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SOCIOECONOMIC ASPECTS, PROFITABILITY, PROBLEMS AND PROSPECTS OF INTEGRATED RICE-FISH FARMING: EVIDENCE FROM DINAJPUR DISTRICT IN BANGLADESH

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ABSTRACT

Ferdoushi Z, Hasan MR, Roy J, Kibria ASM (2018) Socioeconomic aspects, profitability, problems and prospects of integrated rice-fish farming: evidence from Dinajpur district in Bangladesh. *J. Innov. Dev. Strategy.* 12(1), 47-55.

Integration of rice and fish culture together not only mutually improves the production of rice and fish but also enhances food security of the people of Bangladesh. Although integrated rice-fish farming is still in its experimental stage, some agencies have come forward to promote its technology at farmer level. To promote the extension of integrated rice fish farming, this study is undertaken to identify the socioeconomic condition of the integrated rice fish farmers; to analyze the costs and benefits of integrated rice fish farming; and to assess the problems and suggests some policy guidelines of the integrated rice fish farming. Primary data were collected from Sadar Upazilla of Dinajpur district using a pre-tested questionnaire by following simple random sampling procedure. Mostly tabular and graphical analyses including profitability analyses were done to achieve the objectives of the study. Among the socioeconomic aspects, most of the respondents were middle aged (averaged 39.5 years), educated up to primary level, possessed a family of 2 members, and a house built in bricks with electricity connection. In terms of costs and returns analysis, total variable cost was Bangladeshi Tk. 76,725.5 while total fixed cost was Bangladeshi Tk. 45,400 per hectare per crop. Average gross return from rice-fish cultivation was Tk. 185,003 per hectare while net returns were Tk. 63,357.5 per hectare. These figures indicate positive profits of integrated rice-fish farming. The present study found several problems including lack of sufficient funds, lack of good quality seeds or fries, high price of input, low price of output, lack of scientific knowledge and technology, lack of extension services, problems of thefts and multiples ownership which acts as a barrier for rice-fish cultivation. To overcome the problems, the government should extend the supports by means of providing training, credit, and improving marketing facilities of the integrated rice-fish farmers.

Key words: *socioeconomic aspects, profitability, problems, integrated, rice-fish, farming*

INTRODUCTION

The fisheries of Bangladesh is an important sector that plays significant roles in improving socio-cultural and economic activities by providing food, generating employment, and earning foreign exchange of the country. It contributes about 3.69 percent of total GDP and 22.60 percent of agricultural GDP of the country (DoF 2015). Moreover, rice and fish are the main diets of the people of Bangladesh. Fish, particularly small fishes are rich in micronutrients and vitamins, and thus human nutrition can be greatly improved through fish consumption (Larsen *et al.* 2000; Roos *et al.* 2003). Fish and rice cultivation together introduced an integrated agro-ecological system. Diversified varieties of rice along with its wide distribution become an important farming activity all over the world. Rice-fish farming system constitutes a unique agro-landscape across the world, especially in tropical and sub-tropical Asia. The basic principles involve in integrated farming are the utilization of the synergetic effects of integrated farming activities and the conservation including the full utilization of farm waste. It is based on the concept that "there is no waste" and "waste is only a misplaced resource which can become a valuable material for another product" (FAO 1977).

On the other hand, rice is the most valuable source of carbohydrate and fish is the major source of animal protein in the diet of the people of Bangladesh. About 60 percent of animal protein is supplied by fish in Bangladesh (DoF 2015). The growing demand of fish protein in Bangladesh has motivated development of integrated aquaculture, that is, integrated rice-fish farming. Integration of fish with rice farming improves diversification, intensification, productivity, profitability, and sustainability (Ahmed *et al.* 2007; Nhan *et al.* 2007). Resource utilization can be optimized through the complementary use of land and water (Frei and Becker, 2005). It is suggested that integrated rice-fish farming is ecologically sound because fish farming improves soil fertility by increasing the availability of nitrogen and phosphorus (Giap *et al.* 2005; Dugan *et al.* 2006; Rahman *et al.* 2012). The natural aggregation of fish in rice fields inspired the combination of rice farming with fish to increase productivity (Gurung and Wagle, 2005). Studies suggest that integrated rice fish culture enhances net benefit by 64.4 percent and yield by 5 percent (Purba 1998). So, it has been proved that the rice-fish integration is quite attractive both in environmental and economic points of view.

