

Adoption of Livestock Insurance in Ratnanagar Municipality of Chitwan District, Nepal

**¹Kamal Regmi, ¹Srishti Pokhrel, ¹Shreya Aryal,
¹Pravesh Gautam, ²Utshav Pandey**

**¹Paklihawa Campus, Institute of Agriculture and Animal Science,
Tribhuvan University, Nepal**

**²Lamjung Campus, Institute of Agriculture and Animal Science,
Tribhuvan University, Nepal**

Corresponding author: Utshav Pandey, email: utshav.pandey@lac.tu.edu.np

Abstract

The government of Nepal has prioritised insurance in recent years. However, adoption remains very low, with more people practising livestock insurance compared with crops. Thus, a study was conducted regarding the determinants affecting the adoption of livestock insurance in Ratnanagar Municipality of Chitwan district, Nepal. Sixty insurers and 60 non-insurer households were surveyed through multistage sampling from ward numbers 03, 08 and 09 via structured interview schedule. Descriptive study was conducted to determine the characteristics of sample households and risk management strategies used by farmers. The indexing technique was applied to assess the risk associated with production and logistic regression model was used to determine various determinants affecting adoption. The results revealed that disease and parasite incidence were the risk factors associated mostly with production. Farmers were found to practise vaccination, stockpiling hay, low risk low production technology and livestock diversification as major ex-ante risk coping strategies and off farm investment as a major ex post risk coping strategy. Logistic regression revealed that number of economically active male members, educational status of the household head, ethnicity (Brahmin/chhetri), log of income from livestock, livestock unit, use of improved breeds and visit to extension service centers were positively associated with adoption of livestock insurance, whereas the number of economically active female members and experience in livestock rearing were negatively associated. The study highlighted the need to provide formal and nonformal education in the community and integrate a subsidy-based insurance program with an improved breed distribution program in the area.

Keywords: Indexing, Insurer, Logistic Regression, Non-insurer, Production Risk

Introduction

Livestock constitute an integral part of the Nepalese agricultural economy, contributing significantly to rural household income, food security and rural livelihoods. In fact, livestock enterprises are complementary to the crop sector in terms of production and management. This sector is expected to play a vital role in satisfying the demand for animal-driven food by the growing population worldwide and thus ensures global food security (FAO, 2018; Harrero, et al., 2009, Alexandratos and Bruinsma, 2012). The share of agriculture in the total GDP of the country is 24.71%, with growth rate of 3.35%, including livestock sector. The livestock sector alone contributed 23.92% of the agricultural GDP and 5.91% of the total GDP of the country in 2023/24 (MoALD, 2024; MoF, 2025a). This finding highlights the importance of livestock in rural livelihoods. However, livestock are comparatively expensive to rear because of their high cost of shed construction, their per unit price and many more (Nugrahaini et al., 2021). Therefore, the chance of loss is also very high, which discourages farmers from rearing. The major problem in the livestock sector is washing away livestock shed by heavy floods during the rainy season, destroying sheds and causing the death of livestock due to natural disasters such as earthquakes, landslides, floods and fires (Dangi, 2022). This risk occurrence, if it occurs, causes considerable financial loss to farmers. Thus, livestock insurance can be considered an important risk-bearing mechanism for farmers against such unforeseen events (Devkota et al., 2021).

Insurance plays a major role in the commercialisation of agriculture. It protects against the financial risk associated with production and marketing (Petrović et al., 2020; Meuwissen, 2000). In recent years, GONs have focused on and taken initiatives toward agriculture and livestock insurance. Through the promulgation of the Crop and Livestock Insurance Directive, 2012, the GON started insurance of crops and livestock. The policy covered insurance for crops, livestock and fisheries. Later, the directive was amended in 2020 with the implementation of Agriculture and Livestock Insurance Directive, 2020. In 2020, medicinal plants were also included under the scheme of

insurance. In 2022, the directive was again amended with the implementation of “Agriculture, Livestock and Medicinal Herb Insurance Directive, 2022”. According to the report of the Insurance Board (2021), the trend of crop and livestock insurance is increasing where crop insurance coverage amounts to Rs. 2 billion 911 million 847 thousand 2 hundred and twenty-six, and the livestock insurance coverage amounted to Rs. 40 billion 391 million 151 thousand four hundred and twenty-three. Thus, the total insurance coverage stood at Rs. 43 billion 303 million 939 thousand one hundred and forty-nine as per the insured amount. This shows the popularity of livestock insurance over crop insurance. The insurance policy covers losses such as fires, lightening, earthquakes, floods, landslides, droughts, storms, hailstorms, frosts, snow, sudden or accidental external factors, diseases and illness (Pant et al., 2019). Insurance is provided for animals such as cattle, buffalo, sheep/goat, equine, swine and other livestock and for reared birds and fish species. Similarly, the insurance board provides insurance claims for death, permanent disability and the occurrence of mastitis, where 90%, 50% and 30%, respectively, are compensated (Insurance Board, 2022). At present, there are approximately 20 nonlife insurance companies working in the fields of agriculture and livestock insurance. Among these, the GoN assigned the Shikhar insurance company private limited as an insurer in Chitwan district.

Chitwan is one of the potential districts for livestock production. It is the largest producer of livestock in Bagmati province including poultry, whereas it is the 5th largest producer, excluding poultry (DoLS, 2023). Thus, it is known as a hub for poultry production, especially broilers. Within Chitwan district, Ratnagar Municipality is a potential area for livestock production. It ranks 3rd after Ichhakamana rural municipality and Bharatpur metropolitan city in presence of cattle and buffalo farms but ranks 5th in presence of sheep/goat and swine farms within the district. There are 21 dairy cooperatives, 37 registered cattle farms, 9 registered buffalo farms, 3 registered sheep/goat farms, 5 registered swine farms and 12 registered meat shops collectively in 16 wards of the municipality (VHLSEC, 2023).

