Factors Affecting the Risk Attitude of Farmers in Flood Risk Prone Areas of Khyber Pakhtunkhwa: The Case of Mardan District, Pakistan

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Abstract

Farmers are confronted with several sources of climatic risks. Thus, their risk attitude plays an important role in the farm management decisions. Few studies have attempted to explore the farmers' risk attitude in flood prone areas. This study has examined the effects of socio-economic factors on risk attitudes of farmers in a flood risk prone area in Pakistan. The data were collected from 168 subsistence farmers through a standardized questionnaire. The farmers were selected through multistage sampling techniques. For farmers' risk attitude measurement, the Equally Likely Certainty Equivalent (ELCE) model and a cubic utility function were employed. Risk perceptions of farmers were measured by the risk matrix technique. A Probit model was employed to investigate the effects of socio-economic factors on farmers' risk attitudes. The findings of the study revealed that education, experience, family size, farmers' groups, landholding size and risk perceptions of floods were significantly affecting the risk attitude of farmers. The study gives a useful insight about the important factors affecting risk attitude of farmers. The results have implications for the policy makers to provide farmers with accurate risk mitigating and management tools such as agricultural credit and crop insurance to cope with the climatic risks.

Keywords: Risk attitude, risk perception, socioeconomic factors, floods, Khyber Pakhtunkhwa

1. Introduction

Agriculture is inherently a risky enterprise. Farmers are exposed to natural disasters, erratic rainfall and pests. Climate variability is the main source of risk for agriculture and food systems (Choudhry et al., 2015). In addition, the farmers are also confronted with heavy rains, floods, pests and diseases (Iqbal et al., 2016; Ullah et al., 2015a; Ullah et al., 2015b) and droughts (Ullah et al., 2015a) and market price fluctuations (Iqbal et al., 2016). According to Musser and Patrick (2002). There are five important sources of risk factors in agriculture: production, financial marketing, legal, environmental, and human resources. Production risk is associated with the variations in crop yields and livestock due to several sources: uncertain weather conditions and incidence of disease and pests. Financial risks are the farmers' ability to pay their bills to continue their farming and avoid bankruptcy. In addition, Marketing risks concern the fluctuations in prices of agriculturally produced commodities. In addition to that, there are also legal and environmental risks associated with agriculture. Likewise, agriculture is also faced with limited human resources, which means there is an unavailability of family members for labour and farm management. Thus, agricultural production is confronted with risks that can negatively affect production levels, which can consequently lead to considerable production losses (Drollette, 2009). Therefore, it is indispensable for farmers to perceive and manage production risks (Drollette, 2009), that depend on their risk attitudes.

Farmers' risk attitudes towards agricultural risks are very important for planning risk management strategies. Dadzie and Acquah (2012) revealed determining the farmers' attitudes toward risk is the foremost important step to understand their behavior and coping strategies that they are adopting to mitigate the effects of environmental risks in which they are operating agricultural activities. The farmers' risk attitudes are a critical obstacle in adoption of modern agricultural technologies such as production and investment decisions in agriculture (Kitonyoh, 2015). Many studies proved that farmers, especially poor farmers, are at a high risk to natural disasters (Antle, 1987; Binswanger, 1980; Dillon and Scandizzo, 1978; Iqbal et al., 2016; Ullah, 2014). However, this risk factor of adverse nature conditions of farming negatively affected the attitude of the farmers and they were reluctant in the adoption of new technologies in agriculture (Dercon and Christiaensen, 2011; Ghadim et al., 2005). Hence, under this uncertainty and due to the risk of continuing natural risks the farmers are in a continuous search of risk coping strategies.

