Bangladesh Journal of Political Economy

Vol. 29, No. 1, June 2013, pp. 093-108
Bangladesh Economic Association
(ISSN 2227-3182)

Risk and Agricultural Production- An Assessment Towards Food Security in Kurigram District of Bangladesh

Md. Rais Uddin Mian*

Abstract *Risk is an inseparable component of agriculture irrespective of its farming systems and levels of structure. It is a negative factor affecting agricultural production. So, risk should be assessed properly in undertaking strategies to attain food security. With such an objective in view the present study was conducted in Kurigram district, which is one of the most risk prone areas of the country. Three enterprises, i.e., rice, dairy and pond fish were selected and 100 respondents from 10 villages of Nageswari upazila constituted the sample for the study. Primary data were collected following survey method and both tabular and econometric techniques were used to analyze the data. It was found that a total of 7 risk factors were major threats to the selected enterprises as well as household food security in the study area. The respondents expressed that pest/insect attack was the most unfavorable factor for rice production followed by drought, input scarcity and flood. High input price followed by diseases were, respectively, the first and second threat for both dairy and pond fish enterprises. Besides, theft also hampered pond fish production in some degree. In terms of loss in money value, the most negative risk factors for rice, dairy and pond fish were flood, high input price and attack by diseases, respectively. Analysis of influencing variables in total loss showed that income and education were the risk mitigating means, which significantly and negatively influenced loss of the selected enterprises. Other variables influenced the loss positively. Attack by pest/insect was found to be the serious threat frustrating household food security position of rice producers while high input price was the same for dairy rearers and pond fish producers in the study area.*

* Associate Professor, Department of Agricultural Finance, Bangladesh Agricultural University, Mymensingh-2202, Bangladesh

1. Introduction

The performance of agriculture sector greatly determines the overall performance of Bangladesh economy. The farming system of this country is changing and it gradually takes commercial form from its traditional subsistence form. Agriculture alone generates two-thirds of the country's total employment, contributes one-fourth of total exports and provides food security for the expanding population (Ahmed and Hasan, 2009). Presently, food security is one of the vital issues which simply means the physical and economic access to sufficient food to meet dietary needs for productive and healthy life. Agriculture is the only sector, which deals this issue directly. Within the agriculture, crop, livestock and fisheries are the major sub-sectors playing important role in the socio-cultural and economic life of the people. Crop sector provides 11.16% to total GDP in which rice is the major crop and staple food and occupies more than 73 percent of total cropped area. About 82.00 percent of the total agricultural production and about 64.12 percent of total agricultural value added come from rice. Basically rice is one of the important sources of livelihood of Bangladesh. In the case of livestock, dairy plays an important role for improving human nutrition and generation of income and employment.

The contribution of livestock to total GDP is 2.41 percent. Fisheries sub sector assumes a unique status contributing 3.54% to total GDP of the country (BBS, 2011). It plays an important role in supplying protein and nutrition and earning foreign exchange for the economy. Pond fish production holds a unique status in providing employment to many households of the country. About 33 percent of total animal protein is supplied by the fisheries sub sector (MoF, 2012).

Agriculture of Bangladesh is subject to a great many risks and uncertainties. Risk is a fundamental component of agricultural production. It indicates the chances of loss of which probability distribution is known. Ability to manage risk always favors the advantage of growth opportunities (Stulz, 2003). Agricultural risk is associated with negative outcomes that stem from imperfectly predictable biological, climatic, and price variables. These variables include natural adversities (like pests and diseases) and climatic factors, which are not within the control of the farmers. The different sources of risk that affect agriculture are production risk, price or market risk, financial and credit risk, institutional risk, technological risk, personal risk, etc. Now a days, food security is a crucial issue. Therefore, in order to attain food security, impact of risks in agricultural sector should be assessed properly. Rice is the amazing grain that shapes the diets, culture, economy and the way of life in Bangladesh. But damaging rice production by continued drought and flood in many parts of the country is a