Despite government subsidies for livestock insurance, penetration remains low. According to GoN (2023), the coverage of insurance in agriculture activities was found to be only 4%, with the majority of holdings (84%) associated with livestock insurance followed by crop insurance. Owing to a lack of awareness of the insurance scheme, many farmers are feared to do the insurance in time, which results in an enormous economic loss (Devkota et al., 2021; Kandel and Timilsina, 2018a). Another problem is the certainty of farmers where they are not sure before paying the premium that either they will receive compensation for their loss or not. The government's efforts to increase awareness among farmers about the livestock insurance are also lacking, which has created a problem in insurance adoption (Ghimire et al., 2016). The insurance scheme and its knowledge are not available to people living in rural areas because they are deprived of this facility (Acharya et al., 2024). Another problem is that farmers are willing to insure when there is a high chance of loss due to natural disasters such as flooding, rainfall, and high winds during summer when the insurance company does not prefer to insure them (GIZ et al., 2020).

The government of Nepal has prioritised insurance over the past few years and thus has heavily subsidised it. A subsidy of 80% of the premium amount to be paid by farmers up to livestock insurance has been provided. The premium amount is also very low, i.e., 5% of insured amount except for broilers and ostriches, which are 1.25% and 2% per lot, respectively (Insurance Board, 2022). This shows the prioritisation of the livestock insurance sector by the government. Among the total insured amount, 93.27% was covered by livestock insurance (Insurance Board, 2021). Thus, coverage is greater in the livestock sector than in the crop sector, which highlights the importance given by farmers to the livestock sector. A study performed by Devkota et al. (2021) revealed that farmer membership in farmer groups or cooperatives and raising awareness and rearing improved animals significantly affect the adoption of livestock insurance. Similarly, neighbors adopting insurance, members of cooperatives, the loan-seeking behavior of farmers, experience of farmers and trying innovation were also found to affect the adoption of livestock insurance (Nepali, 2021). However, very few studies have been conducted

in Nepal to date, and more studies on the factors affecting the adoption of livestock insurance are needed to scale up its adoption. Thus, this research aims to identify the factors affecting the adoption of livestock insurance by the farmers of the Ratnanagar municipality of Chitwan district, Nepal, along with various risks associated with production marketing and risk coping strategies adopted by the farmers of that area.

Materials and Methods

Ratnagar municipality was selected as the site for the study. This city is selected because it ranks third after Ichhakamana rural municipality and Bharatpur metropolitan city in presence of cattle and buffalo farms but ranks fifth in presence of sheep/goat and swine farms within the district. The area also has proper access to basic infrastructure, such as roads, electricity, and water availability. A total of 145 policies related to livestock insurance were issued by the private Shikhar insurance company, which is limited in area. Most of the policies, i.e., 92 policies, were issued collectively from ward no. 03, 08 and 09. These wards are thus for the purpose of data collection. The sample size is calculated via the formula given by Yamane (1967). The formula was as follows:

$$n = \frac{N}{1 + Ne^2}$$
 where n = sample size, N = total population size, e = margin of error (8% in this study).

A total of 120 farmers (60 insured farmers and 60 non-insured farmers) were selected for the purpose of the study via the multistage sampling method. In the first stage, Ratnagar municipality was selected for the study purpose. In the second stage, 03, 08 and 09 wards were selected, and simple random sampling was then administered to select the sample. Data were collected via a structured interview schedule. Prior to data collection pre-testing of the interview schedule was performed to check the reliability of the questions. A survey was conducted for the purpose of collecting primary information from the household. Different journal articles, reports of government and non-governmental bodies, proceedings and books were also surfed to check the validity of research

and to obtain secondary information. In addition, personnel from insurance companies and officers from Ratnagar municipality were also considered key informants for obtaining general information about the area. The collected data were analysed via Stata 15 software and Excel 2019. A simple descriptive analysis was conducted to show the characteristics of the population under study and different adoption measures. Indexing technique was used to rank the various risks related to production. The formula for indexing is as follows:

$$I = \sum \frac{S_i F_i}{N} \text{ (Kothari, 1990)}$$

where, I= index value, S_i = scale of i th class (ranging from 0.2 for very low to 1 for very high), F_i = frequency of the i th class, and N = total study sample.

Model specification for identifying the determinants of adoption of livestock insurance

To determine the factors influencing the adoption of livestock insurance, binary logistic or probit regression models can be used. These models are used whenever the dependent variable is binary or dichotomous. The difference between these models lies in the distribution of error term, where logistic regression follows a logistic distribution, whereas probit regression follows a normal distribution (Gujrati and Porter, 2009). Both models are found to be equally efficient in terms of function. In the study, binary logistic regression model was used, as the interpretation remains easier, which is described in terms of odds ratio. Additionally, a binary regression model was used more often when the dependent variable was found to be dichotomous. Gbigbi and Ndubuokwu (2022) used binary regression model to identify the determinants of agricultural insurance among crop farmers in Nigeria. Carrer et al. (2020) also used binary regression model to assess the determinants of agricultural insurance adoption in Brazil.