Risk management is a continuous process of farmers. The decisions in these uncertain situations are based on their perception about external environment, information and their attitudes and preferences (Kitonyoh, 2015). Ullah et al. (2015c) found that in risk prone areas the farmers were did not address risk proactively, but were relying on precautionary savings, agricultural credit and diversification as risk management tools at the farm level in Pakistan. Likewise, the farmers adopt diversification beyond the farm, such as diversification in crops, different dating of farming practices, migration, and a variety of other diversification methods, such as irrigation and water conservation techniques to cope with climatic risks (Below et al., 2010). In addition, to cope with droughts, the farmers were involved in income diversification, assets depletion, expenditure adjustment, water shortage coping techniques and migration (Ashraf and Routray, 2013). However, risk management in agriculture is not only important for avoiding risk, but also has ramifications concerning the optimum combination of risk and return that end with a wide range of outcomes (Hardaker et al., 2004).

Farmers' attitudes toward risk depend on several factors, ranging from cultural background to individual psyche (Hamal and Anderson, 1982). Farm household characteristics affect the risk attitude and risk perceptions of farmers (Ullah et al., 2015a). The farming experience and education of the farmers may affect the risk attitude of farmers. Iqbal et al. (2016) stated that the educated farmers perceived the diseases to their crops as less risky and resulted in a negative relationship with risk averseness, whereas the experience was found to be positive. Likewise, other studies revealed that risk attitudes of farmers differ with: (Harrison et al., 2007; Lucas and Pabuayon, 2011), income (Cohen and Einav, 2005; Dadzie and Acquah, 2012; Iqbal et al., 2016; Ullah et al., 2015b) , and with age (Dadzie and Acquah, 2012; Iqbal et al., 2016; Kisaka-Lwayo and Obi, 2012; Tanaka et al., 2010). Similarly, farm size (Kisaka-Lwayo and Obi, 2012; Lucas and Pabuayon, 2011), land ownership status (Lucas and Pabuayon, 2011; Ullah et al., 2015a), off farm employment (Kitonyoh, 2015) farm size (Iqbal et al., 2016), and farmers' risk perceptions (Ullah et al., 2015b) greatly affect the risk attitude of farmers.

The climatic risks in the agriculture sector has long been studied, which has had a substantial influence on farmers' production decisions. Not only are the risk coping strategies adopted by farmers being discussed in the literature, but also many government policies that are being initiated and especially oriented towards risk reduction. This is obvious that risk is the main characteristic of any agricultural decision, whereas, there is a gap in our knowledge about the attitudes of farmers towards risk. The problem links with the situation in which the risk attitudes of farmers are closely associated with the complex individual characteristics of farmers. Therefore, this study is designed based on two objectives. First, to find out the risk attitude of farmers in the study area. Second, to assess the effect of socio-economic factors on risk attitude of farmers.

The paper is divided into six sections. Section-2 is the theoretical framework, Section-3 is about the materials and methods. Section-4 shows the results of the descriptive analysis and regression model. Section 5 of the paper describes the discussion, and section 6 is the conclusion of the study.

2. Theoretical Framework

The study is based on the theory of consumer behavior. Consumers have to maximize their utility and the firms will maximize their profits. Utility, in our case, is the function of wealth, but we are using as a function of income:

$$U = u(w) \quad (1)$$

The individual wants to maximize the utility with respect to income.

$$U'(w) \geq 0 \quad (2)$$

The first differential is positive and indicates that more is preferred over less (also called convex utility function). Likewise, the risk aversion is a state of utility function that shows decrease in marginal utility as the payoff increases (also called concave utility function). The risk neutral has a linear utility function (Hardaker et al., 2004).

2.1 Expected Utility Theory

The expected utility theory is defined by Von Neumann and Morgenstern (1944). According to this theory there are reasons behind the individual choices involving risks. The decisions makers compare the expected utility in risky and uncertain prospects. Levy (2006) and Gill (2007) argued that individuals are reluctant to accept the choices with uncertain payoffs, but rather are willing to accept another choice with a low and sure payoff. The consumer will try to maximize the utility within the constraints:

$$U = u(y, c) \quad (3)$$

Where y is farm income and c is consumption. The TUF (preferences over a set of goods and services in available budget) will show the nature of consumer behavior on the basis of convexity or concavity of the utility function. The nature of the risk attitude is further explained by Arrow (1970) and (Pratt, 1964) that is mentioned in section 3.3.