Although rice-fish farming, as mentioned earlier, is still in experimental stage, some agencies have come forward to promote its technology at farmer level. The area of rice field in Bangladesh is about 10.14 million ha and there are a further 2.83 million ha of seasonal rice fields where water remains for four to six months of the year which is suitable for integrated rice fish culture (Dewan 1992). As a result, rice-fish culture technology has

been slowly extended and adopted by the farmers in many parts of Bangladesh. It is expected that the result of the present study will contribute to adding new knowledge in integrated rice-fish farming and will greatly benefit the farming communities and will be of great use for scientists to undertake fruitful research program in future. By the assessment of integrated rice fish farming, problems can be identified and proper management strategies can be undertaken to resolve the problems so that the fish production can increase as well as the socio-economic condition of the fishermen can be improved. Therefore, this study is undertaken to identify the socioeconomic condition of the integrated rice fish farmers; to analyze the costs and benefits of integrated rice fish farming; and to assess the problems and suggests some policy guidelines of the integrated rice fish farming.

MATERIALS AND METHODS

Selection of the study area

Considering the availability of large number of integrated rice-fish farmers the present study was conducted in Sadar Upazila of Dinajpur district. Dinajpur district located at northern part of Bangladesh contributes largely to rice and fish production. Some selective parts of Dinajpur Sadar Upazila of Dinajpur district where most of the rice-cum-fish culture farms are located were selected for the purpose of the study.

Survey design, sampling and collection of data

A draft interview schedule was prepared and was pre-tested by interviewing 8 farmers in the study area. After pre-testing, the interview schedule was corrected, modified and finalized as per necessary. In the study area 150 farmers were practiced integrated rice-fish culture system. A list of these farmers was prepared in consultation with the Upazila Fisheries Officer (UFO), and then 50 of them were selected as sample by using simple random sampling procedure. Primary data were collected by face-to-face interview. Secondary data were also collected from various sources such as District Fisheries Officer, Upazila Fisheries Officer and NGO workers. During interview it was found that most of the respondents did not keep records regarding purchase, consumption, sales and other aspects of rice-fish culture. So, the researchers had to rely on their memories only. The survey was carried out for a period of six months from May to October 2015.

Variables of interest and their measurement

In this study several variables found important and collected information on age, educational qualification, family size, housing condition, annual income, farm size, and profit margin. The variables are measured as per the standard procedure used for measuring the variables.

Costs of rice-fish farming

The present study placed emphasis on calculation of different cost items as costs play a dominant role in farmer's decision making. There are two types of costs involve in production are, variable costs and fixed costs. Measurement procedures of these costs are:

Variable costs

One of the most important inputs in rice-fish production is human labor. It is required for different operations like land preparation, transplanting, weeding, feeding, fertilizer application, harvesting, etc. Labor was measured in terms of man-days, which usually considered 8 hours of work by an adult person. Hired labor was priced at the actual wage paid and the average wage of the hired labor was taken as the opportunity cost of the family labor. Farmers used both homes supplied and purchased seedlings. The cost of home supplied seedlings was determined at the ongoing market rate in the study area and costs of purchased seedling were calculated on the basis of actual prices paid by the farmers. Cost of fry was calculated on the basis of actual prices paid by the farmers. In the study area farmers used Urea, TSP, MP as inorganic fertilizer and cow dung/ poultry manure as organic fertilizer. The cost of fertilizer was computed at the prevailing market price and in kilogram per hectare basis (kg/ha). The application of lime is very important to maintain soil and water pH. The cost of lime was calculated on the basis of actual prices paid by the farmers. In addition, for fish production in rice field farmers also used rice bran, oil cake, corn flake and some farmers used ready feed. The cost of irrigation was calculated on the basis of actual prices paid by the farmers.

