Available Online at ESci Journals
International Journal of Agricultural Extension
ISSN: 2311-6110 (Online), 2311-8547 (Print)
http://www.escijournals.net/IJAE

FARMERS' KNOWLEDGE ON AQUACULTURE PRACTICES IN BOGRA DISTRICT OF BANGLADESH

Md. H. Sakib, Md. S.I. Afrad, Foyez A. Prodhan*
Department of Agricultural Extension and Rural Development BSMRAU, Gazipur-1706, Bangladesh.

A B S T R A C T

Bangladesh is decorated with a lot of rivers and tributaries across her deltaic plains, in which aquaculture is a potential sector to meet dietary needs of protein. The main objective of this study was to assess the knowledge level on aquaculture practices by the fish farmers. The study was conducted in Kahaloo and Sherpur upazilas of Bogra district. Respondent fish farmers were selected using proportionate random sampling technique. Quantitative data was collected using predesigned interview schedule. knowledge on "stocking ratio of fishes of carp poly culture", "recommended dose of lime", "application of fertilizers", "components fish in carp poly culture", "harmful effect of contaminated water", "recommended pesticide for removing undesirable fish species" was good enough over other arena of knowledge regarding aquaculture practices. Overwhelming majority of the respondents had low to medium overall mean knowledge on fish culture. Age, education, use of information sources, farm size, fish farming area, annual family income, commercialization, social participation and innovativeness of the respondents had a positive and significant relationship with the knowledge of the respondents. Characteristics of respondent's viz. use of information sources, education and annual family income were the best predictors and overall contribution variation to the total explained variation in case of knowledge regarding aquaculture practices. The study recommends was that modern technology and its compatibility, viability and application need to telecast frequently in order to generate knowledge on fish farming technology to the relevant farmers.

Keywords: Farmers knowledge, aquaculture, practices.

INTRODUCTION

All fresh fish provides higher proportions of protein (14-20g /100g raw edible parts) compared to plant sources (2.7g /100g cooked rice and 8.7g/100g cooked bean) besides this small fish species are rich in micronutrients like vitamin A, calcium, iron and zinc. On the other hand, fat composition of fish is unique in respect of other animal food sources due to presence of poly unsaturated fatty acid (PUFAs) (Kawarazuka, 2010). Those PUFAs reduce the risk of heart disease (Angerer and Schacky, 2000). In Bangladesh, the total fish production was 2.7 million metric tons (MT) in 2008-09 which contributed 4.58 percent of total gross domestic product (BBS, 2010). Besides, Total area of capture fisheries was 4,047,316 ha with the production of 1123925 MT covering 41.61% of total fish production in Bangladesh during 2008-09 while the culture fisheries production was 1062801 MT (39.34%) from 258,390 ha in the same year (BBS, 2010). Hence, productivity as well efficiency of culture fisheries is much higher than capture fisheries whereas production of open water bodies showed decreasing trend and availability of some species have greatly reduced but still there is a rampant scope to increase the fish production level by using modern aquaculture technology. Low fish production in the State can be attributed to several reasons. However, knowledge of the fish farmers on scientific fish culture is the single largest known factor responsible for low fish production. Knowledge on scientific fish culture plays a very important role to improve fish production by assisting farmers to make appropriate decision upon adoption of innovations. Knowledge is a component of the behavior of an individual. To improve the present

* Corresponding Author:
Email: foyezbsmrau@yahoo.com

status of aquaculture practice in this country, it is necessary to assess the knowledge of the fish farmers. This would form a base for the future extension efforts. Keeping these facts in view, the present investigation was carried out to 1) determine the extent of knowledge on aquaculture practices, 2) bring out the relationship between selected socio demographic characteristics of respondents and their knowledge on aquaculture practices.