In the study, the probability of adopting insurance is denoted by ($Y=1$), whereas the probability of not adopting insurance is denoted by ($Y=0$). Thus, our variable is categorical and dichotomous or binary. The conceptual model of logistic regression can be expressed as

$$P_i = \frac{e^z}{1+e^z} \text{ where,}$$

P_i denotes the probability of adoption of livestock insurance, e denotes base of natural logarithm, and z is the linear combination of predictors given as,

$$Z = \beta_o + \sum_i^n \beta_i X_i + U_i$$

Similarly, $1 - P_i$ denotes the probability of non-adoption of livestock insurance. In logistic regression model, the outputs are expressed in terms of odds ratio, which is the ratio of probability of adoption to probability of non-adoption and thus can be expressed as,

$$\text{Odds (L)} = \frac{P_i}{1-P_i}$$

The model can be expressed as,

$$\text{Odds (L)} = \frac{P_i}{1-P_i} = Z = \beta_o + \sum_i^n \beta_i X_i + U_i$$

The study model can now be specified as,

$$Z = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + \beta_{11} X_{11} + \beta_{12} X_{12} + \beta_{13} X_{13} + \beta_{14} X_{14} + \beta_{15} X_{15} + \beta_{16} X_{16} + \beta_{17} X_{17} + U_i.$$

where,

$\beta_1, \beta_2, \beta_3, \dots, \beta_{17}$ are the respective co-efficient of the predictor variable. Similarly, $X_1, X_2, X_3, \dots, X_{17}$ are various predictor variables used in the model. A description of predictor variables along with their expected signs is given in Table 1.

Similarly, the marginal effect for each of the independent variables X_i on adoption of livestock insurance was calculated via the following formula,

$$\frac{\Delta P_i}{\Delta X_i} = \frac{\partial P_i}{\partial X_i} = \beta_i \frac{1}{1+e^{-X_i\beta_i}} \times \frac{e^{-X_i\beta_i}}{1+e^{X_i\beta_i}} \text{ (Gujrati, 1998)}$$

Table 1. Description of the variables used in regression model.

Variable	Type	Description	Value	Expected sign
Dependent variable (Z)	Dummy	Adoption of livestock insurance	Adoption = 1, Non-adoption = 0	
Gender (X ₁)	Dummy	Gender of household head	Male =1, Female = 0	+
Size (X ₂)	Numeric	Size of household	Number	+
Eco_male (X ₃)	Numeric	Economically active male member in the family	Number	+
Eco_female (X ₄)	Numeric	Economically active female member in the family	Number	+
Education (X ₅)	Numeric	Education status of household head (Years of schooling)		+
Male livestock rearing (X ₆)	Numeric	Male member involved in livestock rearing	Number	+
Female livestock rearing (X ₇)	Numeric	Female member involved in livestock rearing	Number	+
Experience (X ₈)	Numeric	Experience in livestock rearing	Years	+
Training (X ₀₉)	Dummy	Training taken on livestock	Yes=1, No=0	+
Loan (X ₁₀)	Dummy	Access to loan	Yes=1, No=0	+
Subsidy (X ₁₁)	Dummy	Received subsidy	Yes=1, No=0	+
Ln_income (X ₁₂)	Numeric	Natural log of income from livestock production	Rupees	+
Ethnicity (X ₁₃)	Dummy	Ethnicity of household head	Brahmin/chhetri=1, others=0	
Visit_extension (X ₁₄)	Dummy	Visit to extension service center	Yes=1, No=0	+
Livestock unit (X ₁₅)	Numeric	Total livestock unit	Number	+
Improved (X ₁₆)	Dummy	Rear improved breed of livestock	Yes=1, No=0	+
Major occupation (X ₁₇)	Dummy	Livestock as major occupation	Yes=1, No=0	-

Results and Discussion

Socio demographic characteristics of household

Table 2 shows the characteristics of the households in the study area. The table shows that both insured and non-insured farmer household heads belong to an economically active population with average ages of 54 years and 57 years, respectively. The average family size of non-insured farmers is comparatively greater (5.60) than that of insured farmers (5.05). On average, more economically active members were found for insured farmer families than for noninsured ones. However, in the case of female members, the situation is opposite. The educational status of household heads who insure their livestock is relatively greater (9.17) than that of those who do not (5.48), indicating that education status might positively influence the adoption of insurance schemes by farmers. Both insured family heads and non-insured family household heads had an average of 17 years of experience. Both male and female members are equally involved in livestock rearing in both groups. The average distance of household to the nearest extension office is 2.50 km for both insured and non-insured farmers. The average distribution of land is quite same for both insured and non-insured farmers, whereas the average number of livestock kept is greater for insured farmers (5.41) than for non-insured farmers (2.50). Research has also shown that the dominance of males in the study area, as male headed families were more pronounced than female headed families in both insured and non-insured households, indicating that the livestock sector is a labor-intensive job involving predominantly males in business. The demographic characteristics also revealed that agriculture is not the only primary job in the study area. Visits to extension service centers were more common among insured farmers than among non-insured farmer households, where extension visits were not given more importance, indicating that extension visits can increase the likelihood that a farmer is encouraged to insure their livestock. This study also revealed that very few people obtained subsidies, loans and training related to livestock development and insurance. However, the frequency is greater for insured farmers than

for non-insured ones. This finding showed that exposure of farmers to government programs such as subsidies, training and loans increases with the adoption of insurance facilities. The study also revealed that farmers reared improved breeds compared with indigenous breeds, but the number of farmers who reared indigenous breeds was greater than the number who did not practice insurance, i.e., 27, whereas the number of those who practiced insurance, i.e., 11, potentially indicated that, compared with those who reared indigenous breeds, farmers reared improved breeds focused on practicing insurance. Brahmin/Chhetri was the major ethnic group present in the study area, but other ethnic groups were found to be dominant among those who did not practice insurance compared with Brahmin/chhetri.

Table 2. Socio demographic characteristics of the households.

