Alleppey (n_2=20) Mean±SD	Ernakulam (n_3=17) Mean±SD	Kannur (n_4=8) Mean±SD	
1.	Use of adequate clean water for washing fish	39.49±0.46	45.00±0.67	33.33±0.00	33.33±0.00	54.17±0.52	6.553**
2.	Maintaining personal cleanliness in the landing centre	57.44±0.63	65.00±0.39	33.33±0.00	62.75±0.33	87.50±0.52	56.855**
3.	Prompt system of waste disposal in the landing centre	40.00±0.40	41.67±0.44	33.33±0.00	35.29±0.24	62.50±0.35	17.658**
4.	Use of adequate ice on board the craft	51.28±0.71	36.67±0.31	58.33±0.44	37.25±0.33	100.00±0.00	69.048**
5.	Sorting of the catch done hygienically in a clean place	60.51±0.50	70.00±0.45	51.67±0.51	66.67±0.00	45.83±0.52	9.874**
6.	Use of clean containers for fish handling	81.03±0.53	96.67±0.31	76.67±0.47	66.67±0.35	83.33±0.53	16.142**
7.	Overall Adoption Index	54.96±9.48	59.17±6.32	47.78±2.79	50.33±3.09	72.22±8.91	52.086**

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

Table 4. Impact of popularization efforts undertaken among the fishermen

S.No.	Impact factors	Impact indices					'F' value
		Overall (n=65) Mean±SD	Trichur (n_1=20) Mean±SD	Alleppey (n_2=20) Mean±SD	Ernakulam (n_3=17) Mean±SD	Kannur (n_4=8) Mean±SD	
1.	Clean fish landing platform is used for handling the catch	41.54±0.56	53.33±0.82	33.33±0.00	33.33±0.00	50.00±0.53	7.229**
2.	Adequate water is used for washing fish	40.51±0.54	45.00±0.75	33.33±0.00	33.33±0.00	62.50±0.64	8.421**
3.	Personal cleanliness is maintained in the landing centre	59.49±0.62	66.67±0.32	33.33±0.00	66.67±0.00	91.67±0.46	124.815**
4.	Wastes are disposed promptly in the landing centre	37.44±0.33	40.00±0.41	33.33±0.00	33.33±0.00	50.00±0.53	7.099**
5.	Adequate ice is used to process the fish	67.69±0.59	68.33±0.69	60.00±0.41	62.75±0.33	95.83±0.35	9.828**
6.	Clean containers are used for fish handling	75.90±0.48	96.67±0.31	66.67±0.00	64.71±0.24	70.83±0.35	64.096**
7.	Sorting of the catch is done hygienically in a clean place	55.38±0.71	73.33±0.83	35.00±0.22	64.71±0.24	41.67±0.46	19.563**
8.	Packing and loading of the fish catch are done hygienically	64.10±0.69	88.33±0.49	43.33±0.47	64.71±0.24	54.17±0.52	33.488**
9.	Overall Impact Perception Index	55.26±11.75	66.46±7.46	42.29±3.10	52.94±2.86	64.58±10.68	62.359**

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

The variables viz., education and number of marketing personnel in the landing centre were found to have positive relationship which indicated that when these scores improve, the adoption scores also increase and vice versa. It is inferred that periodical training programmes and continued extension and educational efforts would improve the adoption of quality control practices. The R^2 value indicates that, all the variables taken together served as cause for 71.60% of variation in the adoption level. The highly significant 'F' value reveals the overall significance of the regression. Of the ten variables, only two variables viz., investment and number of marketing personnel had

Table 5. Correlation and regression analyses between the socio-economic variables and adoption scores among the fishermen (n=65)

S.No.	Variables	Correlation coefficients (r)	Regression coefficients (b)	SE of 'b'	't'
1.	Age	-0.158	-0.123	0.238	-0.516
2.	Education	0.305*	2.051	1.144	1.793
3.	Experience	-0.098	0.088	0.248	0.354
4.	Investment	-0.310*	Negligible	0.000	2.576*
5.	Ownership	-0.309*	-3.406	2.335	-1.459
6.	No. of fishing days in a year	0.002	-0.025	0.029	-0.864
7.	Annual income	0.025	Negligible	0.000	0.199
8.	Membership in social organizations	-0.272*	-0.997	3.858	-0.258
9.	Training need	-0.509**	-31.928	7.679	4.158**
10.	Number of marketing personnel in landing centre	0.456**	0.018	0.005	3.436**

** Significant at 1% level ; * Significant at 5% level ; R^2 = 0.716 ; F = 13.641**

contributed significantly towards the extent of adoption of hygienic practices, while training need had negative influence over the adoption behaviour.

The major constraints reported by the respondents were, lack of financial assistance (92.31%), non availability of adequate potable water (47.69%), increasing cost of practices (30.77%), distance to be travelled (26.15%), lack of infrastructural facilities (20.00%), inadequate transport facilities (15.38%), inadequate manpower (6.15%), exploitation by middlemen (6.15%), lack of electricity facilities at landing centre (6.15%), lack of remunerative price for the catches (3.08%) and declining catches (1.54%).

The socio-economic profile of the fish marketing personnel studied is given in Table 6. The average age of respondents was 46 years. They had a background of primary and middle school education and 23 years of experience in fish vending. The mean investment by each respondent was Rs. 0.31 lakhs. The average number of working days in a year was 349 days with an average annual income of Rs. 0.40 lakhs. The average number of marketing personnel in each fish market studied was 41.