METHODOLOGY

Kahaloo and Sherpur upazilas of Bogra district were the locale of this study. Bogra district consists of 12 upazilas from which Kahaloo and Sherpur were selected using simple random technique. Kahaloo is located at western part of Bogra district whereas Sherpur is located at the southern part. Six unions viz. Kahaloo, Jamgaon, Malancha, Kusumbi, Bishalpur, Khanpur unions were selected by using simple random technique procedure from a total 18 unions of Kahaloo and Sherpur upazilas. Then a list of fish growers of these six unions was prepared with the help of the Upazila Fisheries Officer (UFO). Total numbers of fish farmers of these unions were 366 which constituted the population. Thirty percent of the fish growers were selected from villages of six unions by using proportionate random sampling technique. Resultantly 110 fish farmers constituted the sample of this study. In order to collect valid and reliable information from the farmers an interview schedule containing both open and closed form questions was developed considering the objectives of the study. Ten selected characteristics viz. age, education, family size, information sources use, farm size, fish farming area, annual family income, use of agricultural credit, commercialization, social participation and innovativeness of the respondents were the independent variables were measured and categorized by following standard methodology used by Hoque (2010), Ali (2004), Islam (2000) and Muttaleb (2006). Knowledge about aquaculture practices was the dependent variable of this study which consists of thirteen selected questions by covering the following aspects on aquaculture practices viz. (i) recommended dose of lime, (ii) application of fertilizers, (iii) harmful effect of contaminated water (iv) recommended pesticide for removing undesirable fish species, (v) the components fish in carp poly culture, (vi) acquaintance with organic fertilizer, (vii) appropriate dose of organic fertilizers, (viii) stocking density of carp poly culture, (ix) stocking ratio of fishes of carp poly culture, (x) appropriate time of application of urea fertilizer into the pond, (xi) appropriate time of application of TSP fertilizer into the pond, (xii) eradication of undesired fish species and (xiii) appropriate time to release fingerling. Different aspect of knowledge on aquaculture was ranked on the basis of mean as accordance with the methodology of Sendilkumar (2010). The dependent variable has been categorized on the basis of mean and standard deviation viz. Low (Mean-SD/2), Medium (Mean ± SD/2), High (Mean ± SD/2). A standardized knowledge test was developed to measure the knowledge of fish farmers by using following formula used by Jaganathan et al., 2012. However the knowledge index was calculated by the formulae;

$$\text{Knowledge index} = \frac{\text{Respondent's total score}}{\text{Total possible score}} \times 100$$

RESULTS AND DISCUSSION

Overall mean knowledge on aquaculture practices: The index of knowledge about aquaculture practices of the respondents could range from 0 to 100. The computed knowledge level of the respondent ranged from 34.62 to 100 with a mean of 66.68 and standard deviation of 23.23. The respondents were distributed according to their knowledge level into three categories and shown in Table 1.

Table 1. Distribution of the respondents according to their knowledge on aquaculture practices.

Knowledge categories(Index scores)	Respondents		Mean	SD
	Number	Percent		
Low knowledge (<55.07)	50	45.50	66.68	23.23
Medium knowledge (55.07-78.30)	13	11.80		
High knowledge (>78.30)	47	42.70		
Total	110	100.00		

Data presented in Table 1 reveal that about half of the respondents (45.5%) had low knowledge on fish culture and more or less similar portion of them possessed high knowledge category (42.70%) whereas only 11.80 percent of them showed medium category knowledge.

Knowledge on different arena regarding aquaculture practices: It is observed from Table 2 that very big majority of the respondents (90.90%) had medium to high knowledge on recommended dose of lime application into the pond for betterment of water quality. Similarly respondent's knowledge on "application of fertilizers", "harmful effect of contaminated water", "recommended pesticide for removing undesirable fish species", "components fish in carp poly culture" and "appropriate time to release fingerling" found medium to high as presented in the Table 2 where the percentages were 90.00, 83.60, 81.80 and 84.50, accordingly. Besides the overwhelming majority of the respondents (52.70%) had low to medium knowledge on "acquaintance with organic fertilizer". Moreover the knowledge level of respondents on "stocking density of carp poly culture", "appropriate time of urea fertilizer application into the pond", "eradication of undesired fish species" and "appropriate time of TSP fertilizer application into the pond" was the same. The figures were 45.50, 53.70, 57.20 and 57.3 percent, respectively. Surprisingly all the respondents had medium knowledge level on "appropriate doses of organic fertilizers". On the other hand all the respondents had high knowledge level on "stocking ratio of fishes of carp poly culture".

Furthermore, based on mean of the different aspect of knowledge on aquaculture practices viz. "stocking ratio of fishes of carp poly culture" ranked first, "recommended dose of lime" ranked second, "application of fertilizers" ranked third, followed by "components fish in carp poly culture", "harmful effect of contaminated water", "recommended pesticide for removing undesirable fish species", "eradication of undesired fish species" , "appropriate time to release fingerling" , "appropriate time of urea fertilizer application into the pond" ,"appropriate time of TSP fertilizer application into the pond", "stocking density of carp poly culture", "acquaintance with organic fertilizer" and "appropriate doses of organic fertilizers".

Table 2. Distribution of the respondents regarding knowledge on aquaculture practices and ranking among the different knowledge on aquaculture.

