DETERMINANTS OF FARMERS' PARTICIPATION IN BANANA INSURANCE IN CHITWAN DISTRICT, NEPAL

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ABSTRACT

This study was conducted to identify the factors affecting the adoption of banana insurance in Chitwan district of Nepal. A total of 160 samples (80 insurers and 80 non-insurers of banana producers) were selected randomly to collect primary data. Primary data were collected by conducting household survey using personal interview method in the month of September 2019. The logit model was used to identify the factors affecting the adoption of banana insurance policy among farmers. The result showed that the explanatory variables, area under banana cultivation, membership to cooperatives, and awareness about the agriculture insurance, perception of farmer about the necessity of crop insurance, agriculture extension services, and age of banana orchard were significantly contributing to the adoption of banana insurance policy. It also revealed that organization of awareness program, mobilization of groups and cooperatives were the important tools to promote banana insurance program. The findings would be helpful to make the insurance program more effective and hence increase the adoption of insurance policy and ultimately benefit farmers by enhancing their ability to manage risks in agriculture.

Key words: Adoption, banana, insurance policy, logit model, risk

INTRODUCTION

Most of the Nepalese industries are agriculture-based accounting for about 34%of annual export (Department of Customs, 2019). Expansion of agriculture sector is the milestone for the overall economic growth of the country (MoF, 2018). Farming is a risky business by definition.Several abiotic stresses, such as hailstorm, flood, drought and biotic stresses, such as diseases and pests results into instable income from agricultural activities (Nnadi *et al.*, 2013; Dhakal, 2019).There are other several factors such as environmental risks, market related risks, logistical and infrastructure risks, management and operational risks, policy and institutional risks, and political risk (Jaffee *et al.*, 2008) which are basic elements that affect performance of agricultural sector and are beyond the control of farmers.In Nepal, impact of weather

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related risks is remarkable as agricultural systems heavily rely on natural weather conditions (GoN, 2014). As majority of agriculture land (75 %) is lacking year-round irrigation, agricultural production is largely based on the monsoon rainfall (MoF, 2018). Management of losses due to such risk and uncertainties is crucial for establishing trust among farmers and motivating farmers to adopt modern agricultural technologies that can shift agricultural production through higher productivity (Dhakal, 2019).

The most extensively adopted risk management strategy in agriculture is insurance.It is an equitable transfer of a risk from one entity to another in exchange for a premium: a guaranteed and quantified small loss to avoid a huge and potential devastating loss (Iturrioz, 2009). It is a financial indemnity that compensates the monetary loss (Mahul and Stutley, 2010).The adoption of agriculture insurance policy assist individuals to achieve economic growth even after a disaster by compensating the individuals for the financial losses incurred (Warner *et al.*, 2013). It serves as security for banks by increasing the confidence for the banks to provide loan (Nnadi *et al.*, 2013). Melecky and Raddatz (2011) found that countries having high insurance penetration rate can maintain a positive GDP trend even after a devastating event.

Agriculture insurance was formally initiated in Nepal on 14 January, 2013 after the implementation of Crop and Livestock Insurance Directives, 2013(Insurance Board, 2017). Government of Nepal introduced fifty percent subsidy on insurance premium in the same year which was further increased to seventy-five percent in the year 2014. Agriculture insurance has been prioritized by the national government in its national policies, plans, programs, and budgets (MoALD, 2019; Insurance Board, 2017; MoAD, 2015). Due to this facilitation by government, number of farmers adopting agriculture insurance policy is increasing with time. However, the volume of adoption of insurance policy is not satisfactory in comparison to our neighboring countries. Crops covered less than five percent of agriculture insurance based on sum insured and less than three percent based on the number of insurance policies in the year 2020/21(Insurance Board, 2021).

Banana is one of the important summer fruits of Nepal contributing 0.85% to Agriculture Gross Domestic Product (AGDP) (MOALD, 2021). The area, production and productivity of Banana was 16,699 hectare (ha), 254,161 metric tonnes (mt) and 15.22 mt/ha respectively in 2019 in Nepal (MOALD, 2021).Morang, Jhapa, Saptari, Chitwan and Kailali were top 5 banana growing districts of Nepal based on area coverage in the year 2019/20. Banana was cultivated in 2,329 ha land and producing 28193 mt of fresh banana in the fiscal year 2019/20 in Chitwan district (MoALD, 2021).

