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Adoption of Good Management Practices by Aquafarmers

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The study was conducted among the aquafarmers in four selected districts viz., Trichur, Alleppey, Ernakulam and Kannur in Kerala. Data were collected on the extent of adoption of good management practices among the sample respondents. Of the 10 practices evaluated, the adoption scores were higher for six practices viz., preparation of ponds (93.15%), eradication of predators and weeds (85.39%), use of PCR tested seeds (84.47%), use of recommended feeding schedule (77.63%), water exchange and quality monitoring (71.69%) and harvesting after prescribed days of culture (70.32%). The extent of adoption of each practice varied significantly ($p < 0.01$) among the aquafarmers with the overall mean adoption score of 70.09% (n=73). The variables viz., number of training programmes undergone, number of information sources utilized and expert services availed, were found to have positive relationship with the extent of adoption. Regression analysis revealed that of the seven variables, only one variable viz., number of training programmes undergone had contributed significantly ($p < 0.05$) towards the extent of adoption of improved practices.

Key words: Adoption, aquafarmers, good management practices.

India, by virtue of its 8118 km long coastline, 2.02 million sq. km of Exclusive Economic Zone (EEZ) and extensive geographical stretch with varied terrain and climate, supports a wide diversity of inland and coastal wetland habitats. It has been estimated that there is 3.9 million ha of estuaries and 3.5 million ha of brackishwater areas in the country (WWF, 1992). Out of this, 1.2 million ha of coastal area has been identified as suitable for brackishwater aquaculture in addition to about 2.5 million ha of salt affected soils, which can well be brought under aquaculture. Kerala, situated on the south-western part of India has a coastline of 590 km and a continental shelf area of 40,000 sq.km within 200 m depth. The state has a sprawling brackishwater area of nearly 65,000 ha suitable for shrimp farming. Out of this, about 14,500 ha has been utilized for shrimp aquaculture.

Shrimp culture in India, though in vogue in traditional form assumed great importance during late eighties and early nineties and the concept of coastal aquaculture in an organized manner suddenly gained momentum. There was an unprecedented expansion of shrimp culture with simultaneous technological advancement in the research and development organizations catering to the need of the enterprise (Rao, 2004). Through the adoption of improved management practices, this resource can ensure good harvest without much economic loss. But due to non availability of required information on scientific management and inputs, the shrimp farming sector frequently faces viral disease outbreaks resulting in production losses. Further, due to contamination by pesticides, antibiotic residues, toxins and pathogens, HACCP based quality management system has become an important requirement in aquafarming. Hence, an insight into the present level of adoption of good management practices, identification of problem areas and suitable interventions are essential to train the people involved to

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produce quality raw materials. In this context, the present study was conducted with the following specific objectives viz., i) to study the socio-personal profile of aquafarmers ii) to find out the extent of adoption of good management practices followed in aquaculture farms and iii) to identify the operational constraints in adoption of improved practices.

Materials and Methods

The study was conducted among the aquafarmers in four selected locations viz., Trichur, Alleppey, Ernakulam and Kannur districts of Kerala. The data were collected from a random sample of 73 aquafarmers. For measuring the extent of adoption, ten good management practices viz., preparation of ponds, eradication of predators and weeds, use of organic manures and fertilizers, use of recommended stocking rate, use of PCR tested seeds, use of recommended feeding schedule, use of probiotics, use of aerators, water exchange and quality monitoring and harvesting after prescribed days of culture were selected. Using structured interview schedules and observation methods, the data were collected from the respondents.

The adoption of each improved practice by aquafarmers was measured on a three point scale viz., 'adopted', 'partially adopted' and 'not adopted' having scores of 3, 2 and 1 respectively (Balasubramaniam *et al*, 2000; Brajmohan *et al*, 2003; Ponnusamy *et al*, 2004). The adoption index was calculated as the ratio of actual scores obtained to the maximum scores possible and expressed in percentages. Apart from this, data on the socio-personal variables viz., age, education, experience, number of training programmes undergone, number of information sources utilized, expert services availed, area under culture and on the constraints in the adoption of good management practices were also collected. The data were analyzed by using various standard statistical tools using the statistical packages for social sciences (SPSS Ver. 16.0).

