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Factors Affecting The Adoption of Banana Crop Insurance among Banana Farmers in Chitwan District, Nepal

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ABSTRACT

An investigation was carried out in Chitwan district of Nepal in 2021 to identify the factors affecting the adoption of banana crop insurance among banana farmers. Employing multistage purposive random sampling, 80 banana farm households were selected. Primary data were gathered through semi-structured questionnaires administered to the household head. The analysis was carried out using a binary probit model. Results revealed that the annual income of the household significantly and positively affected the adoption of banana insurance. In the present context, farm households with higher annual incomes should be targeted for the efficient adoption of insurance. Thus, it is necessary to improve the income of farmers through multiple approaches such as trainings related to agribusiness management, proper access to cost-effective input market and prices, establishment of efficient marketing channels and value addition for the better adoption. Agricultural cooperatives and farmers groups should be further strengthened to promote collective agribusiness. Subsidy on the crop insurance should be further raised and export opportunities should be explored.

Keywords: Adaptation, climate, crop, income, probit

INTRODUCTION

Climate change is a major concern nationally and globally, as it causes devastating effects on agricultural production and potential damage to property (Ghimire et al., 2016). Droughts, extreme rainfall, strong winds, and extreme temperatures are

climatic risk factors that alter trophic interactions in agroecosystems, reducing both crop productivity and quality (Ghimire et al., 2016). Climate variability and climate driven extremes have several negative impacts on the agriculture sector (FAO, 2016). FAO et al. (2015) reported natural disasters including extreme temperatures and storms, floods, drought, and pest and diseases infestation caused loss in agricultural productivity worth $10 billion in Asia. There is the prediction of an increase in heat waves and erratic rainfall patterns affecting agriculture and making developing countries more vulnerable and challenging in the future (Gouldson et al., 2016). The adoption of good agricultural practices and technologies has often been less than expected to mitigate the climate risk. In this context, farmers could adopt crop insurance to cope with climate variability and risk (Thorton et al., 2017). Crop insurance has been adopted in many developing countries to reduce the economic loss by preserving working capital, repay loans and sustain their commercial viability (De Janvry et al., 2014).

Banana became a highly commercial summer fruit in a very short period of time due to its area extension, productivity and high demand conditions, contributing 0.85% to agricultural Gross Domestic Product (GDP) in Nepal (MoALD, 2021). This crop ranks as the second major summer crop, accounting for 21% of all summer fruit production (Ranjitkar et al., 2016; Sharma et al., 2021). In the year 2019, the area of banana cultivation reached 16699 ha having production of 254161 mt with a productivity of 15.22 mt/ha (MOALD, 2020). Although Nepal may have a remarkable capacity for producing banana, there aren't many commercial banana markets, and the country currently produces relatively few of them (Bhat et al., 2011). Ineffective orchard management practices increase the likelihood of disease and pest infestation along with natural disasters occurring due to climate change are the major challenges to banana production (Adhikari, 2017).

Due to their succulent nature, banana crops are particularly vulnerable to weather-related risks including wind and hail (Ghimire et al., 2016). Due to the fleshy pseudo stem, windstorms possess the biggest issue for farmers who grow banana since they significantly reduce banana yields and cause economic loss to the farmers (Parra et al., 2001; Calberto et al., 2018). Windstorms that occur during pre-monsoon or post-monsoon periods severely impact banana farm. During 2018 in Chitwan district, powerful winds and hail devastated 88 hectares of bananas worth millions of rupees (Rimal, 2018). Around 400 hectares of banana fields in the western Terai and Nawalparasi district were destroyed by strong wind in 2005