Banana crop is highly susceptibleto weather related hazards like wind and hail due to its succulent nature(Ghimire *et al.*, 2016). Strong wind in 2005destroyed around 400 ha banana area in Nawalparasi district and western terai (World Bank, 2009). Similarly, strong winds accompanied by hailstones damaged 88 ha of banana that worthed millions of rupees in Chitwan district in 2018 (Rimal, 2018). Apart from this, banana faces biological risks such as insects and diseases, and market related risks, such as price fluctuation (Ghimire *et al.*, 2016). Encouraging farmers to adopt agriculture insurance policy is crucial for protecting farmers from economic losses due to such catastrophic events (Warner *et al.*, 2013). The objective of this study was to identify the factors affecting the adoption of banana insurance policy in Chitwan district, Nepal.

METHODOLOGY

STUDY AREA AND DATA COLLECTION

Among other crops cultivated in Nepal banana had highest rate of insurance adoption in 2018/19. The number of insurance adopter were higher in Chitwan district of Nepal (Department of Agriculture, 2018). Hence, Chitwan district was purposively selected for this study and farmers involved in banana production were randomly selected to collect primary data. This study utilized both primary and secondary data. Each selected household were the key source of the primary data. The primary data obtained from semi-structured interview schedule, Key Informant Interview (KII) were used to triangulate the household data. Since the number of banana farmers were found higher in Kalika and Ratnanagar Municipality of Chitwan district, these two municipalities were purposively selected to collect primary data and household survey was carried out in the month of September 2019.The total of 80 households adopting the banana insurance policy and same number of households not adopting the banana insurance policy were selected for the collection of primary data.
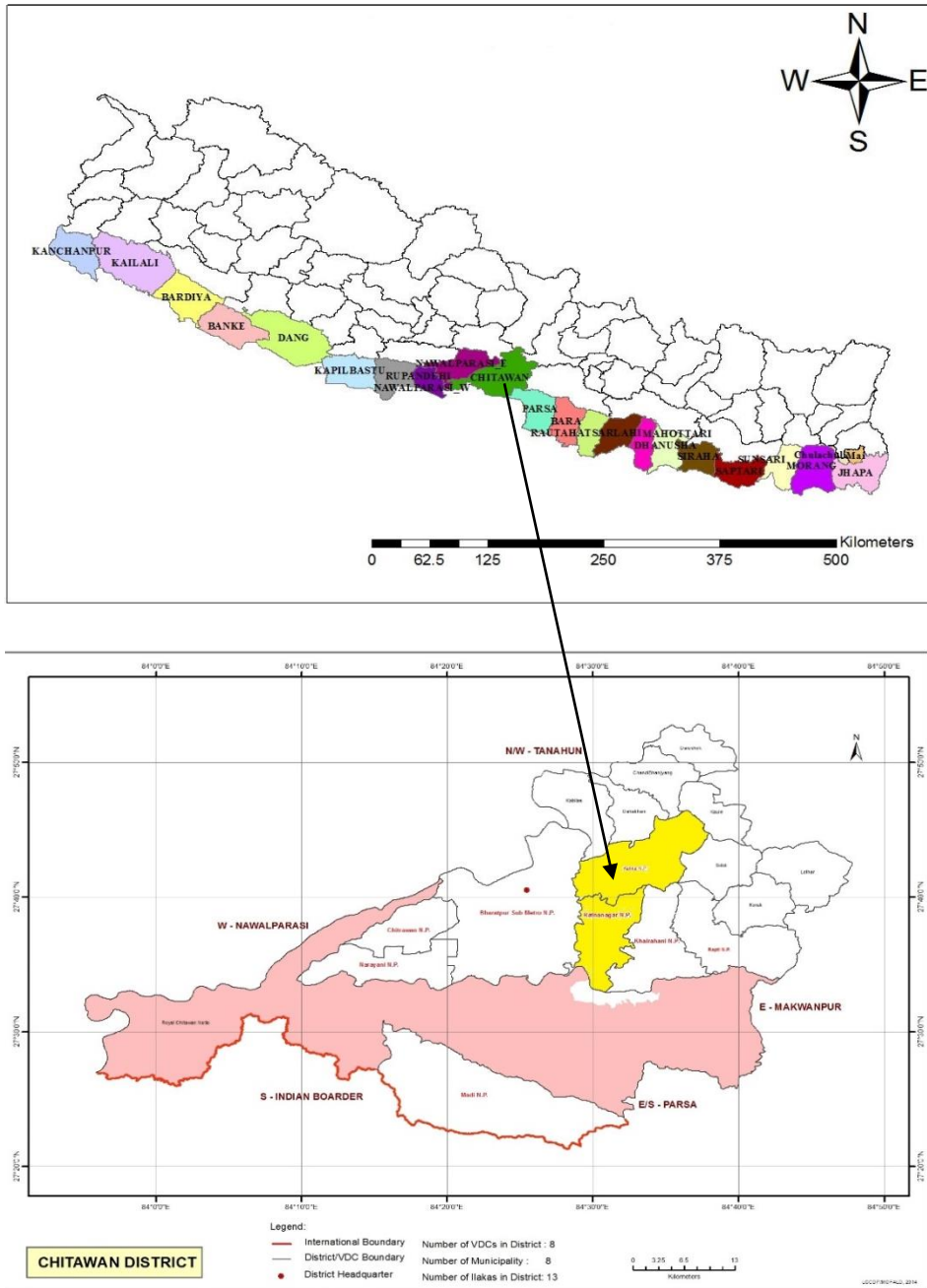
Figure 1. Figure showing map of Nepal and Chitwan District. The green shaded area in the map of Nepal is Chitwan district and yellow shaded area in the map of Chitwan district is study site for this study.