Fixed costs

The land under rice-fish based system becoming popular day by day for which lease value was higher compared to land only for rice farming. Lease value of land was considered as land rent. The security cost was calculated according to the farmers paid on security over the season. Plot repairmen include the dike repairman and manager of drainage system. The cost of plot repairmen was calculated on the basis of the farmers' spent. Interest on operating capital was determined on the basis of opportunity cost. The operating capital actually represented the average operating costs over the period because all costs were not incurred at the beginning or at any fixed time. The cost was incurred throughout the whole period. Interest on operating capital was computed by taking all variable cost incurred for various operations in rice-fish farming. Interest on operating capital was

computed at the rate of 10 percent for a year. It was assumed that if the farmers would deposit the money in a bank, they would have received interest at that time. It was computed by using the formula of Miah (1987):

Interest on operating capital= Al×i×t

Where,

Al= (Total investment)/2

i= Interest rate (assumed 10 percent)

t= Length of the period of farming (6 month)

Return from rice-fish farming

Per hectare profitability of rice and fish production from was measured in terms of gross return, gross margin, and net return. Gross return was calculated by multiplying the total volume of output of an enterprise by the average price in the harvesting period (Dillon and Hardaker, 1993). It consisted of sum of the volume of main products and by products. The following equation was used to estimate GR:

$$GR_i = \sum_{i=1}^{n} Q_{mi}P_{mi} + \sum_{i=1}^{n} Q_{bi}P_{bi}$$

Where,

GR_i= Gross return from ith main product (Tk/ha);

Q_{mi}= Quantity of the ith main product (Tk/ha);

P_{mi}= Average price of the ith main product (Tk/kg);

Q_{bi}= Quantity of ith by product (Kg/ha)

P_{bi}= Average price of the ith by product (Tk/kg)

i=1, 2, 3……., n

Analytical techniques

Gross margin (GM)

Gross margin has given an estimate of the difference between total return and variable costs. The argument for using the gross margin analysis is that the farmers of Bangladesh are more interested to know their return over variable costs. Moreover, gross margin is widely used in short run analysis as well as farm planning. This analysis is easily understandable for its simplicity. Gross margin is calculated by using the following formula:

GM= TR-VC

Where,

GM= Gross margin;

TR= Total return;

VC= Variable cost.

Net returns (NR)

Net return analysis considered fixed cost, cost of land rent, interest on operating capital, etc. Net return was calculated by deducting all costs (variable and fixed) from gross return. To determine the net return of rice-fish production the following equation was used:

$$\prod = P_yY - \sum_{i=1}^{n}(P_{xi}X_i) - TFC$$

Where,

Π= Net return (Tk/ha);

P_y= Per unit price of the product (Tk/kg);

Y= Quantity of the product per hectare (kg);

P_{xi}= Per unit price of ith inputs (Tk);

X_i= Quantity of the ith inputs per hectare (kg);

TFC= Total fixed cost (Tk);

i=1, 2, 3……n (number of inputs).

In this study cost and return analysis were done on both variable and total cost basis. The following profit equation was developed to assess the profitability of rice-fish cultivation.

Π= Gross return - (Variable cost + Fixed cost)

Here,

Π= Profit per hectare;

Gross return= Total production × per unit price.

Problems of integrated rice-fish farming

The problems of integrated rice-fish farming were categorized in consultation with the UFOs, DFOs and focus group discussion. Farmers were facing many problems and constrains in integrated rice-fish farming. The problems were classified into three categories:

A) Economic problems
B) Technical problems
C) Social problems

Data processing and analysis

After collection data were edited, coded, and entered into SPSS Version 20. Different descriptive and inferential analysis was done to interpret data. During data analysis qualitative data was converted into quantitative numbers. Scaling and indexing of the necessary and relevant variables to perform subsequent statistical analysis was also done for drawing inferences.

RESULTS AND DISCUSSION

Farming pattern practiced by the respondents

Farmers cultured rice-fish by the concurrent rice-fish farming process. In the process, they planted rice in the plot. After two months of rice plantation they release fish fry into the ditch. The study indicated that all the farmers were followed polyculture as a strategy to cultivate different species. These species include Rohu (*Labeo rohita*), Catla (*Catla catla*), Mrigal (*Cirrhinus mrigala*), Silver carp (*Hypophthalmichthys molitrix*), Common carp (*Cyprinus carpio* var.), Bighead carp (*Hypophthalmichthys nobilis*), Sorputi (*Puntious sophore*), Tilapia (*Tilapia mossambica*), etc.