3. Materials and Methods

3.1 Study Area

The study was conducted in Khyber Pakhtunkhwa province of Pakistan. This is the north most province of Pakistan. First, Khyber Pakhtunkhwa was purposively selected for two reasons. First, the province is vulnerable to natural disasters such as floods, droughts and storms (Provincial Disaster Management Authority, 2013). Second, the majority of the people live in rural areas and agriculture is their main source of income (Ullah et al., 2015b). Mardan District was purposively selected among 25 districts of the province due to its vulnerability to floods and heavy rains. Moreover, it is the second largest district in province and the 19th largest district of Pakistan. The total area of the district is 1632 square km and 80% of the population are dependent on the agricultural sector (Saqib, 2015).

3.2 Sampling Procedure

The data were collected by multi-stage sampling. First, the Khyber Pakhtunkhwa province was purposively selected due to its vulnerability to natural disasters as mentioned in the previous section. Second, the Mardan District was selected as the study district mentioned in sectioned 3.1. Third, the rural population that was comprised of farmers was purposively selected as the target population. Fourth, the vulnerable farmers mentioned by the Provincial Disaster Management Authority (2013) were purposively selected; these farmers were hit by severe floods in 2010. Fifth, farmers make up about 97 percent of the community (Agriculture Census Organization, 2010), were subsistence farmers having landholding up to 12.5 acres, and were therefore purposively selected. Last, the data were collected through random sampling from the lists prepared by Kisan[1] councillors. A total of 970 households were identified by the PDMA as vulnerable farmers in the study area. Provincial Disaster Management Authority (PDMA) Khyber Pakhtunkhwa is responsible for Disaster Risk Management. It formulates policies of disaster risk management, mitigation and preparedness and hazard risk reduction. Applying the Yamane (1967) formula, a sample size of 168 households was determined to be at a 95% confidence level with a ±7% margin error:

$$n = \frac{N}{(1 + Ne^2)} \quad (4)$$

n	= Sample size
N	= Total number of farming households in an area
e	= Precision value, set at ±7 % (0.07)

3.3 Risk Attitude

Equally Likely Certainty Equivalent Method (ELCEM) is used to calculate the risk attitude of farmers. Several studies have been adopted using this model (Hardaker et al., 1997; Iqbal et al., 2016; Ogurtsov et al., 2008; Smidts and Wageningen, 1990; Torkamani, 2005). Certainty equivalence for several risky outcomes were then compared with associated utility values (Ullah, 2014). For example, the farmers were asked to mention a monetary value between the two risky outcomes that make them indifferent. For instance, the annual income of a sample farmer is PKR 200,000 with associated probability of 0.5 and in case of loss, 0 income with the same probability of 0.5. He is given a chance to choose the income in this range. For example, say the farmer was indifferent in PKR 120,000, which was a sure outcome. The farmer then had to choose in the range between PKR 0 and 120,000, and the experiment was repeated. Likewise, the farmers were asked to choose between the higher ranges (PKR 120,000- 200,000) and were indifferent in PKR 140,000. Similarly, the experiment was repeated and several CEs points were derived with their associated probabilities. The detail of the process is explained in Table 1.

Utility values for certainty equivalence were put in the cubic utility function that divides the farmers into three categories: risk seeker, averse or neutral. The utility function is:

[1] Kisan Councilors are the farmers' elected representatives according to K.P.K local government act of 2013.

$$\text{ui}(\text{w}) = \alpha_1 + \alpha_2\text{w} + \alpha_3\text{w}^2 + \alpha_4\text{w}^3 \quad (5)$$