DATA ANALYSIS

Both qualitative and quantitative data were obtained from the field survey. The primary data collected were entered to Microsoft excel 2010 and descriptive analysis was done using Statistical packages for Social Sciences (SPSS) version 15 and regression model analysis was done using Stata software version 12.The factors affecting the adoption of banana insurance policy was analyzed using Logit regression model. .

ANALYTICAL MODEL

The logit model was used to evaluate the extent to which different independent variables affected the adoption of banana insurance policy decision (Greene, 2000). There were many studies where logit regression model had been used to assess the factors affecting the adoption. The study carried out by Sujarwo and Rukmi (2018); Branstrand and Wester (2014); Kwadzo, Kuwornu and Amadu (2013) also used logit regression model to assess the factors affecting the adoption of crop insurance policy.The dependent variable is binary response where,Y= 1 for adopting an insurance policy, and Y=0 for not adopting an insurance policy.

$P(Y=1) = f (b ' X)$ --------- equation 1

Where,

P = the probability

Y = Adoption of insurance policy = 1, otherwise zero.

b = logit coefficient $(b_1 .... b_n)$

X = Explanatory variables $(X_1 ...... X_n)$

The probability for Y = 0 according to equation 1 is

$P(Y=0) = 1 - f (b ´X)$

The likelihood of farmers adopting the insurance is a non-linear function of regressors.

$P (Y=1) = (X_i)$

Model Specification

$Pr(Y=1) = f (b_o + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + b_8X_8 + b_9X_9 + b_{10}X_{10} +$

$b_{11}X_{11} + b_{12}X_{12} + b_{13}X_{13})$

$b_1, b_{2....} b_{13}$régressions coefficients, b_0= intercept, ε= error term, i=n=160

Table 1. Description of the dependent and explanatory variables used in Logit model

Variables	Type of variable	Description	Expected sign
Dependent	Binary	Adoption of crop insurance policy (Adoption=1, Otherwise 0)	
Gender of Household head HHH(X_1)	Binary	(Male =1, Otherwise 0)	(±)
Schooling HHH (X_2)	Continuous	Years of schoolingof HHH	(±)
Experience HHH (X_3)	Continuous	Banana farming experience of HHH (years)	(±)
Irrigation (X_4)	Binary	Irrigation facility (Yes=1, Otherwise 0)	(±)
Area (X_5)	Continuous	Natural log transformation of area under banana cultivation	(+)
Age of banana orchard (X_6)	Continuous	age of banana orchard	(+)
Extension (X_7)	Binary	Farmer received Extension Services (Yes=1, Otherwise 0)	(+)
Diversification (X_8)	Binary	Diversified source of income (Yes=1, Otherwise 0)	(±)
Membership (X_9)	Binary	Membership inagriculture cooperatives (Yes=1, Otherwise 0)	(+)
Awareness year (X_{10})	Continuous	Number of years the farmer has been exposed or aware about insurance	(+)
Perception (X_{11})	Binary	Perception of farmer on the importance of insurance service for agriculture(Very necessary =1, Otherwise 0)	(+)
Subsidy knowledge (X_{12})	Binary	Understandingabout subsidy in insurance premium (Yes=1, Otherwise 0)	(+)
Credit (X_{13})	Binary	Credit access (Yes=1, Otherwise 0)	(±)

RESULTS AND DISCUSSIONS

SOCIO-ECONOMIC AND DEMOGRAPHIC CHARACTERISTICS

The columns 2 and 3 of table 2 presents the socioeconomic and demographic characteristics of banana insurance policy adopters and non-adopters respectively. Columns 4 and 5 shows the differences among the two categories of farmers. The differences are presented through t-test for continuous variables and chi-square test

for categorical variables.Chi-square test revealed that extension services, membership in cooperatives, perception on importance of insurance, awareness about the government subsidy in insurance premium and accessibility to credit from formal sources, were determining factors for adoption of banana insurance policy decision. The results were significant at 1% level. However, no significant difference in the diversification of farm was observed between adopters and non –adopters.