Table 1. Farmers distribution according to species cultured

Species	Percent of farmers	Size of fry (cm)	Average density/decimal
Rohu	100	8-10	6
Mrigal	100	8-10	6
Silver carp	100	8-10	10
Big head carp	60	8-10	5
Catla	80	8-10	4
Common carp	80	6-8	6
Bata	40	4-6	6
Sorputi	70	4-6	8
Tilapia	30	3-4	10

Source: Field Survey, 2015

The average stocking density of fish species in the study area was 11,115 per hectare. In that area, majority of the farmers (70%) stocked fry from old ponds and rest of the farmers (32%) collected from different hatcheries. The average size of carp fish fry is 8-10 cm and the average size of sorputi and tilapia fry were 4-6 cm. According to the survey, 100 percent of the farmers in Sadar upazila used chemical fertilizer 15 percent used organic fertilizer (cowdung) besides chemical fertilizer in the rice-fish field. The commonly used fertilizers were urea, Triple Super Phosphate (TSP), Muriate of Potash and cow dung used as organic fertilizer. The average fertilization rate of urea, TSP, MP and cow dung were 200 kg/ha, 100 kg/ha, 50 kg/ha and 250 kg/ha, respectively. The survey indicated that 85 percent of farmers used rice bran, corn flake, oil cake as a mixed feed and 15 percent farmers used ready feed besides their handmade feed. In the mixing the average feeding rate of rice bran, corn flake and oilcake were 100 kg/ha, 200 kg/ha and 50 kg/ha. The farmers used ready feed, they supplied 100 kg/ha ready feed and 100 kg/ha mixed feed (include rice bran, corn flake and oilcake). In the study it was found that 44 percent of the farmers were supplied feed daily one time and 56 percent farmers supplied feed once per day. The survey indicated that all the farmers were stocked fry in their plot then rear up to the six months to grow table size. So, they were marketing table size fish.

Average yield of rice and fish

The production of rice and fish depends on the optimum inputs supply. The productions are presented in Table 2. It shows that the average production of rice in *Boro* season was 5416 kg/ha and the fish production was 875 kg/ha/season.

Table 2. Average production of rice and fish

Items produced	Production (kg/ha)
Rice (Boro) per crop	5416
Fish (per season)	875

Source: Field Survey, 2015

Socioeconomic characteristics

Age of the respondents

For any farming activity age is very important. The respondents were classified into four categories on the basis of their age: 'young' (bellow 25 years); 'adult' (26-40 years); 'middle' (41-50) and 'old' (above 50 years). On the basis of the age, the respondents were distributed into three categories as presented in Table 3. The age of

the respondents was varied from 20 to 60 years with an average of 39.5 years. It reveals that near about three-fifths (60 percent) of respondents were in the middle-aged category followed by 16 percent young and 24 percent under old age group. This led to understanding that overwhelming portion (76 percentages) of the respondents belonged to young to middle age group that is active age group (Table 3). Mitali (2005) in her study in Mymensingh district found that 53% farmers were in 31-40 age groups which is more or less similar with present study.

Table 3. Distribution of the farmers according to their age

Age groups	Number	Percent	Range	Mean	SE
Young (25< years)	8	16			
Adult (25-40 years)	12	24	20-60	2.68	±0.144
Middle (41-50 years)	18	36			
Old (>50 years)	12	24			

Source: Field Survey, 2015

Educational qualifications

Based on the educational qualification scores, the respondents were classified as 'self-educated (1)' 'primary (2)' 'secondary (3)' and 'above secondary (4)'. The distribution of the respondents on the basis of their educational qualification has been presented in Table 4. Results show that 24 percent farmers were self-educated, 32 percent were primary, 28 percent were secondary, and 16 percent were above secondary level (Table 4). The situation might appear to be the normal in a usual rural background of Bangladesh.