Variables	Characteristics	
	Insured farmer (mean±s.d.)	Non-insured farmer (mean±s.d.)
Size (X ₂)	5.05±2.35	5.60±2.36
Eco_male (X ₃)	1.40±1.04	1.38±0.80
Eco_female (X ₄)	0.85±0.55	1.02±0.65
Education (X ₅)	9.17±3.99	5.48±5.47
Male livestock rearing (X ₆)	0.95±0.47	1.01±0.33
Female livestock rearing (X ₇)	1.20±0.58	1.22±0.56
Experience (X ₈)	16.95±13.31	17.09±13.20
Ln_income (X ₁₂)	12.38±1.02	11.70±1.03
Livestock unit (X ₁₅)	5.41±4.84	3.32±2.10
	Frequency	Frequency
Gender (X₁)		
Male	47 (83.33)	50 (78.33)
Female	13 (16.67)	10 (21.67)
Total	60 (100.00)	60 (100.00)

Continuation Table 2. Socio demographic characteristics of the households.

Variables	Characteristics	
	Insured farmer (mean±s.d.)	Non-insured farmer (mean±s.d.)
Training (X₉)		
Yes	24 (40.00)	5 (8.33)
No	36 (60.00)	55(91.67)
Total	60 (100.00)	60 (100.00)
Loan (X₁₀)		
Yes	19 (31.67)	4 (6.67)
No	41 (68.33)	56 (93.33)
Total	60 (100.00)	60 (100.00)
Subsidy (X₁₁)		
Yes	19 (31.67)	4 (6.67)
No	41 (68.33)	56 (93.33)
Total	60 (100.00)	60 (100.00)
Ethnicity (X₁₃)		
Brahmin	52 (86.67)	22 (36.67)
Others	8 (13.33)	38 (63.33)
Total	60 (100.00)	60 (100.00)
Visit extension center (X₁₄)		
Yes	37 (61.67)	6 (10.00)
No	23 (38.33)	54 (90.00)
Total	60 (100.00)	60 (100.00)
Improved Breed (X₁₆)		
Yes	49 (81.67)	33 (55.00)
No	11 (18.33)	27 (45.00)
Total	60 (100.00)	60 (100.00)
Major occupation (X₁₇)		
Livestock	25 (41.67)	17 (28.33)
Other	35 (58.33)	43 (71.67)
Total	60 (100.00)	60 (100.00)

Note: Figure in parenthesis represents percentage

Production risk faced by the farmers

Table 3 shows various production risks involved in rearing livestock. Among different stated production risks, the incidence of disease ranks first, with an index value of 0.53, followed by the incidence of parasites, with index value of 0.31. Nepali (2021) reported that the frequent occurrence of disease and mortality are major risks in livestock

production. Sahu (2017) and Ghimire et al. (2016) also considered disease, health issues and mastitis as major risks associated with the production of livestock, where the prevalence of disease was mostly in goats and large animals. Devkota et al. (2021) and Acharya et al. (2024) also reported that disease is the major risk for livestock production, followed by the incidence of parasites. Climate risk and limited credit were found to be comparatively less risky than the incidence of disease and parasites, each with an index value of 0.25. Singh and Hlophe (2017) stated that climate factors such as drought and lightening were the major risk factors related to livestock production. Unavailability of the vaccine in time was found to be less risky than other factors, with an index value of 0.23. Research thus shows that there is proper availability of vaccines related to livestock management in most places.

Table 3. Production risk faced by the farmers in the study area.

Production Risk	Indexing	Rank
Diseases	0.53	I
Parasites	0.31	II
Climate Factor	0.25	III
Lack of credit	0.25	III
Unavailability of vaccine	0.23	IV

Risk management strategy adopted by the farmer

Ex-ante risk coping strategies

Figure 1 shows different ex-ante strategies adopted by the farmers to address probable risk during production. The study revealed that almost all of the surveyed respondents used stockpiling of grass and vaccination as major ex- ante risk coping strategies. Ghimire et al. (2016) and Kharel and Dahal (2023) reported that farmers use vaccination as major risk management. A total of 108 out of 120 farmers were found to follow the low-risk low production technology by rearing fewer livestock. Multiple risk coping strategies were found to be adopted by a single

farmer. The diversification of livestock type and breed was not found to be the preferred way to mitigate risk.

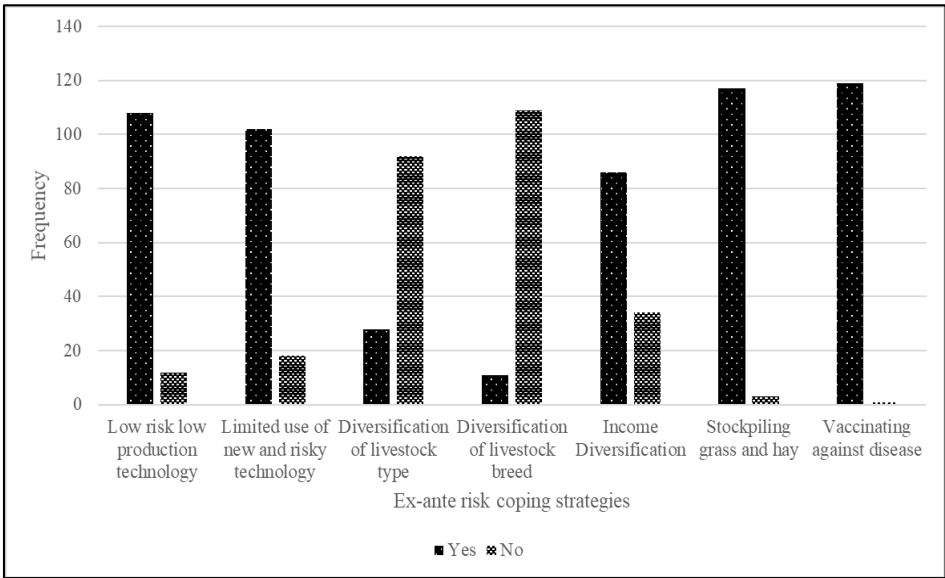


Figure 1. Different ex-ante risk coping strategies adopted by farmers.