Results and Discussion

The results on socio-personal profile of the aquafarmers studied are given in Table 1. The results revealed that on an average, the age of aqua farmers was 46 years, most of them had high school education and had an experience of 12 years in aquafarming. On an average, they had undergone one training programme in aquaculture practices. The

Table 1. Socio-personal profile of aquafarmers (n=73)

S. No.	Variables	Overall (n=73)		Trichur (n_1=21)		Alleppey (n_2=19)		Ernakulam (n_3=18)		Kannur (n_4=15)		'F' value
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
1.	Age (years)	46.08	10.89	40.29	9.50	49.32	10.71	51.17	11.81	44.00	7.88	4.640**
2.	Education (scores)	3.19	0.68	3.38	0.86	2.89	0.57	3.22	0.55	3.27	0.59	1.889
3.	Experience (years)	11.96	8.33	10.43	8.27	13.47	7.28	15.94	9.96	7.40	4.58	3.693*
4.	Number of training programmes undergone	0.81	1.23	1.38	1.69	0.26	0.45	1.00	1.28	0.47	0.64	3.642*
5.	Number of information sources utilized	1.73	1.47	2.86	2.10	1.26	0.56	0.78	0.43	1.87	0.92	9.997**
6.	Expert services availed (scores)	1.78	1.59	2.38	2.11	2.32	1.00	1.28	1.45	0.87	0.83	4.541**
7.	Area under culture (acres)	10.00	14.70	5.83	6.91	9.77	11.09	17.78	23.65	6.80	9.54	2.653*

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

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		Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
1.	Age (years)	46.08	10.89	40.29	9.50	49.32	10.71	51.17	11.81	44.00	7.88	4.640**
2.	Education (scores)	3.19	0.68	3.38	0.86	2.89	0.57	3.22	0.55	3.27	0.59	1.889
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** Significant at 1% level ; * Significant at 5% level

frequently used information sources were friends, neighbours and dealers of various aqua farm inputs. Most of them availed technical expert services at the farm level and the most availed expert service was the consultancy services offered by the private consultants. The data revealed that the average area under culture was 10 acres and the source of water supply for all the respondents were found to be either back-water or river canals near their farms. The 'F' values showed that there was significant difference among the aquafarmers of the four districts on the variables such as age, experience, number of training programmes undergone, number of information sources utilized, availing the expert services and area under culture, though there was no significant difference among them in their educational status.

In aquacultural farms, improved management practices are followed which ensure good harvesting without much loss due to frequent occurrence of viral diseases. The ponds are initially prepared by drying and tilling to remove the pests and predators and metabolise the organic matter. Then liming is done to correct the pH and to keep the bottom, free from microorganisms. Inorganic fertilizers such as urea and super phosphate are then applied to develop the natural food such as plankton and benthos. Then the shrimp post larvae are stocked at varying densities. Pelleted diets are used as supplementary feed. The feed is provided in three different sizes depending on the size of the shrimp - starter, grower and finisher. The feed quantity to be given is monitored using feed trays and it is adjusted according to the level of growth. Water quality is continuously monitored and the optimum levels of important parameters such as dissolved oxygen, pH and salinity are regulated by resorting to periodical exchange of water. The stocks are generally harvested when they reach marketable size of 30-35 gm. It normally takes about four to five months to achieve this size. An average production of 1000-1600 kg per hectare is expected per crop by adopting these good management practices.