Knowledge	Knowledge categories (Index scores)	Respondents		Mean	Rank
		No.	%		
Recommended dose of lime (RDL)	No (0)	2	01.80	75.68	2
	Low (1.00-33.33)	8	07.30		
	Medium (33.34-66.66)	35	31.80		
	High (above 66.66)	65	59.10		
Application of fertilizers (AF)	Low (1.00-33.33)	11	10.00	75.45	3
	Medium (33.34-66.66)	33	30.00		
	High (above 66.66)	66	60.00		
Harmful effect of contaminated water (HECW)	Low (1.00-33.33)	18	16.40	70.91	5
	Medium (33.34-66.66)	29	26.40		
	High (above 66.66)	63	57.30		
Recommended pesticide for removing undesirable fish species (RP)	Low (1.00-33.33)	20	18.20	70.91	5
	Medium (33.34-66.66)	26	23.60		
	High (above 66.66)	64	58.20		
Components fish in carp poly culture (CFCP)	Low (1.00-33.33)	17	15.50	71.81	4
	Medium (33.34-66.66)	31	28.20		
	High (above 66.66)	62	56.40		
Acquaintance with organic fertilizer (AOF)	Low (1.00-33.33)	35	31.80	62.50	10
	Medium (33.34-66.66)	23	20.90		
	High (above 66.66)	52	47.30		

Appropriate doses of organic fertilizers (ADOF)	Medium (33.34-66.66)	110	100.00	50.00	11
Stocking density of carp poly culture (SDCP)	Low (1.00-33.33)	32	29.10		
	Medium (33.34-66.66)	29	26.40	62.50	10
	High (above 66.66)	49	44.50		
Stocking ratio of fishes of carp poly culture (SRFC)	High (above 66.00)	110	100.0	100.00	1
Appropriate time of urea fertilizer application into the pond (ATUA)	No (0)	1	00.90		
	Low (1.00-33.33)	29	26.40	63.64	8
	Medium (33.34-66.66)	30	27.30		
	High (above 66.66)	50	45.50		
Appropriate time of TSP fertilizer application into the pond (ATTA)	Low (1.00-33.33)	32	29.10		
	Medium (33.34-66.66)	31	28.20	62.95	9
	High (above 66.66)	47	42.70		
Eradication of undesired fish species (EUFS)	No (0)	2	01.80		
	Low (1.00-33.33)	36	32.70	69.09	6
	Medium (33.34-66.66)	27	24.50		
	High (above 66.66)	45	40.90		
Appropriate time to release fingerling (AT RF)	No (0)	2	01.80		
	Low (1.00-33.33)	24	21.80	63.86	7
	Medium (33.34-66.66)	36	32.70		
	High (above 66.66)	48	43.60		

Relationship between the selected characteristics of the respondents and their knowledge on aquaculture practices: Table 3 is providing the information about the relationship nature between the independent and dependent variable where age, education, use of information sources, farm size, fish farming area, annual family income, commercialization, social participation and innovativeness of the respondents had a positive and significant relationship with the knowledge of the respondent about the aquaculture practice at the one percent level of significance.

Manoj (2000) Venkatesan (2000) and Jaganathan (2012) also found the significant and positive relationship between innovativeness and knowledge. However, education too had a significant and positive relationship with knowledge level reveals that educated farmers know many things than less educated/ illiterates. Since highly educated farmers collect information from various sources like mass media as well as through interaction with experts. This result is also akin to the reports of Majjusha (2000), Manoj (2000), Elakkia (2007) and Jaganathan *et al*. (2012).

There was a significant and positive relationship between social participation and knowledge level which indicates that frequent group discussion, personal contact, meetings with scientists, experts and extension personnel and affiliation with government and non-government organization could enhance their knowledge level as found by Elakkia (2007) and Jaganathan (2012). Moreover decision making pattern, i.e., taking right decisions at right time and place not only saves a lot of resources but motivates farmers to switch over to modern aquaculture technologies. On the other hand, significant and positive relationship was found between use of information source and knowledge on aquaculture practices as earlier reported by Pandey and Kushwaha (2010). This finding reveals that people, who had more tendencies to become updated with news regarding aquaculture practices thorough mass media and print media were more knowledgeable and expert on aquaculture practices. Moreover media acquaintances people with the latest appropriate technologies for their aquaculture which can switchover them to take appropriate aquaculture technologies.

Factors contributing to respondents' knowledge on aquaculture practices: To find out contributing characteristics of the respondent's knowledge on aquaculture practices, general linear multiple regression analysis was used.