Ex-post risk coping strategies

Figure 2 shows different ex-post strategies adopted by the farmers to address probable risk after production. The results revealed that very few farmers practiced risk management strategies. The majority of farmers prefer farm investment as a measure to address potential losses, followed by reducing food consumption and burrowing. None of the farmers practiced selling assets, and very few practiced reliance on external support. Our results are also in line with the research of Moscardi and Janvry (1997), who identified off- farm investment as a major substitute for risk management. Subedi and Kattel (2021b) also found borrowing to be one of the major risk management strategies practiced by dairy farmers.

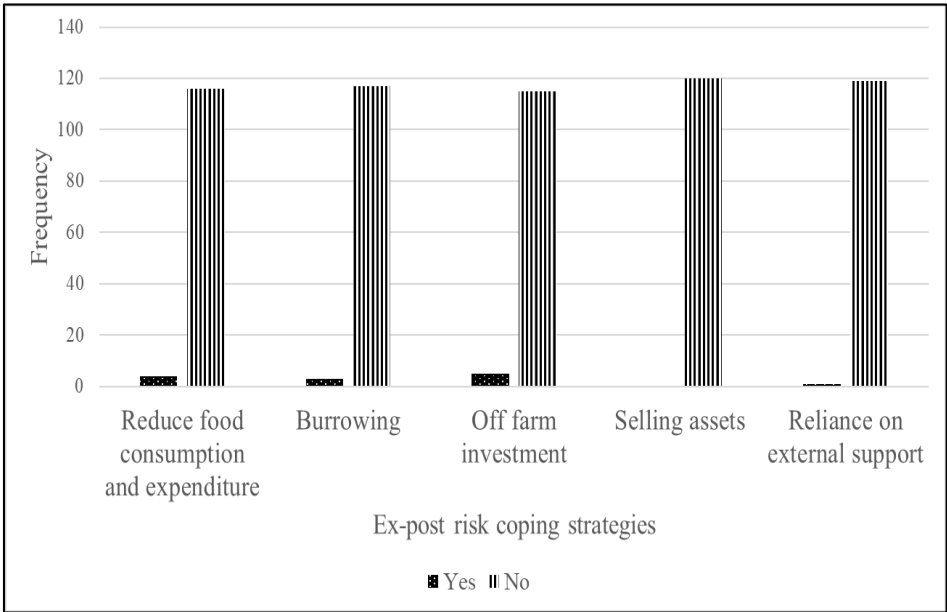


Figure 2. Different ex-post risk coping strategies adopted by the farmers.

Determinants affecting the adoption of livestock insurance

Table 4 shows the logistic regression model used to determine the different factors affecting the adoption of livestock insurance. The LR chi2 value of 98.670 and log likelihood value of -31.760 implied that the model fit significantly and that the independent variable collectively explained the variation in the outcome. The prob>chi2 value of 0.000 also showed that the model is fit and explains the factors affecting the adoption of livestock insurance. The pseudo R² value of 0.608 implied that the independent variables used in the model were able to explain 60.8% of the variation in the adoption of livestock insurance. The results revealed that the presence of economically active male members, the log of income from livestock and the use of improved breeds significantly and positively affected the adoption of livestock insurance at the 10% level of significance. Similarly, the educational status of the household head and livestock unit significantly and positively affects adoption at the 5% level

of significance. Similarly, the ethnicity of the family, i.e., Brahmin/chhetri and visiting extension service centers, also positively and significantly affects adoption at 1% level. In contrast, the presence of economically active female members and experience in livestock rearing significantly but negatively affected the adoption of livestock insurance at 5% level of significance. The results indicate that gender has no role in the adoption of livestock insurance, as an increase in the number of male-headed families or an increase in the number of male or female-headed families did not significantly affect adoption, indicating an equal role in livestock farming for both males and females. Similarly, the size of the family also had no role in the adoption of livestock insurance, as an increase in the number of family members enhanced off-farm employment activities rather than livestock rearing, shifting the focus from livestock to off-farm employment opportunities. Likewise, major occupation as livestock was not found to affect adoption, indicating that all the people were not aware of the insurance and importance of insurance in livestock farming. In addition, some people who were aware of insurance were also found not to focus on insuring, probably because of the complex procedures of insurance and the claim of insured amounts and high premium amounts (Devkota et al., 2021). Training was also found to be insignificant in the adoption of livestock insurance, as most of the training focused on other aspects of livestock production and management, highlighting the need for training focused primarily on insurance and its awareness. This finding was similar to the findings of Devkota et al. (2021), who also did not find any significant relationship between adoption and training. Access to loans was also found to be insignificant, as it depicted that livestock insurance is not significantly affected by access to loans, as insurance programs are open for all farmers whether they are small and marginal and who are risk averse in nature to commercial individuals who are risk takers. These findings are similar to those of Mishra and Singh (2024). The adoption of insurance was also found to be insignificant with receiving subsidies, which means that the subsidy program was not properly aligned with insuring livestock in the

area, which focuses on coordinating the subsidy program with the livestock insurance scheme.

Economically active members of the family

The study revealed that the presence of economically active male members in the family increases the adoption of livestock insurance by 24.2%, but the presence of economically active female members in the family decreases the chances of adoption of livestock insurance by 33.3%. These findings indicate that livestock farming is comparatively labor-intensive and that males are more likely to be involved in productive work than females are. This result was supported by the research of Babalola (2014), who reported that livestock farming is a more male worker-intensive job than a female worker-intensive job.