common scenario. The production of rice is also affected by some risk factors like pest, input scarcity and output price variation that hampers the production of rice. The highest amount of rice area was damaged by flood in the year 2007 (BBS, 2010). Dairy rearing is more or less a profitable business and a significant number of small and landless farm families have shifted to dairying to supplement their family income. Some big commercial capital intensive dairy farms have also come up. Milk production is largely affected by some risk factors like disease, high price of inputs and milk price variation. Inadequacy of veterinary services and unfamiliarity of modern rearing techniques at grass roots level aggravates the situation. Thus, farmers always face problems to cope with risk in dairy farming. Fisheries comprises of a range of options that can be adapted to suit different needs and capacity of people of Bangladesh. But pond fish production is largely affected by some risk factors like disease, high price of input, theft, etc. Overflowing by flood, irregular supply and poor quality of water, building up organic matter in pond bottom and attack by predators are the other factors affecting negatively the pond fish production. The risk from theft and vandalism of fishes is a serious problem in some places.

It is clear that the risk in agriculture should be assessed properly to attain food security and other goals of modern agriculture. Northern part of Bangladesh is comparatively a riskier region where flood, drought and other risk factors are common in affecting agricultural production. But studies on risk are very limited in Bangladesh and in Kurigram district it is almost absent. So, this study was undertaken to make an assessment of the risk factors affecting three major sub sectors of agriculture in Kurigram district, which is one of the most risk prone areas of Bangladesh. The specific objectives of the study are a) to identify the risk factors affecting agricultural production in the study area, b) to assess the amount of losses caused by the risk factors, c) to determine the contributions of influencing variables in total losses of the selected enterprises and d) to study the perception of the respondents about the effect of risk factors on their household food security. It is expected that this study would help identify appropriately the risk factors and their contributions in total losses in the study area. It would also help the producers, credit agencies, different GOs and NGOs and researchers to undertake optimal plans for their operation incorporating appropriate risk management strategies. Thus the study provides some valuable information to attain food security coping with risks in the study area and in the country as a whole.

2. Methodology of the Study

Kurigram district was purposively selected for the study. One hundred respondents from 10 villages of Nageswari sadar upazila of the district constituted the sample of the study. Purposive random sampling technique was followed to select the respondents. Among the respondents 40 were rice producers and 30 each were dairy rearers and fish farmers. In rice producers 20 were small, 12 were medium and the rest 8 were large farmers while they were 15, 9 and 9 and 16, 9 and 5 for dairy rearers and pond fish producers, respectively. In each category, the selected enterprise was the major source of earning of the respondent. Data were collected during March to April, 2009 following survey method (Efferson, 1963) and the period of study covered 5 years before the survey year. Both descriptive and econometric techniques were followed to analyze the collected data. Descriptive technique included easy statistical tools like average, percentage, ratio, etc. Following Cobb Douglas production function (Gujarati, 2003), econometric technique employed a specified stochastic frontier function to identify the contributions of influencing variables in total losses of the enterprises. As the risk factors were not similar for all the selected enterprises, separate stochastic frontier function was used for each of the enterprises. For rice production it took the shape of:

$$\ln y_i = \ln\beta_0 + \sum_{j=1}^{3} \beta_j \ln X_{ij} + \sum_{m=1}^{4} \beta_m D_{im} + \varepsilon_i \quad , \quad i = 1, 2, 3\ldots..N$$

Where,

i = i^{th} farmer

j = j^{th} input

β_0 = intercept

β_j = coefficient of different variables

β_m = coefficient of different dummy variables

y_i = loss of i^{th} respondent (Tk) in rice production

X_{i1} = income of respondent (Tk)

X_{i2} = age of respondent (years)

X_{i3} = educational level of respondent (1, 2, 3, 4 and 5 for illiterate, sign only, primary, SSC and HSC & above respectively)