Where α_s are the parameters and, w represent the wealth of farmers and their attitudes towards risk, which is depended on several factors. However, a significant theoretical argument has been shown that there is a link between risk attitude and wealth. Arrow (1970) and Pratt (1964) stated that for an individual, absolute risk aversion should be a decreasing function of wealth. Instead of wealth, we have used annual income of the household in the cubic utility function following (Olarinde et al., 2007; Ullah et al., 2015b).
After estimation of the model, the first derivatives of the function are:

$$U' = \alpha_2 + 2\alpha_3 w + 3\alpha_4 w^2 \quad (6)$$

$$U'' = 2\alpha_3 + 6\alpha_4 w \quad (7)$$

Then, by using the derivatives, the absolute risk aversion is calculated by the formula:

$$r_a\ (\text{w}) = -\frac{U''(\text{W})}{U'(\text{W})} \quad (8)$$

Where the $U'(\text{w})$ is > 0 and the first derivative is with respect to income.
According to (Arrow, 1970) and (Pratt, 1964), the risk aversion coefficient indicates the nature of risk attitude. In the language of mathematics:

$r_a\ (\text{w}) < 0$ implies risk aversion
$r_a\ (\text{w}) = 0$ implies indifference
$r_a\ (\text{w}) > 0$ implies risk seeker

Table 1. Example of Elicitation of Certainty Equivalents and Computation of Utility Values

Step	Elicited CE	Utility Calculation
	Scale	U(0) = 0 and U(200,000) = 1
1	(120,000; 1.0) ~ (0, 200,000; 0.5, 0.5)	U(120,000) = 0.5u(0) + 0.5u(200,000) = 0.5
2	(60,000; 1.0) ~ (0, 120,000; 0.5, 0.5)	U(60,000) = 0.5u(0) + 0.5u(120,000) = 0.25
3	(30,000; 1.0) ~ (0, 60,000; 0.5, 0.5)	U(30,000) = 0.5u(0) + 0.5u(60,000) = 0.125
4	(20,000; 1.0) ~ (0, 30,000; 0.5, 0.5)	U(20,000) = 0.5u(0) + 0.5u(30,000) = 0.0625
5	(140,000; 1.0) ~ (200,000, 140,000; 0.5, 0.5)	U(140,000) = 0.5u(200,000) + (0.5u(140,000) = 0.75
6	(170,000; 1.0) ~ (200,000, 170,000; 0.5, 0.5)	U(170,000) = 0.5u(200,000) + (0.5u(170,000) = 0.875
7	(180,000; 1.0) ~ (200,000, 180,000; 0.5, 0.5)	U(180,000) = 0.5u(200,000) + (0.5u(180,000) = 0.937

Authors' Calculations

3.4 Risk Perception of Floods

The risk perception is measured by a 5 digit Likert Scale. This scale ranges from 1 to 5, where 1 is very low, 2 is low, 3 is normal, 4 is high and 5 is very high. To calculate the risk perception, the data were collected for two dimensions, their incidence and severity, and were put in the risk matrix (Ogurtsov et al., 2008; Senkondo, 2000).

Figure 1. Risk Matrix

Incidence	Severity 1	Severity 2	Severity 3	Severity 4	Severity 5
5	6	7	8	9	10
4	5	6	7	8	9
3	4	5	6	HIGH 7	8
2	3	4	5	6	7
1	2	LOW 3	4	5	6

3.5 Regression Model

In this study, we have tried to investigate the factors involved at the farm level that affect the attitudes of farmers. Our dependent variable was a binary variable based on the categorization of the risk aversion coefficient value; in our case only two types of farmers were found -- either risk averse or risk seekers, as shown in section **3.3**. If the farmer is risk averse, we assign a numerical value =1, otherwise we assign a numerical value = 0. As the dependent variable was a binary qualitative variable, the Classical Linear Regression Model and the Linear Probability Model were both not appropriate. A Probit model was employed in this study. The Probit model has several advantages compared to linear models (Greene, 2008; Liao, 1994). The CLRM model cannot be applied, and the Linear Probability Model (LPM) has several problems, such as non-normality of disturbance terms (u_i), the possibility of the Y_i value being beyond zero, and the heteroscedasticity of u_i having a lower R^2 value (Gujarati et al., 2013). Keeping in view the stated problems, probit and logit models were considered the most suitable, and were therefore applied in our study. For the choice and utility in risk attitudes of farmers, probit estimation is more suitable than logit regression, and according to Asteriou and Hall (2007), probit estimation is more sophisticated than logit. The study adopts the following general probit model:

$$\Pr(Y = 1|X) = \Phi(X^T \beta) \tag{9}$$

Where Pr represents probability, and Φ is the Cumulative Distribution Function (CDF) of the standard normal distribution (Hatirli et al., 2004) . The parameters β are typically estimated by maximum likelihood.

X represents the vector of regressors, which are assumed to influence the outcome of *Y*. The model takes the form:

$$Y^* = X^T \beta + \varepsilon \tag{10}$$

Where ε is the error term and $\varepsilon \sim N(0, 1)$. Then Y can be viewed as an indicator for whether this latent variable is positive:

$$Y = \begin{cases} 1 \text{ if } Y^* > 0 \\ 0 \text{ if otherwise} \end{cases}$$

The specific model is:

$$Y = \beta_0+\beta_1 X_1+\beta_2 X_2+\beta_3 X_3+\beta_4 X_4+\beta_5 X_5+\beta_6 X_6+\beta_7 X_7+\beta_8 X_8+\beta_9 X_9+\beta_{10} X_{10}+\beta_{11} X_{11}+ \beta_{12} X_{12} + \mathcal{E}_i \quad (11)$$

Where

i = 1……..168

Y_i = 1 if the respondents are using agricultural credit as a risk management strategy,
Otherwise 0.

ε_i = Error term

4. Results

4.1 Descriptive Analysis of Study Variables

The dependent variable in our study is the risk attitude of the respondents. The results from the cubic utility function showed that all the farmers are either risk averse or risk seeker/preferred. However, no respondent was found risk indifferent/ neutral. For this purpose, only one dummy is used: 1 for the risk-averse farmer, and 0 for otherwise. Results showed that the majority of the farmers were risk averse in nature. The binary variable used for risk attitude averseness had a mean value of 0.65 (Table 2). Likewise, for the independent variables the mean and standard deviations were calculated. These variables are categorised into three groups: socio-economic factors, risk perception of floods and farmers' category (lower subsistence farmers and above lower subsistence). Among the socio-economic factors, the age had an average value of 48.6 years. The educational level of the respondents was measured in years of school attendance that the respondents had completed at the time of data collection, and this was 5.6 years of mean years of schooling for the whole sample respondents, which was very low. Similarly, experience of farmers was also measured in years with a mean value of 23.9 years. For health status of farmers, we have used the Likert Scale with 5 digits ranging from very poor (1) to very good (5). Later, 1 and 2 were categorised into poor health and 3,4 and 5 were categorised into good health (Bond et al., 2006; Halima and Rococo, 2014). In the model, a dummy was included for these variables as 1 for good health and 0 otherwise. In addition, the family size was the number of family members living in the same boundary and sharing their kitchen, income and expenditures. The average family size was 9 members per household. The family income is measured in Pakistani Rupee (PKR)[2]. The mean income per household per month was PKR 31047.6. The mean landholding size was 4.4 acres while the land ownership proportion was 0.41. Likewise, the mean value of proportion of labour working at the farm was 0.31. Distance from the river was a dummy and its mean value was 0.60. The mean value of the risk

[2] 1PKR= 0.00982, on 30 June 2015. According to the State Bank of Pakistan.URL: http://www.sbp.org.pk/

perception was 0.59. While we have used a dummy for the farmers' groups, 1 implied subsistence farmers while 0 implied others. The farmers were divided into two groups: the lower subsistence and the others. Lower subsistence farmers had landholding of less than 5 acres.