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(World Bank, 2009). Farmers are driven to modify their business and seek sources of non-farm income because of the significant losses they have experienced. The government has developed a number of policies and programs to help the banana farming become more commercialized. However, most of them appear to have focused primarily on policy and to have had little practical impact on the level of the farmer. Insurance is the risk management technique most commonly used in agriculture. It is a fair transfer of risk from one party to another in exchange for a premium: a small, defined loss that is assured to prevent a much larger and potentially catastrophic loss (Iturrioz, 2009). Following the implementation of the 2013 Crop and Livestock Insurance Directives, agriculture insurance was formally introduced in Nepal on January 14, 2013 (Insurance Board, 2017). In the same year, the government of Nepal provided a 50% subsidy on insurance premiums, which was later increased to 75% in 2014, then to 80% in 2021. The government has given agriculture insurance priority in its national policies, plans, projects, and budgets (Insurance Board, 2017). Adopting an insurance program encourages farmers to seek out risk and pursue commercialization, increasing banana production and income. Therefore, stakeholders and policymakers should concentrate on promoting insurance schemes for banana farming through awareness and the advantages of insurance adoption among banana growers (Dulal & Kattel, 2020). Thus, to develop mechanisms that will promote increased adoption of banana insurance and benefit farming communities, this study was done to identify the factors affecting the adoption of banana insurance among banana farmers.

MATERIALS AND METHODS

Study area

Chitwan district was selected for the study, being a key contributor to the country's banana production (Bhatta et al., 2023; MoALD, 2023). Due to its potentiality of production, the Government has established Banana Zone under Prime Minister Agriculture Modernization Project (PMAMP) and One Village One Product (OVOP) program had given priority for banana production in Chitwan. The PMAMP command area lies in Bharatpur metropolitan (ward no. 1), Ratnanagar municipality (ward no. 1-16), Khairahani municipality (ward no. 1-13) and Kalika municipality (ward no. 1-8) where the majority of the farmers are growing Malbhog followed by G9 and/or William hybrid. We selected Khairahani, Ratnanagar and Kalika Municipality to carry out the survey as large number of banana farmers have adopted the insurance policy to avoid the risk associated with

the weather variables as shown in Figure 1. Initial, Focus Group Discussion (FGD) and Key Informant Interviews (KII) with different stakeholders highlighted the average adoption of banana insurance in this area. Thus, this study on the adoption of banana insurance will promote sustainable development and benefit farming practices in this area.

Sampling technique and sample size

During 2021, we employed multistage sampling to select the study area and the respondent household. At first, we purposively selected the study municipalities along with wards of the Chitwan district. Later, we used stratified random sampling techniques to select the 80 respondent's households representing adopter and non-adopter of the banana insurance from the list of the 423 registered farmers provided by the PMAMP as shown in Table 1. A face to face interview was carried out using the semi-structured questionnaire to gather primary data. A pre-test was conducted using the guiding semi-structured questions to interview the first respondent. With minor adjustments made based on the feedback from the pre-test, the interview questions proved to be working well in achieving the research objectives of this study. Furthermore, KII and FGD were conducted in study municipalities including the concerned stakeholders to complement the result from the household interview.

Table 1. Selected sample size along with municipalities, wards and adoption groups

Municipality	Adopters	Non-adopters	Total
Khairahani	4	1	5
Ratnanagar	33	5	38
Kalika	12	25	37
Grand total	49	31	80

Note: Sample size calculation based on Daniel (1999)

Empirical model

Descriptive analysis and t-test was done using IBM SPSS Statistics 25. In order to determine the factors affecting the adoption of banana crop insurance, probit regression model was employed using Stata/SE 12.1. This probit model was used to identify the socio-economic factors affecting the farmers' adoption of banana crop insurance, using the functional form of probit as model Pr (Y = 1) = (X_i) where Pr (Y = 1) represents the probability of adoption of banana insurance with

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the change in X variable. A positive estimated coefficient implies an increase in the likelihood of adoption of banana insurance. Relation between probability values and explanatory variables is established with probit model. It ensures the probability value between 0 and 1.

Let us suppose Y_i is the binary response of the banana farmers, $Y_i = 1$, if banana farmer adopts banana crop insurance, and $Y_i = 0$ if the banana farmer doesn't adopt.

If $Y_i = 1$; Pr $(Y_i = 1) = P_i$

If $Y_i = 0$; Pr $(Y_i = 0) = 1\text{-}P_i$

Where $P_i = E\ (Y = 1/X)$ represents the conditional mean of Y given certain values of X.