D_{m1} = dummy for drought, if affected 1, otherwise 0

D_{m2} = dummy for flood, if affected 1, otherwise 0

D_{m3} = dummy for pest/insect, if affected 1, otherwise 0

D_{m4} = dummy for input scarcity, if occurred 1, otherwise 0

ε_i = error term

N = 40 respondents

For dairy farming, the shape of production function was:

$$\ln y_i = \ln\beta_0 + \sum_{j=1}^{3} \beta_j \ln X_{ij} + \sum_{m=1}^{2} \beta_m D_{im} + \varepsilon_i \quad , \quad i = 1, 2, 3.....N$$

Where,

D_{m1} = dummy for high input price, if affected 1, otherwise 0;

D_{m2} = dummy for disease, if affected 1, otherwise 0;

N = 30 respondents

and others are as defined in the equation for rice.

For pond fish production the shape of stochastic function was:

$$\ln y_i = \ln\beta_0 + \sum_{j=1}^{3} \beta_j \ln X_{ij} + \sum_{m=1}^{3} \beta_m D_{im} + \varepsilon_i \quad , \quad i = 1, 2, 3.....N$$

Where,

D_{m1} = dummy for high input price, if affected 1, otherwise 0;

D_{m2} = dummy for disease, if affected 1, otherwise 0;

D_{m3} = dummy for theft, if affected 1, otherwise 0;

N = 30 respondents

and others are as defined in the equation for rice.

3. Results and Discussion

3.1 Risk Factors affecting Agricultural Production

The respondents were asked to carefully identify the risk factors that affected their production during the last five years. Among the factors identified by them, the important ones were selected for analysis.

3.1.1 Risk factors affecting rice production

As Table 1 shows, pest/insect attack was the most important risk factor affecting rice production irrespective of farm categories. It negatively affects 99.90, 94.93 and 87.50 percent of small, medium and large farms, respectively. Drought was the second important risk factor for both small and large farms (84.84 and 75.00 percent) while, flood occupied the second position in medium farm (84.21 percent) in the study area. The third important risk factor for medium farm was drought (78.95 percent). Input scarcity was also the third important risk factor for both small and large farms (75.76 and 62.5 percent, respectively). Flood and input scarcity had negative impact on the crop production of small and medium farms. Considering all farms together, pest/insect attack stood the highest in terms of negative effect on crop production as it was mentioned by maximum (91.67 percent) of the respondents. The second and third important risk factors irrespective of farm categories were drought and flood which affected 91.67 and 78.33 percent of rice producers negatively. Input scarcity was fourth in terms of intensity of effect but was a great concern because 73.33 percent of respondents suffered from scarcity of necessary inputs during their production operation. So, it can be said that all the risk factors identified were very crucial for analyzing risk in crop production in the study area.

Table 1 : Risk Factors Affecting Rice Production

Risk factors	Small farm	Medium farm	Large farm	All
Drought	28 (84.84)	15 (78.95)	6 (75.00)	49 (81.67)
Flood	24 (72.73)	16 (84.21)	7 (87.50)	47 (78.33)
Pest/insect	30 (90.90)	18 (94.93)	7 (87.50)	55 (91.67)
Input scarcity	25 (75.76)	14 (73.68)	5 (62.50)	44 (73.33)

Figures within the parentheses indicate percentages
Note: Percentages for all may not be 100 because of multiple answers given by the same respondent

3.1.2 Risk factors affecting dairy farming

It is evident from Table 2 that the small farm was most negatively affected by high input price followed by medium and large farms by 90.90, 78.94 and 75.00 percent, respectively. Effect of disease on dairy farming was in the same order where the respective percentages were 66.67, 63.15 and 62.50. Over all, high input price negatively affected 85.00 and disease so affected 65.00 percent of farms. So, high input price was the most important risk factor for dairy farming.