Table 4. Distribution of the respondents on the basis of their educational qualifications

Categories	Number	Percent	Range	Mean	SE
Self-educated	12	24			
Primary	16	32	1-4	2.36	±0.145
Secondary	14	28			
Above secondary	8	16			

Source: Field Survey, 2015

Family size

The minimum and maximum family size scores were 1 and 4 respectively. The average family size was 2.08. According to family size scores the respondents were classified into four categories like 'small' (up to 3); 'medium' (4-5); 'large' (5-7) and 'very large' (above 7) are presented in Table 5. Results indicate that more than half (52 percent) of the respondents had medium family size, 24 percent had small family size and 16 percent had large family size. Thus, overwhelming portion (80 percent) of the respondents had small to medium family size. The data indicate that few farmers (20%) family size in the study area was lesser than the national average of 4.85 (BBS 2014).

Table 5. Distribution of the respondents according to their family size

Family categories	Number	Percent	Range	Mean	SE
Small (up to 3)	12	24			
Medium (4-5)	26	52	1-4	2.08	±0.120
Large (5-7)	8	16			
Very large (above 7)	4	8			

Source: Field Survey, 2015

Housing condition of the respondents

The housing condition of farmers were classified into four categories like 'tin-shed', 'half building', 'building' and building with electricity are presented in Table 6. Result shows that 4 percent farmers house were tin shade, 34 percent were half building, 12 percent were building and half of the respondents (95 percent) were building with electricity. Mitali (2005) found 35 percent half building and 17 percent building housing condition within rice-fish farmers in Mymensingh area. The present study indicates better housing conditions of rice-fish farmers due to the development of socioeconomic condition by rice-fish cultivation (Table 6).

Table 6. Distribution of the respondents on the basis of their housing condition

Classification	Number	Percent	Range	Mean	SE
Tin-shed	2	4			
Half building	17	34	1 to 4	3.08	±0.142
Building	6	12			
Building with electricity	25	50			

Source: Field Survey, 2015

Farm size

The farm size scores range of the respondent was 0.01-2 ha. Average farm size was 0.405 ha. According to farm size scores, the respondents were categorized into four categories like 'landless' (up to 0.02 ha); 'marginal' (0.021-0.20 ha); 'small' (0.21-1.0 ha) and medium (above 1.0 ha) are presented in Table 7. Data indicate that majority (64 percent) of the farmers had small farm size, 14 percent had marginal farm size, 14 percent had medium and 8 percent are in the landless category (Table 7).

Table 7. Distribution of the farmers according to their farm size

Categories	Number	Percent	Range	Mean	SE
Landless (up to 0.02 ha)	4	8			
Marginal (0.021-0.20 ha)	7	14	1-4	2.84	±0.108
Small (0.21-1.0 ha)	32	64			
Medium (above 1.0 ha)	7	14			

Source: Field Survey, 2015

Annual income

The annual income score of the respondents ranged from 0.75 to 5 with an average of 1.5. According to the annual income scores, the beneficiaries were classified into four categories such as 'low' (up to 0.5 ha); 'medium' (0.51 to 1.5 ha), 'moderately high' (1.51-2 ha) and 'high' (above 2 ha) has shown in Table 8.

Table 8. Distribution of the farmers according to their annual income

Income categories	Number	Percent	Range	Mean	SE
Low (up to 0.5)	14	28			
Medium (0.51 to 1.5)	18	36	0.75-5.00	2.24	±0.147
Moderately high (1.51-2.00)	10	20			
High (above 2)	8	16			

Source: Field Survey, 2015

Near about half (46 percent) of the respondents belong to the low-income category while 36 percent of the respondents had medium income and rest 18 percent were fell in the high-income category. Majority of farmers (82 percent) were in the low to medium income category. According to BBS (2015) the national average income was Tk. 1,02,400 which indicate the more or less similar result of this study.

Cost-benefit of integrated rice-fish farming

Variable Costs

Variable costs were analyzed by using one sample T-test. The process showed that all the variable costs were highly significant ($P<0.05$) at 5% level. One of the most important inputs in rice-fish production was human labor. In the study area, the average wage rate was Bangladeshi taka 150 per man-day during the study period. To convert the physical data into financial terms, the total man-days of human labor were multiplied by average wage rate. The total labor cost was Tk. 9580±154.10 per hectare.