Model specification

The probit model specified in this study to analyze factors affecting the adoption of banana crop insurance among banana farmers was expressed as follows;

$$\Pr(Y = 1) = f(b_0 + b_1 X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4 + b_5 X_5 + b_6 X_6 + b_7 X_7 + b_8 X_8 + b_9 X_9 + b_{10} X_{10} + b_{11} X_{11} + b_{12} X_{12})$$

Where, Pr (Y = 1) = Probability of adoption of banana crop insurance

X_1 = Gender (dummy); X_2= Age (continuous); X_3 = Education (continuous); X_4 = Farming experience (continuous); X_5 = Farm size (continuous); X_6 = Varieties (dummy); X_7 = Source of income (dummy); X_8 = Income (continuous); X_9 = Contact with extension workers (dummy); X_{10} = Member in agricultural cooperatives (dummy); X_{11}= Member in farmers group (dummy); X_{12}= Use of ICTs (dummy)

b_0 = Regression coefficient

$b_1, b_2 \ldots\ldots\ldots\ldots b_{12}$ = Probit coefficient

The description of the variables is presented in Table 2.

RESULTS AND DISCUSSION

Descriptive statistics of the variable used in this study are presented in Table 2. Result showed that 61% of the respondents adopted banana insurance. As observed, 85% of the respondents were male. Respondents, on average, were 48.48 years of age and had 10.58 years of formal schooling. Respondents on average had 8.24 years of farming experience and annual household income of NPR 1894637.50. On average, respondents had farm size of 121.17 kattha, 21% of the respondent's cultivated G9 variety (tissue-cultured) of banana and 73% of the farm household earned income from agriculture only. Similarly, on average,

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41% of the respondents had participation in agricultural cooperatives, 64% of the respondents have participation in farmers group and 25% of the respondents had regular contact with extension workers. On average, 31% of the respondents uses ICTs in agriculture.

Table 2. Descriptive statistics of the dependent and independent variables used in the study

Variable	Description	Mean	SD
Dependent variable			
Insurance adoption	=1 if respondent adopt banana crop insurance, 0 otherwise	0.61	0.490
Independent variable			
Gender	Gender of the respondent (1-male,0-female)	0.85	0.359
Age	Age of the respondent (year)	48.48	12.914
Education	Formal education of the respondent (year)	10.58	3.638
Farming experience	Farming experience of the respondent (year)	8.24	5.045
Farm size	Farm size (kattha)	121.17	162.602
Variety	=1 if respondent grow G9 variety, 0 otherwise	0.21	0.412
Source of income	Farm household source of income (1- agriculture only; 0- agriculture + off-farm)	0.73	0.449
Income	Annual farm household income (NPR)	1894637.50	3002187.811
Contact with extension workers	=1 if respondent have regular contact with extension workers, 0 otherwise	0.25	0.436
Member in agricultural cooperatives	=1 if respondent participate in agricultural cooperatives, 0 otherwise	0.41	0.495
Member in farmers group	=1 if respondent is member in farmers group, 0 otherwise	0.64	0.484
Use of ICTs	=1 if the respondent uses ICTs in agriculture, 0 otherwise	0.31	0.466

Source: Field survey, 2021

Mean difference of characteristics describing adopters and non-adopters of banana crop insurance

The results of differences between means of characteristics describing adopters and non-adopters of banana insurance are presented in Table 3. There was a significant difference in age, education, farming experience, farm size, income,

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participation in agricultural cooperatives and participation in farmers group between adopters and non-adopters. Education, farming experience, farm size, income, participation in agricultural cooperatives and participation in farmers group were significantly higher for adopters compared with non-adopters. However, age was significantly higher in non-adopters compared with adopters. Additionally, there was no significant difference in other listed characteristics among adopters and non-adopters.