Table 3. Relationship between the selected socio-demographic characteristics of the respondents and their knowledge on aquaculture practices

Independent variables	Coefficient of correlation (r)	Dependent variable
Age	0.303**	Knowledge on aquaculture practices
Education	0.752**	
Family size	0.076 NS	
Use of information sources	0.801**	
Farm size	0.425**	
Fish farming area	0.398**	
Annual family income	0.722**	
Commercialization	0.215*	
Social participation	0.513**	
Innovativeness	0.325**	

* = significant at 5% level of significance, ** = significant at 1% level of significance, NS = Not significant

Table 4. Regression coefficient of farmers knowledge on aquaculture practices with farmers selected characteristics.

Farmers characteristics	Unstandardized coefficients	Standardized coefficients	t-value	Level of significance
Constant	37.367		3.074	0.003
Age	0.514	0.245	4.708	0.000
Education	1.831	0.400	4.970	0.000
Use of information sources	0.552	0.235	2.877	0.005
Farm size	-2.886	-0.118	-.664	0.508
Fish farming area	-4.573	-0.185	-1.103	0.273
Annual family income	0.00004	0.540	5.577	0.000
Commercialization	0.375	0.139	2.676	0.009
Social participation	0.674	0.052	1.026	0.308
Innovativeness	0.032	0.009	.189	0.851
R2 = .830	Adjusted R2 = .814	F-value= 54.128	P = 0.000	

Pearson correlation test indicates that nine characteristics of the respondents have significant relationship with the overall knowledge on 13 areas of aquaculture practices. These nine significant variables were included to run the multiple regression analysis. The findings are presented in Table 4. The regression coefficient of five variables namely, age, education, use of information sources, annual family income and commercialization were being indicated their significant contribution to the knowledge on aquaculture practices. The remaining characteristics had no significant contribution to the respondents' knowledge. The R2 value was 0.830 and the corresponding F value was 54.128, at zero (0.0000) level of significance. This R2 value indicated that 83.00percent of the total variation in the respondents' knowledge was explained by the nine variables included in the regression analysis. To ascertain the proper contribution of the characteristics, stepwise multiple regression analysis was run and the findings are presented in Table 5. Five characteristics viz. age, education, use of information sources, annual family income and commercialization entered into the stepwise regression model and the contribution of each of these variables was significant level at least at 0.01. Hence, whatever variation was in the respondents' knowledge was mainly due to the contribution of these five characteristics. The coefficient of multiple determinations (R2) for the stepwise regression model was 0.797 which indicated that the independent variables explained 79.70 percent variation to the farmers' knowledge on aquaculture practices. Finally, another linear multiple regression analysis was run involving only the five significantly contributing variables found in the stepwise regression analysis. In this regression analysis, R2 value was also 0.797 (significant at 0.000 level). This final analysis thus, indicated that 79.70 percent of the total variation in respondents' knowledge on aquaculture practices was explained by the above mentioned five characteristics (Table 5).

Table 5. Regression coefficients of adoption of farmers knowledge on aquaculture practices by the respondents with their characteristics entered in regression model.

Respondents characteristics	Coefficients		t-value	Level of significance
	Unstandardized	Standardized		
Constant	37.809		3.044	0.003
Age	.583	0.277	5.470	0.000
Education	2.248	0.492	5.899	0.000
Use of information sources	0.518	0.221	2.657	0.009
Annual family income	0.00002	0.283	3.802	0.000
Commercialization	0.477	0.177	3.318	0.001
R2 = .797 Adjusted R2 = .787	F-value= 81.435	P = 0.000		

The unique contribution of each of the five characteristics was determined by taking the changes in R2 value occurred for enter of a particular variable in the stepwise regression model. Individual contribution of five characteristics has been presented in Table 6.

Table 6. Changes in the multiple R2 for enter of a variable into the stepwise regression analysis model for knowledge on aquaculture practices.

Variable entered	Multiple R	Multiple R2	Change in R2	Variation explained percent	level of Significance of F-change
Use of information sources	0.801	0.642	0.642	64.20	0.000
Annual family income	0.830	0.688	0.046	4.60	0.000
Age	0.845	0.714	0.026	2.60	0.003
Education	0.880	0.775	0.061	6.10	0.000
Commercialization	0.892	0.797	0.022	2.20	0.001

Information presented in Table 6 reveals that the use of information sources contributed 64.20 percent, education contributed 6.10 percent, annual family income contributed 4.60 percent, age and commercialization contributed 2.60 and 2.20 percent respectively to the explained variance of 79.70 percent.