The findings of t-test shows that years of schooling, experience of banana farming, area of banana cultivated, production of banana, income from banana, age of banana orchard and number of years famers are aware about insurance were different between adopters and non–adopters with significant result at 1% level of confidence. However, area of irrigated land was similar among both groups.

Table 2. Socio-economic and Demographic characteristics of the sampled households

Variables	Insurance Adoption		Test Statistics	
	Yes (n=80)	No (n=80)	t-test	Chi-square
Gender of HHH (male = 1)	73 (91.3)	65 (81.3)		3.373*
Year of schooling)	10.7	8.23	4.417***	
Experience (in year)	8.6	5.25	4.56***	
Area (ha)	3.49	0.91	4.595***	
Age of banana orchard	4.58	2.86	5.186***	
Awareness year	4.14	2.88	5.042***	
Extension received (Yes = 1)	48 (60)	23 (28.7)		27.16***
Membership (Yes =1)	73 (91.2)	52 (65)		16.128***
Perception (necessary = 1)	77 (96.2)	54 (81.8)		8.171***
Subsidy knowledge (Yes =1)	71 (88.8)	38 (47.5)		31.34***
Credit (Yes =1)	43 (53.8)	20 (25)		13.850***
Irrigation (Yes = 1)	3.30	0.88	4.199	
Diversification (Yes = 1)	55 (68.8)	62 (77.5)		1.558
Production (Mt)	88.89 (126.99)	23.92(45.41)	4.3***	
Income from banana (NPR 000')	1902.56 (2615.15)	566.00 (986.62)	4.28***	

Source: Field Survey, 2019 (Note: Figures in Parentheses indicate percent. *** and *indicates significant at 1 and 10% level of significance.)

FACTORS AFFECTING THE ADOPTION OF BANANA INSURANCE POLICY

The description of dependent and independent variables are given in table 1. The statistical analysis of factors affecting the adoption of crop insurance in banana was done using the logit model. The multi collinearity of the explanatory variables was checked by using VIF and there was no issue.The likelihood ratio chi-square)LR chi^2 (for the model was statistically significant at 1 %level of significance which revealed

that the model had good explanatory power .The log-likelihood indicates that the explanatory variables included in the model jointly explain the probability of farmers ' decision to purchase banana insurance policy.

The result of logit regression model is described below in table. The increase in banana area by 1%, the probability of adoption of banana insurance policy would increase by 19% keeping all other factor constant and was found statistically significant at 1% level of significance. The increase in area under banana cultivation means increasing investments on banana production and also increasing risks which attracts farmers towards purchase of insurance policy for the minimization loss incurred. The study conducted by Ntukamazina *et al.* (2017) in Sub-Sahara, Africa, also found positive relationship between farm size and adoption of insurance policy.The finding was also consisted with the study conducted bySihem (2019), Bharati *et al.* (2014) and Ali (2013) where they found positive and significant relationship between the farm size and adoption of insurance policy.

Similarly, the increase in the age of banana orchard by 1 year, the probability of adoption of banana insurance policy would increase by 7.4% and was found statistically significant at 5% level of significance. The more the age of banana orchard, the more risky is the farm. Ghimire *et al.* (2016) found that banana farmers were not interested to insure their newly established banana orchard due to belief that there would be minimum crop losses. The findings was also consisted with the study conducted by Goodwin, Vandeveer and Deal (2004).

The result revealed that farmers who had received extension services, the probability of adoption of banana insurance policy increases by 24% and was found statistically significant at 10% level of significance. Farmers get aware about the importance of insurance and they would be likely to adopt insurance policy.The study by Ellis (2017) in Ghana found the farmers who had received extension services, the probability of purchase of policy would increase by 61.1%. Ali (2013) also found positive and significant relation between access to extension service and willingness to participate in index-based crop insurance in Pakistan. The finding was also consisted with the study of Falola, Ayinde and Agboola (2013) conducted in Nigeria where they found the positive relationship between access to extension service and willingness to purchase insurance policy.