Table 3. Characteristics of adopters and non-adopters of banana crop insurance

Variable	Adopters (n=49)	Non-adopters (n=31)	Mean difference	t value
Gender	0.90	0.77	0.124	1.513
Age	46.04	52.32	-6.282	-2.169**
Education	11.92	8.45	3.467	4.667***
Farming experience	9.20	6.71	2.494	2.207**
Farm size	179.82	28.48	151.332	4.529***
Variety	0.27	0.13	0.136	1.453
Source of income	0.73	0.71	0.025	0.241
Income	2863775.51	362774.19	2501001.317	3.952***
Contact with extension workers	0.29	0.19	0.092	0.921
Member in agricultural cooperatives	0.53	0.23	0.305	2.794***
Member in Farmers group	0.78	0.42	0.356	3.418***
Use of ICTs	0.35	0.26	0.089	0.829

Source: Field survey, 2021

Note: ***, ** indicate significant at 1%, 5% level of significance, respectively.

Factors affecting the adoption of banana crop insurance

Table 4 shows the results of binary probit regression analysis used to identify the factors affecting the adoption of banana insurance. Marginal effect after probit was also estimated and presented in the same table. The wald test (LR chi2) has good explanatory power at 1% level. Results revealed that annual household income significantly influenced the adoption of banana insurance among banana farmers. Other mentioned variables were not significant in the adoption.

Keeping other factors constant, with the increase in annual household income by one unit, the probability of adoption of banana insurance among banana farmers increases by 93.9%. Research shows that as household income rises, the

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likelihood of purchasing insurance products, including agricultural insurance, also increases (Subedi & Kattel, 2022; Ezekiel & Njanike, 2022).

Table 4. Probit regression analysis and marginal effect for factors affecting the adoption of banana crop insurance

Variable	Coef.	SE	p value	dy/dx	SE (dy/dx)
Gender	-0.244	0.615	0.692	-0.083	0.198
Age	0.026	0.019	0.178	0.009	0.006
Education	0.118	0.093	0.208	0.042	0.033
Farming experience	0.011	0.045	0.797	0.004	0.016
Farm size	-0.002	0.003	0.425	-0.0009	0.001
Variety	-0.314	0.626	0.615	-0.116	0.238
Source of income	-0.284	0.500	0.570	-0.098	0.166
Log(Income)	2.628***	0.786	0.001	0.939	0.298
Contact with extension workers	0.222	0.652	0.733	0.077	0.217
Member in agricultural cooperatives	-0.321	0.629	0.610	-0.115	0.227
Member in farmers group	0.531	0.521	0.308	0.194	0.192
Use of ICTs	-0.434	0.515	0.399	-0.159	0.190
Cons	-16.788	4.562	0.000		
Summary statistics Number of observation = 80 LR chi2(12) = 55.68 Prob> Chi2 = 0.0000 Pseudo R2 = 0.5212 Log likelihood = -25.570 Marginal effect after probit y=Pr(insurance) (predict) = 0.680 Goodness of fit test Number of observation = 80 Number of covariate patterns = 80 Pearson chi2 (67) = 59.03 (Prob>chi2 = 0.7452)					

Source: Field survey, 2021

Note: *** indicate significant at 1% level of significance.

Studies suggest that farmers with more financial resources are more inclined to invest in insurance, as they can better absorb the costs of premiums and potential losses (Subedi & Kattel, 2022; Ezekiel & Njanike, 2022). This financial capacity enables them to adopt risk management strategies that protect their investments in banana farming. Ginder and Spaulding (2006) reported price of insurance significantly influenced the adoption of insurance. Makki and Somwaru (2001) reported adoption of insurance depends on amount of premium. Swain and

Hembram (2020) reported household having larger incomes are likely to adopt crop insurance. Vandeveer (2000) reported with higher income, farmers are more likely to participate in crop insurance.

CONCLUSION

Results revealed that two third of the farm households adopted insurance scheme. Adoption of banana crop insurance is significantly and positively influenced by annual household income. Thus, extension agencies of institutions and insurance companies should emphasize household having larger annual income for better adoption. Efforts should focus on enhancing the income of banana farmers through various strategies. These include providing training in agribusiness management, ensuring access to affordable input markets and fair pricing, establishing efficient marketing channels, and promoting value addition to boost farmers' earnings. Strengthening agricultural cooperatives and farmers' groups is essential to encourage collective agribusiness activities. Additionally, the government should increase subsidies for agricultural insurance and introduce minimum support prices for bananas. Exploring export opportunities and restricting imports can further prioritize and support the domestic market.

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