Education status of the household head (years of schooling)

The results revealed that a one-year increase in education increased the adoption of livestock insurance by 5.3%. Thus, the educational status of the household head had a positive effect on the adoption of livestock insurance. These findings indicate that providing education to household heads increases their willingness to adopt innovation and technology (Darijani, 2017; Carrer et al., 2020; Devkota et al., 2021; Fahad et al., 2018). Akinola (2014) reported that both formal and informal education help farmers be aware of innovation and technology and thus increase the probability of adopting insurance. Education changes ways of thinking and attracting people towards technology and innovation. It makes a person more efficient in thinking, understanding and analyzing about the technology. Acharya et al. (2024) mentioned that an increase in education makes a farmer more conscious about risk and its impact and thus helps the adoption of technology reduce risk. The government of Nepal, thus, in the recent budget speech, allocated the highest budget to the ministry of education, science and technology, i.e., 10.75% (MoF, 2025b). Similarly, Ratnanagar municipality allocated the highest budget for quality education, i.e., 23%, in the fiscal year 2081/82 (Ratnagar Municipality, 2024). This showed

that the government of Nepal also prioritized education for innovation and technology adoption.

Experience in livestock rearing

The results revealed that an increase in experience in livestock rearing significantly decreased the adoption of livestock insurance by 1.7%. This shows that farmers in the study area are more focused and are proficient in using other risk management strategies, such as income diversification, vaccination, the use of low-risk technology, livestock diversification, and off-farm investment, as shown in Figure 1 and Figure 2. This finding shows that experienced farmers are more proficient in reducing risk via multiple technologies (Ugwumba, 2010; Akinola, 2014). However, our results contrast with those of Fahad et al. (2018), who reported that increasing experience increases the adoption of crop insurance.

Natural log of income from livestock production

The results showed that a unit increase in log of livestock income will increase adoption by 18.7%. Thus, there is a positive relationship between income from livestock production and the adoption of livestock insurance (Filson 2009; Masoumi and Khodadadi, 2013). This finding showed that an increase in income motivates a farmer to take more risk by expanding their farm and thus encouraging her to practice livestock insurance. This finding also shows that farmers with higher income from livestock activities can more easily purchase insurance schemes than can those with lower livestock income (Subedi and Kattel, 2021a).

Ethnicity of household head

The results revealed that ethnicity, being Brahmin/chhetri, was positively related to the adoption of livestock insurance. These findings indicate that the presence of Brahmin/chhetri as a major ethnic group increases the probability of adoption of livestock insurance by 67.9%. The results thus clarify that insurance schemes are more pronounced and accessible to Brahmin/chhetri, who are considered to be the upper ethnic

group in society, than others. The results revealed that household heads with Brahmin/chhetri ethnicity had a higher average education level (8.95 years) than did those with other ethnicities (4.70). Additionally, families with Brahmin/chhetri ethnicity had more access to extension service centers (79.07%) than other families did (20.93%). Similarly, families with Brahmin/chhetri ethnic groups rear more livestock (5.54 livestock units) than other families do (2.53 livestock units). All these factors were found to significantly and positively affect the adoption of livestock insurance. Thus, the results also indicate the need for programs related to insurance and other improved technologies for indigenous and ethnic groups in addition to Brahmin/chhetri.

Visits to extension service centres

The results revealed that visits to extension service centres were positively related to the adoption of livestock insurance. The results revealed that farmers who visited extension service centres had a 52.9% greater probability of receiving livestock insurance than did those who did not visit such centres. Visiting an extension service centre that is aware of the farmer's new and promising technology and innovation and thus motivates a farmer to adopt the technology. Similarly, it is also aware that the farmer is aware of insurance, the benefits of insurance and its coverage and thus motivates the farmer to adopt it. Fahad et al. (2018) also reported that increasing access to extension services increases the adoption and dissemination of new technologies and insurance. This finding was also supported by Falola et al. (2013), Nahvi et al. (2014), Mohammed and Ortmann (2005) and Kumar et al. (2011), who stated that access to agriculture extension contact positively influences farmers' willingness to adopt insurance schemes. Nepali (2021) also stated that limited access to information for the farmer limits the adoption of livestock insurance.

Total livestock unit

The total number of livestock units was found to positively influence the adoption of livestock insurance. The table shows that an increase in livestock units increases the probability of adoption by 3.3%. The results indicate that an increase in the total number of herds increases the probability of adoption of livestock insurance. An increase in the total livestock population also increases the risk of management and thus encourages farmers to better prepare for the worst situation, thus increasing their motivation for livestock insurance. On the other hand, an increase in herd size means that farmers are doing well from livestock and thus will be willing to accept more risk in anticipation of future income and thus practise livestock insurance. Subedi and Kattel (2021a), Acharya et al. (2024) and Kandel and Timilsina (2018b) also stated that increases in herd size and cattle number increase the probability of adoption of livestock insurance.

Improved breed of livestock

The results revealed, rearing improved breeds increases the likelihood of adopting livestock insurance by 45.2% compared to indigenous breeds. The reason is obvious, as improved breeds cost more and demand improved technology than indigenous (Dangi, 2022). This increases the risk of rearing and likely increases profits. An increase in the risk of rearing increases a farmer's willingness to insure livestock. A higher profit, on the other hand, will also increase a farmer's ability to pay for risk premium and thus adopt livestock insurance (Devkota et al., 2021). This finding was supported by the study of Subedi and Kattel (2021a), who reported that improved cattle breeds increased the adoption of livestock insurance.

.

Table 4. Determinants affecting the adoption of livestock insurance.