Table 2 : Risk Factors Affecting Dairy Farming

Risk factors	Small farm	Medium farm	Large farm	All
High input price	30 (90.90)	15 (78.94)	6 (75.00)	51 (85.00)
Disease	22 (66.67)	12 (63.15)	5 (62.50)	39 (65.00)

Figures within the parentheses indicate percentages
Note: Percentages for all may not be 100 because of multiple answers given by the same respondent

3.1.3 Risk factors affecting pond fish production

High input price was the most important risk factor for pond fish production in small farm followed by disease attack and theft, which were 90.90, 78.94 and 75.00 percent, respectively (Table 3). For medium farm, high input price was the highest risk factor followed by theft and disease attack as reported by 78.94, 73.68 and 63.15 percent of respondents, respectively. Respondents of large farm experienced both the input scarcity and theft as the most crucial risk factors (each of 75.00 percent) followed by attack of different diseases (50.00 percent). Table 3 shows that high input price was the most important risk factor followed by theft and disease attack affecting pond fish production in the areas under study.

Table 3: Risk Factors Affecting Pond Fish Production

Risk factors	Small farm	Medium farm	Large farm	All
High input price	30 (90.90)	15 (78.94)	6 (75.00)	51 (85.00)
Disease	20 (60.61)	12 (63.15)	4 (50.00)	36 (60.00)
Theft	18 (54.55)	14 (73.68)	6 (75.00)	38 (63.33)

Figures within the parentheses indicate percentages
Note: Percentages for all may not be 100 because of multiple answers were given by the same respondent

3.2 Assessment of Loss Caused by the Risk Factors

Assessment of loss by risk factor is essential to respond risk in two ways- one is selecting actions that reduce the effects of risk and another is changing the decision process (Barry, 1984). It was endeavored to assess the loss occurred by the risk factors in the study area. Loss here means negative outcome which is the difference between expected return and realized return in operation.

3.2.1 Assessment of loss in rice production

Table 4 shows that for small farm, average expected return of rice was Tk 20148, while average realized return was Tk15220, therefore average loss from rice was Tk 4927. Medium and large farms incurred loss Tk 4616 and 4250, respectively. It is clear that there prevailed a negative relationship between loss incurred and the farm size. Overall, 20.85 percent of loss was borne by the rice producers due to drought. Table 4 also indicates that maximum loss due to flood was experienced by large farms (46.00 percent) followed by medium and small farms (44.76 and 42.70 percent, respectively). So, loss of rice production due to flood maintained a negative relationship with farm size. Rice losses due to attack by pest/insect was the highest in small farm as the loss was 28.93 percent of total expected return. The losses were 25.47 percent in medium farm and 21.73 percent in large farm. The loss of all farms showed a negative relationship between them. The maximum 19.37 percent of expected return was not realized by the small farms due to non-availability of production inputs. The losses of the medium and large farm were 18.99 and 18.12 percent, respectively. So, a negative relationship was also found between farm size and loss for input scarcity. For all farms, loss due to flood was the highest (44.49 percent) of expected return. The losses by pest/insect, drought and input scarcity were 25.42, 20.85 and 18.84 percent, respectively. So, flood

Table 4 : Average Annual Loss Caused by Risk Factors in Rice Production

Risk factors	Return	Small farm (Tk/acre)	Medium farm (Tk/acre)	Large farm (Tk/acre)	All (Tk/acre)
	Expected	20148	20993	24970	22037
	Realized	15220	16376	20720	17439
Drought	Loss	4928	4617	4250	4598
		(24.45)	(21.99)	(17.02)	(20.85)
	Expected	21091	21150	21303	21181
	Realized	12084	11682	11503	11756
Flood	Loss	9007	9467	9800	9425
		(42.70)	(44.76)	(46.00)	(44.49)
	Expected	20913	20229	20171	20438
	Realized	14861	15075	15787	15241
Pest/insect	Loss	6052	5154	4384	5197
attack		(28.93)	(25.47)	(21.73)	(25.42)
	Expected	20699	20142	20080	20307
	Realized	16688	16316	16440	16481
Input	Loss	4011	3826	3640	3826
scarcity		(19.37)	(18.99)	(18.12)	(18.84)

Figures within parentheses indicate percentages of expected return

was the most important risk factor affecting rice production negatively in the areas under study.