Table 9. Costs of integrated rice-fish farming

Cost items	Costs (Tk./ha ± SE)
Variable Costs (VC)	
Labor	9580±154.10
Stocking cost	23415±378.33
Fertilization	13288±185.24
Liming	3556.8±316.86
Irrigation	6280±99.14
Feeding	20624.5±190.83
Total Variable Cost (VC)	**76725.5±612.17**
Fixed Costs (FC)	
Land rent	24700±000
Security cost	12000±000
Dike and plot repairmen	8700±149.15
Interest on operating cost	2937.75±000
Total Fixed cost	**45400±149.15**
Total Cost (VC+FC)	**122125.5±637.60**

Source: Field Survey, 2015

The cost of fry was calculated on the basis of actual prices which were paid by the farmers. The average stocking cost was Tk. 23415±378.33 per hectare for rice-fish cultivation. The cost of fertilizer was computed at the prevailing market price. In the culture system the average cost of fertilizer was Tk. 13288±185.24 per

hectare. In the study area the average cost of lime was Tk. 3556.8±316.86 per hectare. The average cost of feed was Tk. 20624.5±190.83 per hectare. Cost of irrigation cost depended on the size of field and level of water. The average cost of irrigation was Tk. 6280±99.14 per hectare (9). Mitali (2005) found that the variable cost for rice-fish production was Tk. 73,385 per hectare while the present study indicates higher variable costs (Tk. 76725.5±612.17) due to increased market price of fish fry, fish feed, fertilizers, labor, irrigation which increase the variable cost in rice-fish farming.

Fixed costs

All the fixed costs were showed high level of significant during the one sample T-test. In rice-fish farming system, per hectare land rent was Tk. 24700±000. Security is important to protect fish from stealing. In the study area it was found that the average security cost per season was Tk. 12000±000 per season. Plot repairmen include the dike repairman, drainage system. In the study area the average cost was Tk. 8700±149.15 per hectare. The interest on operating capital per hectare was Tk. 2937.75 for rice-fish farming (Table 9). Marina (2009) found that the fixed cost for rice-fish production was Tk. 8564 per hectare but the present study indicated higher (45400±149.15) amount of fixed cost. This occurred due to increasing land rent, security cost, plot repairmen cost which increase fixed cost.

Return from rice-fish production

Gross return (GR)

Returns were found highly significant during one sample T-test performed. Average gross return from rice-fish cultivation was Tk. 185003±1035.38 per hectare. The argument for using the gross margin analysis is that the farmers are interested to get returns over variable cost. It is found that gross margins for producing rice-fish was Tk. 101707.3±976.10 per hectare (Table 10). Mitali (2005) found that the gross return for rice-fish production was Tk. 140628. Marina (2009) found that the gross return for rice-fish production was Tk.117280 per hectare. In the present study the gross return higher than those value due to the higher rice and fish production, increased demand and market price of fish (Table 10).

Table 10. Different types of return from rice-cum-fish culture

Return items	Average return (Tk./ha/crop ± SE)
Return from rice	86647.6±344.57
Return from fish	99047±876.47
Gross revenue	185003±1035.38
Gross margin	101707.3±976.10
Net return	63357.5±1150.58

Source: Field Survey, 2015

Net return (NR)

Net return was obtained by deducting all cost (variable and fixed) from gross return. It is found that net return from rice-fish production was Tk. 63357.5±1150.58 per hectare. Mitali (2005) found that the net return for rice-fish production was Tk. 67,245 per hectare which was higher than the present study this occurred because she did not consider land rent, security cost but in the present study land rent, security cost was considered. Kohinoor *et al.* (2001) conducted experiment about rice-fish culture and found that the net benefit from rice-fish farming was Tk. 32,560 per hectare. This result indicates the lower profit than the present study. In the survey it was found that majority of the farmers were achieved training on integrated rice-fish cultivation. Thus, they adopted new technology and supplied sufficient amount of feeds which gave them higher production, thus they earned more profit (Table 10).