Table 6. Socio-economic profile of fish marketing personnel (n=67)

S.No.	Variables	Mean ± SD
1.	Age (years)	46.42±10.09
2.	Education (scores)	2.87±0.87
3.	Experience (years)	22.63±10.58
4.	Investment (Rs.)	31470.15±91276.84
5.	No. of working days in a year	349.18±22.16
6.	Annual income (Rs.)	40891.50±14782.75
7.	No. of marketing personnel	40.58±36.08

The extent of availability of infrastructural facilities is given in Table 7. The overall availability index was 79.74 ±14.74%. The infrastructural facilities such as cemented floor, clean water, drainage channels, waste disposal facility, clean ground conditions and approach roads were moderately available.

Table 7. Availability of infrastructural facilities in fish markets

S.No.	Infrastructural facilities	Availability index
1.	Cemented floor	84.33±0.47
2.	Clean water	86.57±0.45
3.	Drainage channels	78.36±0.50
4.	Waste disposal facility	70.90±0.50
5.	Clean ground conditions	70.90±0.50
6.	Approach roads	92.54±0.36
7.	Overall	79.74±14.74

The scores on extent of awareness and adoption of selected hygienic practices are given in Tables 8 and 9. The average awareness index among the fish marketing personnel was quite high (93.60%) and the respondents were aware of the seven hygienic practices to be followed in the fish markets. This might be due to the frequent awareness and educational programmes being conducted by the various governmental and non-governmental organizations on hygiene.

The overall adoption index was 89.05 ±10.28% (Table 9). Of the six hygienic practices measured, practices such as the use of clean containers or polythene sheets for keeping fish (89.55%), using adequate clean water for washing (98.51%), sorting of fish hygienically in a clean place (84.33%), using adequate ice for preventing fish spoilage (98.51%) and maintaining personal cleanliness and handling of the fish hygienically (94.78%) were adopted by majority of the respondents. Lower adoption was observed in the case of using prompt methods of waste disposal (68.66%). The result implies the need for interventions for prompt system of environment friendly waste disposal methods.

The correlation and regression coefficient values calculated between the socio-personal characteristics and adoption scores

Table 8. Extent of awareness about hygienic practices among the fish marketing personnel

S. No.	Hygienic practices	Awareness indices Mean ± SD
1.	Use of raised platform for selling fish or polythene sheets	97.01±0.24
2.	Using clean containers for keeping the fish instead of keeping the fish on the floor	91.79±0.37
3.	Using adequate clean water for washing fish	96.27±0.26
4.	Sorting of the catch done hygienically in a clean place	89.55±0.41
5.	Using prompt method of waste disposal	81.34±0.49
6.	Using adequate ice for preventing fish spoilage	99.25±0.12
7.	Maintaining personal cleanliness and handling of the fish is done hygienically	100.00±0.00
8.	Overall Awareness Index	93.60±9.72

Table 9. Extent of adoption of hygienic practices among the fish marketing personnel

S. No.	Hygienic practices	Adoption indices Mean ± SD
1.	Using clean containers or polythene sheets for keeping fish	89.55±0.27
2.	Using adequate clean water for washing	98.51±0.00
3.	Sorting of fish done hygienically in a clean place	84.33±0.35
4.	Using prompt methods of waste disposal	68.66±0.50
5.	Using adequate ice for preventing fish spoilage	98.51±0.00
6.	Maintaining personal cleanliness and handling of the fish is done hygienically	94.78±0.35
7.	Overall Adoption Index	89.05±10.28

are given in Table 10. Among the fish marketing personnel, the variables viz., age, education, experience, investment, annual income and number of marketing personnel did not have any association with the adoption. Only one variable viz., number of working days in a year was found to have positive correlation with adoption scores. The R^2 value indicated that, all the variables taken together served as cause for only 28.40% of variation in the adoption level. The highly significant value revealed the overall significance of the regression. Among the variables, education and number of working days in a year had positive influence towards the extent of adoption of hygienic practices.

Table 10. Correlation and regression analyses between the socio-economic variables and adoption scores among the fish marketing personnel (n=67)

S.No.	Variables	Correlation coefficients (r)	Regression coefficients (b)	SE of 'b'	't'
1.	Age	0.089	0.166	0.173	0.960
2.	Education	0.200	3.445	1.624	2.121*
3.	Experience	-0.012	0.033	0.172	0.191
4.	Investment	0.124	Negligible	0.000	0.329
5.	No. of working days in a year	0.417**	0.184	0.053	3.436**
6.	Annual income	0.234	Negligible	0.000	0.866
7.	No. of marketing personnel	-0.100	-0.049	0.035	-1.374

** Significant at 1% level ; * Significant at 5% level ; $R^2 = 0.284$; F = 3.344**

The major constraints in adoption of hygienic practices were found to be lack of infrastructural facilities (19.40%), lack of governmental support (19.40%), lack of hygiene and sanitation in the market environments (17.91%), lack of waste disposal facilities (14.93%), lack of adequate space (10.45%) and non availability of potable water (7.46%).

The acceptance of a new idea is not a unit act but a complex process involving a sequence of thoughts and actions among the members of the society. Usually these decisions are made on the spot and also through multiple contacts with peer groups, various communication channels and extension efforts. Hence, the adoption behaviour could be improved by expanding non-formal adult education, adequate training and demonstration programmes, contact with extension agency and mass media exposure among the various client categories.

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