The extent of adoption scores measured for ten improved practices in the selected districts and the average of all districts are given in Table 2. The average adoption scores were higher for the following practices viz., (i) preparation of ponds (93.15%) (ii) eradication of predators and weeds (85.39%) (iii) use of PCR tested seeds (84.47%) (iv) use of recommended feeding schedule (77.63%) (v) water exchange and quality monitoring (71.69%) and (vi) harvesting after prescribed days of culture (70.32%). Pre-mature harvesting due to viral attack after 60 days was reported in a few cases. As reported by Lin (1989), infected seed obtained from different sources spreads disease in the culture system. The causes of disease and production losses are in many cases difficult to ascertain, but several studies link outbreaks of diseases to environmental factors.

Partial adoption was more seen in two practices such as the use of organic manures and fertilizers (68.95%), and use of recommended stocking rate (64.38%). Non-adoption was more in two practices such as the use of aerators and use of probiotics probably, due to extensive or traditional pattern of shrimp farming. The overall adoption index was 70.09%. These results are comparable with the findings of Lekshmi *et al* (2005) who reported that the adoption behaviour of the shrimp farmers in Tamil Nadu was high with respect to practices such as harvesting at prescribed stage without viral attack, pond bottom conditioning, pond bottom sterilization, acclimatization and stocking of fry, liming of pond, feed management and health management.

The 'F' values shown in Table 2 revealed that there were significant differences among the aquafarmers of four districts in the adoption of almost all the improved practices. About 88% of the aqua farmers had reported the occurrence of viral diseases in their farms at least once during

Table 2. Extent of adoption of improved practices by aquafarmers (n=73)

S. No.	Improved practices	Adoption Indices										'F' value
		Overall (n=73)		Trichur (n_1=21)		Alleppey (n_2=19)		Ernakulam (n_3=18)		Kannur (n_4=15)		
		Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
1.	Preparation of ponds	93.15	0.53	80.95	0.81	100.00	0.00	94.44	0.38	100.00	0.00	6.286**
2.	Eradication of predators and weeds	85.39	0.80	69.84	0.94	96.49	0.46	79.63	0.92	100.00	0.00	6.472**
3.	Use of organic manures and fertilizers	68.95	0.92	69.84	0.94	45.61	0.68	68.52	0.87	97.78	0.26	11.784**
4.	Use of recommended stocking rate	64.38	0.77	57.14	0.64	56.14	0.89	59.26	0.55	91.11	0.46	9.236**
5.	Use of PCR tested seeds	84.47	0.83	68.25	1.02	92.98	0.63	81.48	0.86	100.00	0.00	5.450**
6.	Use of recommended feeding schedule	77.63	0.90	73.02	0.93	78.95	0.90	62.96	0.96	100.00	0.00	5.175**
7.	Use of probiotics	47.95	0.83	58.73	1.00	33.33	0.00	40.74	0.65	60.00	1.01	4.816**
8.	Use of aerators	36.99	0.43	46.03	0.74	33.33	0.00	33.33	0.00	33.33	0.00	4.559**
9.	Water exchange and quality monitoring	71.69	0.78	65.08	0.92	64.91	0.23	62.96	0.83	100.00	0.00	10.590**
10.	Harvesting after prescribed days of culture	70.32	0.79	61.90	0.91	75.44	0.56	51.85	0.51	97.78	0.26	14.557**
11.	Overall Adoption Index	70.09	0.56	65.08	0.77	67.72	0.18	63.52	0.50	88.00	0.09	7.641**

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

the last three years. The yield rate varied from 600 to 1600 kg per hectare in most of the farms depending upon the species cultured (*Penaeus indicus/ P. monodon*) and the farming techniques used. Most of the respondents had perceived the sources of virus infection as seeds/ feeds/ water and the stage of disease occurrence was found to be during 40-60 days.

In order to find out the degree of relationship between the socio-personal characteristics of aqua farmers and extent of adoption, simple correlation coefficients were worked out. To determine the strength of various characteristics influencing the level of adoption, the data were subjected to multiple regression analysis. The results are given in Table 3.