3.2.2 Assessment of loss in dairy farming

Input price hike and fluctuation is a common phenomenon in the economy of Bangladesh. Farmers faced loss in dairy farming for the high price of different inputs (straw, concentrated feed, etc.). Table 5 indicates that for small farm, average expected return from dairy was Tk 19573, while average realized return was Tk 15713, therefore average loss was Tk 3860. For medium and large farms, average losses were Tk 3632 and 3200, respectively. The table shows that there prevailed a negative relationship between loss incurred and the farm size. Overall, 19.11 percent of loss was faced by the dairy farmers due to high input price. Disease outbreaks reduce yield and cut profit margins and farmers incurred loss in dairy farming. Table 5 shows that maximum of loss due to different diseases were experienced by small farms (19.53 percent) followed by medium and large farms (18.81 and17.48 percent, respectively). So, loss of dairy farming due to different diseases had a negative relationship with farm size. Considering all farms together, loss for dairy farming due to high price of inputs was the highest (19.11 percent) followed by attack of different diseases (18.81 percent).

Table 5 : Average Annual Loss Caused by Risk Factors in Dairy Farming

Risk factors	Return	Small farm (Tk)	Medium farm (Tk)	Large farm (Tk)	All (Tk)
High input price	Expected	19573	18950	17416	18646
	Realized	15713	15318	14216	15082
	Loss	3860	3632	3200	3564
		(19.72)	(19.16)	(18.37)	(19.11)
Disease	Expected	20872	18075	18640	19195
	Realized	16795	14575	15380	15583
	Loss	4077	3400	3260	3612
		(19.53)	(18.81)	(17.48)	(18.81)

Figures within parentheses indicate percentages of expected return

3.2.3 Assessment of loss in pond fish production

Farmers incurred loss in fish farming for the high price of different inputs. It was evident that the highest 21.93 percent of expected return was not realized by the small farm due to high price of production inputs (Table 6). The losses of medium and large farms were 19.71 and 18.86 percent, respectively. So, a negative relationship was found between farm size and loss for high price of production

inputs. Attack by diseases in pond fish production causes huge loss in fish farming and farmers have to cope with these risk factors. Table 6 indicates that the loss due to different diseases was the highest in large farms (28.18 percent of total expected return). The losses were 27.65 percent in medium farms and 23.35 percent in small farms. The risk by theft and vandalism was also a problem and negatively affected pond fish production. Table 6 shows that maximum of loss due to theft was experienced by large farms (23.06 percent) followed by medium and small farms (22.23 and 20.06 percent, respectively). So, loss of fish farming due to theft maintained a positive relationship with farm size. Considering all farms together, loss in fish farming due to disease was the highest (26.43 percent of the expected return). The losses were 21.85, and 20.49 percent by theft and high price of production inputs, respectively. So, disease was the most important risk factor affecting fish farming negatively in the areas under study.

Table 6 : Average Annual Loss Caused by Risk Factors in Pond Fish Production

Risk factors	Return	Small farm (Tk/acre)	Medium farm (Tk/acre)	Large farm (Tk/acre)	All (Tk/acre)
High input price	Expected	93077	96242	97266	95528
	Realized	72261	76666	78916	75948
	Loss	20416	18976	18350	19580
		(21.93)	(19.71)	(18.86)	(20.49)
Disease	Expected	90691	93975	94300	92988
	Realized	69511	67988	67725	68408
	Loss	21180	25987	26575	24580
		(23.35)	(27.65)	(28.18)	(26.43)
Theft	Expected	90030	90350	99200	93193
	Realized	71968	70183	76316	72822
	Loss	18062	20167	22884	20371
		(20.06)	(22.23)	(23.06)	(21.85)