CONCLUSION AND RECOMMENDATIONS

Fisheries are now one of the most important sectors in the Bangladesh economy. Hence, the demand of fish in Bangladesh is increasing day by day with her ever growing population. Knowledge on scientific fish culture plays a very important role to improve fish production by assisting farmers to make appropriate decision upon adoption of innovations. Among the thirteen aspects of knowledge, respondents had appreciable knowledge on "stocking ratio of fishes of carp poly culture", "recommended dose of lime", "application of fertilizers", "components fish in carp poly culture", "harmful effect of contaminated water", "recommended pesticide for removing undesirable fish species". About half of the respondents had low overall mean knowledge on fish culture and near about similar portion of them had high knowledge category (42.70%). Age, education, use of information sources, farm size, fish farming area, annual family income, commercialization, social participation and innovativeness of the respondents had a positive and significant relationship with the knowledge of the respondent about the aquaculture practices. In case of knowledge on aquaculture practices of the respondents, use of information sources, education and annual family income were the best predictors to the total explained variation of 79.70 percent. Therefore it is recommended that modern technology and its compatibility, viability and application have to telecast frequently in order to generate knowledge on fish farming technology to the relevant farmers.

REFERENCES

Ali, M. M. (2004). Adoption of Aquaculture Technologies by the Selected Fish Farmers of Mymensingh and Netrokona districts. M.S. (Ag.Ext.Ed.) Thesis, Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh.

Angerer P. and C. V. Schacky. (2000). n-3 Polyunsaturated Fatty Acids and the Cardiovascular System. Curr Opin Lipidol; 11(1): 57-63.

BBS. (2010). Statistical Yearbook of Bangladesh. Statistics Division, Ministry of Planning,

Government of the People's Republic of Bangladesh.

Elakkia, N. (2007). Training needs of Vegetable Growers on Organic Farming Practices in Western Zone of Tamil Nadu. M.Sc. (Ag.) thesis, Department of Agricultural Extension and Rural Sociology, Tamil Nadu Agricultural University, Coimbatore.

Hoque, M. Z. (2010). Role of Farming System towards Household Food Security in Selected Charland of Bangladesh. M.S. Thesis. Department of Agricultural Extension and Rural Development, Bangabandhu Sheikh Mujibur Rahman Agricultural University. Gazipur.

Islam, M. S. (2000). Farmers' Perception of the Harmful Effects of Using Agro-Chemicals in Crop Production with Regard to Environmental Pollution. Ph. D Thesis, Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh.

Jaganathan D., Ram Bahal, R. Roy Burman & V. Lenin. (2012). Knowledge Level of Farmers on Organic Farming in Tamil Nadu. Indian Research Journal of Extension Education, 12 (3): 70-73.

Kawarazuka, N. (2010). The Contribution of Fish Intake, Aquaculture, and Small-scale Fisheries to Improving Nutrition: A literature review. The World Fish Center Working Paper No.2106. The World Fish Center, Penang, Malaysia. 51 p.

Majjusha, A.R. (2000). Techno-socio-economic Assessment of Farmers' Practices in the Cultivation of Cowpea (Vigna unguiculata L.) in Thiruvananthapuram district. M.Sc. (Ag.) thesis, Department of Agricultural Extension, Kerala Agricultural University, Thrissur.

Manoj, S. (2000). Techno-socio-economic Assessment of Farmers' Practices in Rice Cultivation in Thiruvananthapuram District. M.Sc. (Ag.) thesis, Kerala Agricultural University, Thrissur.

Muttaleb, M. A. (2006). Farmers' Preference Matching and Adoption of Modern Rice Cultivation Practices In Haor Area of Northeast Bangladesh. Ph.D. (Ag.Ext.Ed). Thesis, Department of Agricultural Extension Education, Bangladesh Agricultural University, Mymensingh.

Pandey, N. K. & R. K. Kushwaha. (2010). Knowledge Level of Agricultural Officers regarding Sustainable Agricultural Practices in Uttar Pradesh. Indian Research Journal of Extension Education, 10 (1): 69-73.

Sendilkumar, R. (2010). Knowledge and Information Sources Utilization Pattern of Soybean Growers. Indian Research Journal of Extension Education, 10 (3): 71-74.

Venkatesan, S. (2000). Awareness, Knowledge and Adoption Level of Recommended Tomato Cultivation Practices. M.Sc. (Ag.) thesis, Tamil Nadu Agricultural University, Coimbatore.