Similarly, membership in cooperatives, number of awareness year on insurance and perception of farmer about the importance of insurances were found positively and significantly affecting the adoption of banana insurance policy. The farmers who were

the members of cooperatives, the probability of adoption of banana insurance policy would increase by 21.6% and similarly increase in awareness year about insurance would increase the probability of adoption of banana insurance policy by 6.5%. The increase in farmer's perception about the importance of insurance would increase the probability of adoption of banana insurance policy by 23.5%. The rest of the other explanatory variables were found statistically non-significant.

Membership in a farmer cooperative organization provides opportunity to farmers to know more about modern farming technologies and new interventions. Therefore, the farmers engaged in cooperatives are expected to avail agriculture insurance more compared to those who were not engaged. Ashimwe (2016) also found that membership in farmer cooperatives has positive and significant relationship with the adoption of index-based crop insurance in Rwanda. In contrary, Masara and Dube (2017) found that the more the number of years of involvement of a household head in a farmer groups has significantly negative influence on the adoption of agricultural insurance among smallholder maize farmers in Goromonzi district of Zimbabwe. Similarly, Singh and Hlophe (2017), Masara and Dube (2017) found that adoption of agriculture insurance was positively related to awareness on insurance.Ashimwe (2016) also found a positive and significant relationship of the years of experience and the adoption of weather-index crop insurance in Rwanda.Similarly, the study of Yang *et al*. (2015) revealed the significant and positive influence on the level of farmers' awareness about agricultural insurance and the participation in agricultural insurance. The findings of the study conducted by Karthick and Mani (2013), Tamil Nadu, India revealed that awareness about the benefits of adopting insurance influenced the adoption of crop insurance as farmers realized that adopting crop insurance will minimize income loss occurred due to adverse weather events, pests and diseases.

Table 3. Factors determining the adoption of banana insurance policy using Logit model

Variables	Coefficients	Standard error	p-value	dy/dx	Standard error
Gender of HHH (male = 1)	0.109	0.688	0.874	0.027	0.171
Year of schooling of HHH	0.085	0.074	0.252	0.021	0.018
Experience in banana production (in year)	0.019	0.053	0.715	0.004	0.013
Area (ha)	0.763***	0.240	0.001	0.190	0.060

Variables	Coefficients	Standard error	p-value	dy/dx	Standard error
Age of banana orchard (in year)	0.299**	0.138	0.031	0.074	0.034
Extension service (Yes = 1)	0.980*	0.513	0.056	0.240	0.120
Membership in cooperatives (Yes = 1)	0.878*	0.514	0.088	0.216	0.122
Awareness year on insurance	0.260*	0.155	0.094	0.065	0.038
Perception of farmer about importance of insurance (Yes = 1)	0.972*	0.564	0.085	0.235	0.128
Knowledge on subsidy (Yes = 1)	0.798	0.624	0.201	0.195	0.147
Credit access (Yes = 1)	0.299	0.510	0.557	0.074	0.126
Irrigation facility (Yes = 1)	0.507	0.774	0.512	0.125	0.185
Diversification on income (Yes = 1)	-0.384	0.644	0.551	-0.096	0.158
Constant	-5.380	1.510	0.000		
Number of Observations	160				
Log Likelihood	-59.351				
LR chi^2 (15)	103.10***				
Prob>Chi^2	0.0001				
Pseudo R^2	0.4648				

Source: Field Survey (2019)

Notes: ***, ** and * indicate significant at 1, 5and 10% levels, respectively.

DETERMINATION OF GOODNESS OF FIT

A goodness-of-fit test was conducted to determine how well the model fits the data. The Hosmer-Lemeshow test compares the predicted values in groups with the observed values (Hosmer D.W. and Lemeshow S, 1989). The p-value in the Hosmer–Lemeshow test being lower than 0.05 indicates that the model does not fit the data. Here, Hosmer – Lemeshow value was 0.2548 which indicates that the model fits the data well.

CONCLUSIONS

The study was conducted to assess factors affecting the adoption of banana insurance policy in Chitwan district of Nepal.The research problem addressed in this study was to determine the reasons behind the low adoption of agriculture insurance and make recommendations for improvements. The findings revealed that socio-economic and demographic factors such as area under banana cultivation, membership to cooperatives, awareness about the insurance scheme, perception about the importance of crop insurance, access to extension services, and (age of banana orchard had significant effect on the adoption of banana insurance policy. It is necessary to raise awareness about agriculture insurance and their importance through government agencies, I/NGOs, insurance companies, and farmers' organizations.Since subsidy in agriculture insurance premiums is necessary for the rapid growth of insurance, the government should continue to provide the subsidy. The different concerned stakeholders should increase their extension services and this should be regularly provided to the farmers.

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