Among the aquafarmers, the variables 'age' and 'education' did not have any association with the adoption while two variables viz., experience and area under culture were found to have negative correlation with adoption scores. The variables viz., number of training programmes undergone, number of information sources utilized and expert services availed, were found to have positive relationship which indicated that when these scores improve, the adoption scores could be more and vice versa. It is inferred that periodical training programmes and continued extension and educational efforts would improve the adoption of good management practices. Further, training undergone/ participation in extension programmes, utilization of information sources and availing expert services/ linkage with research and extension groups are more or less related characteristics, which have positive association with the dependent variable. This might be due to the fact that the efficient adoption behaviour might be requiring the technical advices, help and expertise from the extension personnel or any external development

Table 3. Correlation and regression analyses between the socio-personal variables and adoption scores among the aquafarmers (n=73)

S. No.	Variables	Correlation coefficients (r)	Regression coefficients (b)	SE of 'b'	't'
1.	Age	-0.114	0.014	0.006	2.201
2.	Education	0.207	0.002	0.093	0.019
3.	Experience	-0.416**	-0.025	0.009	-2.905**
4.	Number of training programmes undergone	0.421**	0.124	0.056	2.222*
5.	Number of information sources utilized	0.394**	0.079	0.047	1.685
6.	Expert services availed	0.326**	0.032	0.043	0.758
7.	Area under culture	-0.248*	-0.003	0.004	-0.644

** Significant at 1% level ; * Significant at 5% level ; R^2=0.373 ; F=5.514**

agencies. Therefore, the extension efforts of extension personnel or development agencies would have to be enhanced for increasing the extent of adoption of good management practices, through the use of pluralistic extension methods like training programmes, demonstrations, group meetings, publications, radio programmes, television programmes and Information and Communication Technology (ICT) based approaches.

Regression coefficients were worked out to find out the extent of contribution of each of the socio-personal characteristics with the adoption of improved practices. Of the seven variables, only one variable viz., number of training programmes undergone had contributed significantly towards the extent of adoption of improved practices, while experience had negative influence over the adoption behaviour. From this, it could be inferred that the highly experienced farmers might still be in favour of traditional system with lesser production costs rather than increasing the production costs through the adoption of intensive prawn culture practices. Further, the analysis revealed that a unit of change in the component 'number of training programmes undergone', *ceteris paribus*, would result in increasing the adoption behaviour of aquafarmers by 0.124 units. The R^2 value indicated that, all the variables taken together served as cause for 37.30% of variation in the adoption level. The significant 'F' value revealed the overall significance of the regression.

The major constraints reported by the respondents were, increased cost of culture (86.30%), lack of financial assistance (68.49%), risk due to mortality (46.58%) and lack of technical guidance (43.84%), followed by lack of infrastructural facilities (17.81%), lack of remunerative price for the commodity (17.81%), water pollution (13.70%), lack of policies/ governmental schemes (10.96%), frequent occurrence of diseases (8.22%), absence of an enforcement agency to monitor the supply of good quality seeds and feeds, and non-availability of quality seeds (6.85%), absence of synchronized/ group farming approach (2.74%) and lack of access to laboratory facilities (1.37%).

Quality of seed is a major concern of aquaculture and this needs to be ensured with quarantine and quality control facilities. An institutional mechanism of seed certification involving fisheries research institutes, state fisheries departments and entrepreneurs as a joint venture is the need of the hour. Disease diagnostic capabilities need to be strengthened through establishment of a

chain of laboratories in different parts of the country. Selection of farm site in such a way that it should be away from other farms to avoid pollution, use of pond liners to prevent seepage and soil erosion, reduced stocking density to reduce disease risk, stocking disease-free seed to prevent disease outbreak and maintaining water quality through constant monitoring to prevent diseases and to maintain healthy environment are some of the recommended good management practices for better growth and survival. With the tremendous biological and physical potential in the country coupled with excellent entrepreneurship from the private sector, the growth of the aquaculture sector could be phenomenal, leading to several advantages to the people involved in shrimp culture as also in the ancillary activities besides contributing to the increase in foreign exchange earnings of the country.

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