Variables	Coef.	Std. Err.	p-value	dy/dx	Std. Err.
Gender (X ₁)	0.977	0.923	0.290	0.237	0.209
Size (X ₂)	-0.211	0.244	0.386	-0.053	0.061
Eco_male (X ₃)	0.970*	0.587	0.098	0.242	0.147
Eco_female (X ₄)	-1.336**	0.650	0.040	-0.333	0.163
Education (X ₅)	0.214**	0.0856	0.012	0.053	0.021
Male livestock Rearing (X ₆)	0.013	0.348	0.969	0.003	0.087
Female livestock Rearing (X ₇)	1.369	0.858	0.110	0.341	0.214
Experience (X ₈)	-0.069**	0.032	0.032	-0.017	0.008
Training (X ₉)	2.122	1.344	0.114	0.448	0.207
Loan (X ₁₀)	1.689	1.279	0.187	0.369	0.218
Subsidy (X ₁₁)	1.833	1.412	0.195	0.391	0.226
Ln_income (X ₁₂)	0.749*	0.400	0.061	0.187	0.100
Ethnicity (X ₁₃)	3.351***	1.042	0.001	0.679	0.133
Visit_extension (X ₁₄)	2.453***	0.798	0.002	0.529	0.131
Total_livestock_unit (X ₁₅)	0.135**	0.059	0.022	0.033	0.015
Improved (X ₁₆)	1.982*	1.076	0.065	0.452	0.200
Major occupation (X ₁₇)	0.627	0.824	0.447	0.154	0.197
constant	-	5.757	0.006	-	-
	15.813***				
Predicted Probability	0.525				
log likelihood	-31.760				
LR chi2	98.670				
Prob>chi2	0.000				
Pseudo R2	0.608				

*Note: ***, ** and * represents data are significant at 1%, 5% and 10% level of significance.*

Conclusion and Recommendations

Livestock farming is an integral and important part of Nepalese agriculture. It contributes well to the national GDP and agricultural GDP. However, due to the high operating costs of businesses and biological enterprises, they face considerable risks over time. Thus, insurance is one of the major tools used to address the different types of risk associated with livestock production. The government of Nepal, through the Agriculture, livestock and medicinal herb insurance directive, has provided different insurance schemes related to livestock production in subsidized form in 2022; thus, the trend toward insurance in Nepal is increasing, but the results are not satisfactory. Therefore, this study aimed to analyze the different factors affecting the adoption of livestock insurance.

Studies have shown that livestock farming is one of the different major sources of income in the area, with a major occupation of approximately 35% of the population. As a major occupation, it faces different risks, such as disease, parasites and climatic change. Farmers preferred vaccination against different diseases, the use of low production, less risky technology, income diversification, stockpiling hay and off farm investment as major risk coping strategies to address risk. Economically active male members, the log of income from livestock, use of improved breeds, educational status of the household head, livestock unit, ethnicity of the family being Brahmin/chhetri and visit to an extension service centre were found to be positively related to the adoption of livestock insurance, whereas the presence of economically active female members and experience in livestock rearing were found to be negatively related to the adoption of livestock insurance.

The study revealed that the education level of household heads in insurer families is secondary to the primary level of education in the case of non-insurers. Thus, both formal and informal education play important roles in the adoption of technology. Government programs focusing on formal education are valuable in this area, but programs related to informal education, such as adult learning, agribusiness schools and training, need to be prioritized to include illiterate or less literate groups.

It helps farmers focus on the adoption of modern technologies and innovations rather than on low production, low-risk technologies and income diversification. The importance of government extension service centers is also evident in the study, potentially indicating the prioritization of farmer contact with the government and nongovernmental organizations for technology adoption. A comprehensive package that not only provides government related support but also, at present, is aware of the importance of these programs needs to be developed. Moreover, public programs focusing on providing improved breeds of livestock are seen as necessary. This type of program can be launched under a subsidy scheme of 50–50%, where 50% can be funded by the government and 50% by individual beneficiaries. This not only increases the adoption of insurance but also increases the associated profit of the farm household.

Acknowledgment

The authors acknowledge the farmer respondent, Shikhar insurance company private limited, insurance agent and officers from Ratnanagar municipality who helped during the process of data collection and analysis. The authors also acknowledge Paklihawa Campus, Institute of Agriculture and Animal Science, Tribhuvan University, Rupandehi, Nepal, for providing a suitable environment for conducting research.

Literature Cited

- Acharya, S., Tiwari, U., Kattel, R. R., & Dhakal, S. C. (2024). Willingness to pay for livestock insurance by dairy farmers in Kavrepalanchowk district, Nepal. *Cogent Food & Agriculture*, 10(1), 2298530. doi: 10.1080/23311932.2023.2298530
- Akinola, B.D. (2014). Determinants of Farmers' Adoption of Agricultural Insurance: The Case of Poultry Farmers in Abeokuta Metropolis of Ogun State, Nigeria. *British Journal of Poultry Sciences* 3 (2): 36-41.

Alexandratos, N., & Bruinsma, J. (2012). World agriculture towards 2030/2050: The 2012 revision. Rome: FAO.

Babalola, D. A. (2014). Determinants of farmers' adoption of agricultural insurance: The case of poultry farmers in Abeokuta Metropolis of Ogun state, Nigeria. *British Journal of Poultry Sciences*, 3(2), 36–41. doi: 10.5829/idosi.bjps.2014.3.2.83216

Carrer, M. J., Silveira, R. L. F. D., Vinholis, M. D. M. B., & De Souza Filho, H. M. (2020). Determinants of agricultural insurance adoption: Evidence from farmers in the state of São Paulo, Brazil. *RAUSP Management Journal*, 55(4), 547–566. doi: 10.1108/RAUSP-09-2019-0201

Dangi, S., (2022). Overview of Livestock Insurance in Nepal. *Academia Letters*. doi: 10.20935/al5977

Darijani, Ali. (2017). Factors Affecting the Adoption of Agricultural Insurance and Providing the Sustainable and Unsustainable Insurance Model. *Agricultural Economics*, 11(2), 1-20. doi: 10.22034/iaes.2017.27086

Devkota, D., Ghimire, Y. N., Timsina, K. P., Subedi, S., & Poudel, H. K. (2021). Determinants of livestock insurance adoption in Nepal. *Cogent Food & Agriculture*, 7(1), 1952012.