Figures within parentheses indicate percentages of expected return

3.3 Contributions of Influencing Variables in Loss of Enterprises

3.3.1 Contributions in loss of rice production

Table 7 indicates that all independent variables other than income and education are positively significant. The regression co-efficients of drought, flood, pest/insect and input scarcity indicate that they affected rice producer's loss by 33.4, 41.5, 20.5 and 11.5 percent, respectively, higher than the farmers who were not affected by these variables. The co-efficients of income and education were negative and significant. It indicates that 1 percent increase in income and

education level would decrease the loss by 25.8 and 4.3 percent, respectively. It clears the importance of education in risk management. As risk management is a technical consideration, relatively higher educated persons can employ the mitigating strategies more successfully than the illiterate or lower educated ones. The co-efficient of multiple determination, R^2, was 0.956, which indicates that about 96 percent of the variations of loss in rice production were explained by the independent variables included in the model. The F-value of the equation was highly significant implying that all the variations in loss of rice production depended mainly upon the explanatory variables included in the model.

3.3.2 Contributions in loss of dairy farming

It can be seen in Table 8 that income and education are negatively related with loss in dairy farming and they were significant at 10 and 5 percent levels, respectively.

Table 7 : Estimated Values and Related Statistics of Stochastic Frontier Function for Rice Production

Variable/parameter	Co-efficient	t-value
Intercept	4.960*** (1.398)	3.571
Income (X_1)	-0.258** (0.152)	-1.697
Age (X_2)	-0.027 (0.094)	-.287
Education (X_3)	-0.043**** (0.020)	-2.150
Dummy for drought (D_1)	0.334**** (0.039)	8.564
Dummy for flood (D_2)	0.415**** (0.037)	11.216
Dummy for pest/insect (D_3)	0.205** (0.044)	4.659
Dummy for input scarcity (D_4)	0.115** (0.052)	2.212
R^2 (adjusted)	0.956	-
F-value	467.209	-

Figures within parentheses indicate standard error

*** significant at 1% level

** significant at 5% level

It means that keeping other variables constant, 1 percent increase in income and education would decrease loss in dairy farming by 14.6 and 11.7 percent, respectively. The co-efficients of high input price and disease indicate that they

affected dairy farmers' loss by 16.7, and 14.3 percent higher than the farmers who were not affected by these variables. The co-efficient of multiple determination, R^2 was 0.613, which means that about 61 percent of the variations of loss was explained by the independent variables included in the model. The highly significant F-value implies that all the variations in loss of dairy farming depended mainly upon the explanatory variables.

Table 8 : Estimated Values and Related Statistics of Stochastic Frontier Function for Dairy Farming

Variable/parameters	Co-efficient	t-value
Intercept	5.402***	10.681
	(0.506)	
Income (X_1)	-0.146*	-1.687
	(0.087)	
Age(X_2)	-0.232	-1.044
	(0.222)	
Education (X_3)	-0.117**	-3.9
	(0.030)	
Dummy for high input price(D_1)	0.167***	2.889
	(0.058)	
Dummy for disease(D_2)	0.143**	2.483
	(0.058)	
R^2 (adjusted)	0.613	-
F-value	19.706	-

Figures within parentheses indicate standard error

*** significant at 1% level

** significant at 5% level

* significant at 10% level

3.3.3 Contributions in loss of pond fish production

Table 9 shows that all the independent variables included in the model were positive except income and education. The significant regression co-efficients of income and education implies that 1 percent increase in these variables would decrease the loss by 11.5 and 1.6 percent, respectively. The co-efficients of high input price, disease and theft indicate that they affected fish farmer's loss by 18.90, 13.00 and 33.30 percent higher than the farmers who were not affected by these variables. Value of R^2 shows that about 85 percent of the variations of loss was explained by the independent variables. The highly significant F-value means that all the variations in loss of pond fish production depended mainly on the explanatory variables.