Table 2. Descriptive Analysis of Variables

	Variables	Description and Forms of Expression	Mean	SD
Dependent Variable				
Y	Risk Attitude Averseness	Attitude (1= Averse, 0= otherwise)	0.65	0.49
Independent Variables				
X_1	Age	Age of farmers in years	46.80	13.80
X_2	Education	Education as year of schooling	5.60	5.50
X_3	Experience	Farming experience in years	23.90	14.60
X_4	Health status	Health status (1=good health, 0= poor health)	0.53	0.50
X_5	Family size	Total number of family members	9.10	3.30
X_6	Monthly income	Average monthly income in PKR[3]	31047.6	17413.5
X_7	Land holding size	Land holding size in acres	4.40	4.20
X_8	Owned land proportion	Proportion of owned land out of total land holding in acres (ratio)	0.41	0.42
X_9	Field labour	Ratio of family members working as labour in the field to total family members	0.31	0.42
X_{10}	Distance from river	Distance of field from river (1= within 500 m from the bank, 0= otherwise)	0.60	0.49
X_{11}	Risk perception of floods	Risk perception of floods (1= high risk, 0= low risk)	0.59	0.49
X_{12}	Farmers' groups	Farmers' groups (1= lower subsistence farmer, 0= otherwise)	65.5	0.45

Source: Field Survey, 2015

4.2 Results of the Probit Model

The results of the probit regression analysis are mentioned in (Table 3). Fist, we performed bivariate analysis and tested correlation of dependent variable with independent variables. The variables that had significant correlation were included in the model. Second, the variables were tested for multicollinearity and no detection was observed. Following this, the regression model was estimated by using STATA-12. The Pseudo R^2 as a goodness of fit measure shows the value of 0.672. Six (6) variables out of twelve (12) show significance at (10 percent) or better. Four variables are found significant at (1 percent), while one variable is significant at (5 percent) and one at (10 percent). Therefore, the high Pseudo R^2 measured the goodness of fit, combined with the six significant variables at (10, 5 and 1 percent), which indicates that the model has sufficient explanatory power.

[3] According to the State Bank of Pakistan, PKR 1=0.00982 US$, dated 30 June 2015. URL: http://www.sbp.org.pk/

The probit results for the risk attitude averseness in (Table 3) shows that age was not found to be significant at (p-value 0.283). Educational level was found to be significant at (p-value 0.001) with a positive coefficient (0.114). This shows that the educated farmers were more risk averse than the uneducated or lower educated farmers. The educated framers can perceive the disasters more wisely and it was found that their attitude was more risk averse. Likewise, the experience level of farmers was found to be statistically significant at (p-value 0.006) and had a positive coefficient (0.0453). The findings for experienced farmers implies that the experienced farmers were more risk averse than the inexperienced or less experienced farmers. Similar, according to the previous findings, family size has a positive coefficient 0.0.149 at (p-value 0.010), showing that as family size increases, farmers are more likely to be risk averse in nature.

Unlike the previous results that were positively associated with risk attitude averseness, the landholding size was found to be significant at (p-value 0.021) and had a negative coefficient (-0.1464). This implies that as the landholding size increases, farmers are less likely to be risk averse in nature, whether they are rich or more of a risk seeker.

For risk perception, we have used risk perception of floods. The results (Table 3) show a positive coefficient of 2.4388 at (p-value 0.000). This means that as farmers' perception of floods rises from 0 to 1, their probability to be risk averse will increase. Likewise, the dummy variable that is included for lower subsistence farmers was found significant at (p-value 0.064) with a positive coefficient (0.821). The results for farmers' groups variables implies that lower subsistence farmers are more risk averse in nature than other farmers who had landholding above 5 acres.