Problems and constrains of integrated rice-fish farming

Economic problems

Economic problems related to integrated rice-fish cultivation were identified as lack of sufficient funds, lack of good quality seeds or fries, high price of input and low price of output. Most of the farmers were not economically solvent to run the farm smoothly without any financial support. In this case, they did not get loan from financial institution. About 40 percent farmers reported that lack of sufficient fund was one of the major problems for them. In the study area lack of quality seeds and fries one of main problems for rice-fish farming system. About 56 percent farmers complained that absence of good quality seeds and fries. About 48 percent farmers complained about that high price of input was most important problem for them. Low price of output was considered as another important problem and reported by 35 percent farmers. Most of the farmers had to sell their products at home or local market at low price owning to the transportation problem (Table 11).

Table 11. Problems and constrains of rice-fish culture

Problems and constrains	Number of respondents	Percent
a) Economic problems		
i. Lack of sufficient fund	20	40
ii. Lack of good quality seeds and fries	28	56
iii. High price of input	24	48
iv. Low price of output	12	24
b) Technical problems		
i. Lack of scientific knowledge and technology	18	36
ii. Lack of extension services	16	32
c) Social problems		
i. Problems of theft	8	16
ii. Multiples ownership	6	12

Source: Field survey, 2015

Technical problems

Technical problems are related to lack of scientific knowledge and technology, lack of extension services, over flooding in the rainy season and insufficient water in dry season. In the study area, about 36 percent farmers claimed that they had lack of scientific knowledge and technology. Integrated rice-fish farming is a new concept of farming systems. So, farmers of integrated rice-fish culture need sufficient service from extension agencies. About 32 percent farmers reported such types of problems (Table 11).

Social problems

Social problems related to theft of fish and rice from the fields. It was found that some of the fields were located far away from the house in the study area. Proper care and supervision is a major problem for this location. About 16 percent farmers complained such problems. Ownership problem was the traditional and historical in context of Bangladesh. About 12 percent farmers reported about problem of multiples ownership. This problem can be solved by educating the people to develop social consciousness by strengthening local security service through private and public initiatives (Table 11).

CONCLUSION

This study is undertaken to identify the socioeconomic condition of the integrated rice fish farmers; to analyze the costs and benefits of integrated rice fish farming; and to assess the problems and suggests some policy guidelines of the integrated rice fish farming. The survey indicated that all of the farmers followed polyculture. The present study revealed that majority farmers were middle aged involved in rice-fish farming activities. The average family size was estimated about two persons per family. Educational level of all fish farmers was primary, secondary and SSC level. Only few farmers were self-educated. Better housing conditions of rice-fish farmers were found due to improvement of socioeconomic condition by rice-fish cultivation. The study showed that the majority farmer's main income source was rice cultivation or rice-fish cultivation.

In the study variable cost items include labor, fertilizers, seedlings, fry, lime, feed, irrigation etc. The study indicates higher variable cost due to increased market price of fish fry, fish feed, fertilizers, labor, irrigation which increase the variable cost in rice-fish farming. The present study also indicates higher amount of fixed cost. This occurred due to increasing land rent, security cost, plot repairmen cost which increased fixed cost. Gross return is higher due to the higher rice and fish production and increased demand and market price of fish. Net return was obtained by deducting all cost (variable and fixed) from gross return. In this study, it is found lower net returns compared to other similar studies due to inclusion of land rent and security cost that are deducted from the gross return. This result indicates the lower profit than the previous studies. The present study found several problems including lack of sufficient funds, lack of good quality seeds or fries, high price of input, low price of output, lack of scientific knowledge and technology, lack of extension services, problems of thefts and multiples ownership which acts as a barrier for rice-fish cultivation.

As rice and fish are two of the most staple food items in Bangladesh it is essential to find ways to increase the production of rice and fish. Integrated rice-fish farming is a way of increasing production of both. Because this cultivation method mutually improves each other's production by providing essential nutrients to the soil and water. Moreover, with the increased production of rice and fish food security scenario might be improved in the country by increasing availability of animal protein from fish. However, integrated rice-fish farming is still in its initial stages and suffers from various economic, technological, and social problems. To overcome those, the government should extend the hands by means of providing training, credit, and improving marketing facilities of the integrated rice-fish farmers.

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