Table 9 : Estimated Values and Related Statistics of Stochastic Frontier Function for Pond Fish Production

Variable/ parameters	Co-efficient	t-value
Intercept	8.065***	12.862
	(0.627)	
Income (X_1)	-0.115***	-3.270
	(0.035)	
Age(X_2)	-0.092	-0.912
	(0.101)	
Education (X_3)	-0.016*	-1.320
	(0.012)	
Dummy for high input price (D_1)	0.189***	3.583
	(0.053)	
Dummy for disease (D_2)	0.130***	4.898
	(0.027)	
Dummy for theft (D_3)	0.333***	6.263
	(0.053)	
R^2 (adjusted)	0.853	-
F-value	58.180	-

Figures within parentheses indicate standard error

*** significant at 1% level

* significant at 10% level

3.4 Perception of Respondents about Effects of Risk Factors on Household Food Security

The respondents were asked what they thought about the identified risk factors as threat to their household food security. The opinions of the respondents were collected under three categories of threat, i.e., severe, moderate and low, which are presented in Table 10. Pest/insect attack was the most frustrating risk factor to food security of the rice producers as highest proportion of the respondents (57.00 percent) reported this problem. Drought and flood emerged as second joint damaging factors, which were mentioned by 50.00 percent of the rice producers. Input scarcity was not a major threat to food security of the respondent households. The respondents expressed that though flood and drought are major risk factors, they maintained more or less a regular interval in their occurrence. But attack by insect/pest causes frequent damage in rice production, which was a major concern of the rice producers.

In dairy production, high input price is the major risk factor and 60.00 percent of dairy farmers reported it as a threat to their food security. Next to it, attack by diseases was the threat which was felt by 46.67 percent of the respondents. High

Table 10 : Perception of Risk Factors affecting Food Security

Enterprise	No. of respondents	Risk factors	Perception in terms of threat to household food security (no. of respondents)		
			Severe	Moderate	Low
		Drought	20	16	4
			(50.00)	(40.00)	(10.00)
		Flood	20	15	5
Rice	40		(50.00)	(37.50)	(12.50)
		Pest/insect	23	11	6
			(57.00)	(27.50)	(15.00)
		Input scarcity	9	13	18
			(22.50)	(32.50)	(45.00)
		High input	18	8	4
Dairy	30	price	(60.00)	(26.67)	(13.33)
		Disease	14	10	6
			(46.67)	(33.33)	(20.00)
		High input	17	9	4
		price	(56.67)	(30.00)	(13.33)
Pond fish	30	Disease	10	15	5
			(33.33)	(50.00)	(16.67)
		Theft	7	7	16
			(23.33)	(23.33)	(53.33)

Figures within the parentheses indicate percentages

input price was also mentioned as a threat to food security by 56.67 percent pond fish farmers. Attack by diseases and theft were more or less moderate (50.00 percent) and low (53.33 percent) negative factors, respectively, affecting food security position of the respondents. All the identified risk factors frustrated the household food security position of the respondents. Among them pest/insect attack and high input price were the matters of major concern.

4. Conclusion

Farming system is a dynamic process where changes are essential to ensure profitability of farming and to attain food security of the producers. But risk is an impediment in this process. In the study area, several risk factors affected agricultural production adversely. Among them seven factors were prominent. These are insect/pest, flood, drought, input scarcity, high input price and diseases. Attack by insect/pest, flood and drought were the most important threats to the rice producers while high input price was the major threat for both dairy rearers and pond fish producers. But one thing is clear that all the risk factors reduce farm

income and frustrate household food security of the respondents seriously. As risk cannot be avoided fully, proper measures should be taken from both government and non-government levels so that the adverse effects of risk could be mitigated and advantages of changing farming system could be enjoyed to attain food security of the country.

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