Table 3. Factors Affecting Risk Attitude (Probit Model)

Variables	Coefficients	Standard Errors	Significance p-value
Age	0.0163	0.0152	0.383
Education	0.0114	0.0345	0.001***
Experience	0.0453	0.0165	0.006***
Health status	0.2551	0.4803	0.581
Family size	0.1498	0.0577	0.010***
Monthly income	9.9×10^{-6}	0.0000	0.423
Landholding size	-0.1464	0.0630	0.021**
Owned land proportion	0.6766	0.4903	0.168
Field labour	-1.3159	0.8157	0.101
Distance from river	0.2327	0.4832	0.630
Risk perceptions			
Risk perception of floods	2.4388	0.4400	0.000***
Famers' category			
Dummy 1: Lower subsistence farmers	0.8218	0.4440	0.064*
Log-Likelihood Value	- 38.01		
Wald Test Chi2(12)	156.27		
Prob-Chi ^{2}	00.000		
Pseudo R^2	0.672		
Total number of observations	168		

Source: Field Survey, 2015

Significance Levels: p≤ 0.10*, p ≤ 0.05**; p≤ 0.01***

5. Discussion

The findings of the study revealed that most of the farmers were risk averse in nature and their perception about the floods were found to be high. Our results for the risk attitude averse are consistent with findings of Iqbal et al. (2016), Ullah et al. (2015b), Bond and Wonder (1980) and Kitonyoh (2015).They reported that the majority of the farmers in their studies were risk averse in nature. Among the socio-economic factors, education was highly significant affecting the risk attitude averseness of farmers. The educated farmers may have better knowledge about the sources of risk and also the possible strategies they may adopt at the farm level to secure themselves from these risks. This could be the possible reason that the educated farmers were more risk averse. Our findings for the relationship of education with risk attitude averseness are in agreement with the findings of Lucas and Pabuayon (2011). They found the same results for farmers in the Philippines. Likewise, Kitonyoh (2015) and (Ullah et al., 2015b) reported the same results for education and risk attitude of farmers. However, Dadzie and Acquah (2012) and (Binici, 2001) have reported an inverse relationship. For experience, our findings revealed that higher experienced farmers are more risk averse than lower experienced farmers. The experienced farmers have long run indigenous knowledge of the environment, weather, natural hazards and the possible pests and diseases that made them more careful and are not likely to take risks. Our findings support the findings of Lucas and Pabuayon (2011). Their results revealed that the educated farmers were more risk averse than less educated farmers. The results of the landholding size of our study indicate that higher landholders were more risk seekers than lower landholders. The large subsistence farmers had more land, diversified activities and diversified crops that made them more risk seeking than lower subsistence farmers. However, our results are consistent with the findings of Sewando et al. (2011), who stated that the large landholders were more risk seeking than the small landholders in making decisions. However, Iqbal et al. (2016), Ullah et al. (2015b) and Dadzie and Acquah (2012)found no significant relationship of landholding size with risk attitude averseness of farmers. The dummy for the farmers' category revealed small subsistence farmers were more risk averse in nature than large subsistence farmers.

When the results of this study and other researches are compared, it is clear that although there is absence of any clear theoretical framework and the nature of causality of risk attitude with socio-economic factors (Hamal and Anderson, 1982), still the socio-economic factors had a great role in the farmers' risk attitudes.

6. Conclusion

Conclusively, based on the results and important findings, it is clear that in the study area risk and uncertainty are the main causes of low numbers in yield and crop production. The majority of the farmers were risk averse and had a high perception of floods. Farmers' risk attitude was significantly influenced by their education, experience, family size and income. Moreover, risk perception of floods and the farmers' category also played a role in their attitude. This implies that these factors are very important for consideration under policy framework. In addition to this, these socio-economic factors are also important for farmers' risk management strategies. The findings of the study can also be used in future studies. There is need to explore the role of information such as formal sources; print media, electronic media and extension services in farmers' risk attitudes and risk perception. Moreover, the research could be extended to the role of informal sources of information such as face to face, input dealers and output dealers in farmers' risk attitudes. The study further suggests that as the farmers were more risk averse in nature, therefore other studies should find out what are the risk management activities that the farmers are practicing in the study area. The research could also include investigating the farmers' willingness to adopt and willingness to pay for crop loan insurance that has been started by the government but not yet extensively practiced by the farmers.

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