DoLS. (2023). Livestock and fisheries statistics of Nepal 2079/80 (2022/23). Harihabhawan, Lalitpur, Nepal: Livestock Statistics Management and Economic Analysis Section.

- Fahad, S., Wang, J., Hu, G., Wang, H., Yang, X., Shah, A. A., Huong, N.T.L., & Bilal, A. (2018). Empirical analysis of factors influencing farmers crop insurance decisions in Pakistan: Evidence from Khyber Pakhtunkhwa province. *Land use policy*, 75, 459-467.
- Falola, A., Ayinde, O. E., & Agboola, B. O. (2013). Willingness to take Agricultural Insurance by Cocoa farmers in Nigeria. *International Journal of Food and Agricultural Economics*, 1(1), 97-107.
- FAO. (2018). *The future of food and agriculture: alternative pathways to 2050*. Rome, Italy: Food and Agriculture Organization of the United Nation
- Filson, G. C., Sethuratnam, S., Adekunle, B., & Lamba, P. (2009). Beneficial management practice adoption in five southern Ontario watersheds. *Journal of Sustainable Agriculture*, 33(2), 229-252.
- Gbigbi, T. M. & Ndubuokwu, G. O. (2022). Determinants of agricultural insurance patronage among crop farmers in Delta north agricultural zone, Delta State, Nigeria. *Ege Univ. Ziraat Fak. Derg.*, 59 (2), 235-248. doi: 10.20289/zfdergi.883004
- Ghimire, Y., Timsina, K., Kandel, G., Thapa Magar, D., Gautam, S., & Sharma, B. (2016). *Agriculture Insurance in Nepal: Case of Banana and Livestock Insurance*. doi: 10.13140/RG.2.1.4767.6403
- GIZ, MEFIN Network, & Beema Samiti. (2020). *Nepal agricultural insurance: Country experience factsheet*. Retrieved from <https://mefin.org/docs/Nepal Agricultural Insurance Country Experience Factsheet.pdf>

GoN. (2023). National Sample Census of Agriculture Nepal 2021/22. Kathmandu: National Statistics Office.

Gujrati, D.N., & Porter D.C. (2009). *Basic econometrics*. (5th ed.) New York: McGraw-Hill/Irwin.

Herrero, M., Thornton, P. K., Gerber, P., & Reid, R. S. (2009). Livestock, livelihoods and the environment: understanding the trade-offs. *Current Opinion in Environmental Sustainability*, 1(2), 111-120.

Insurance Board. (2021). *Agriculture and Livestock Insurance Report, 2021*, Kupandol, Lalitpur.

Insurance Board. (2022). *Agriculture, Livestock and Medicinal Herb Insurance Directives, 2022*, Kupandol, Lalitpur.

Kandel, G., & Timalisina, R. (2018a). Farmers' awareness and perception about livestock insurance: A case from Nawalparasi District of Nepal. *ACTA Scientific Agriculture*, 3, 117- 121.

Kandel, G., & Timalisina, R.H. (2018b). Factors affecting the adoption of livestock insurance by dairy farmers in Nawalparasi District, Nepal. *Nepalese Journal of Agricultural Sciences*, 16, 59-67.

Kharel, S., & Dahal, S. (2023). Study of Livestock Production System and Management Practices Adopted by Small Ruminants Farmers in Bagmati Province, Nepal. *Nepalese Journal of Agricultural Sciences*, 25, 259-275.

Kothari, C.R. (1990). *Research methodology: Methods and techniques*. New Delhi, India: New Age International (P) Ltd.

- Kumar, D. S., Barah, B. C., Ranganathan, C. R., Venkatram, R., Gurunathan, S., & Thirumoorthy, S. (2011). An analysis of farmers' perception and awareness towards crop insurance as a tool for risk management in Tamil Nadu. *Agricultural Economics Research Review*, 24(1), 37-46.
- Masoumi, S.R. & Khodadadi, T.H. (2013). Factors influencing on demand of insurance in agricultural sector of Behshahr County, Mazandaran, Iran. *Technical Journal of Engineering and Applied Science*, 3(19), 2376-2382.
- Meuwissen, M. P. M. (2000). *Insurance as a risk management tool for European agriculture*. Wageningen University and Research.
- Mishra, B. P., & Singh, O. P. (2024). Determinants of Livestock Insurance Adoption by Dairy Cattle Farmers of Nawalpur District, Nepal. *NPI Journal of Science and Technology*, 1, 14-30.
- MoALD. (2024). *Statistical Information of Nepalese Agriculture 2022/23*. Singhadurbar, Kathmandu: Planning and Development Cooperation Coordination Division.
- MoF. (2025a). *Economic survey 2024/25*. Singhadurbar, Kathamandu: Ministry of Finance.
- MoF. (2025b). *Budget speech of fiscal year 2082/83*. Singhadurbar, Kathamandu: Ministry of Finance.
- Mohammed, M. A., & Ortmann, G. F. (2005). Factors influencing adoption of livestock insurance by commercial dairy farmers in three zobatat of Eritrea. *Agrekon*, 44(2), 172-186.

- Moscardi, E., & de Janvry, A. (1977). *Attitudes toward risk among peasants: An econometric approach*. *American Journal of Agricultural Economics*, 59(4), 710–716.
- Nahvi, A., Kohansal, M.R., Ghorbani, M., & Shahnoushi, N. (2014). Factor affecting rice farmers to participate in agricultural insurance. *Journal of Applied science and Agriculture*, 9, 1525-1526
- Nepali, B. (2021). Farmers' perception on status of livestock insurance in Surkhet district, Nepal. *Journal of Agriculture and Natural Resources*, 4(2), 111-123.
- Nugrahaini, A.D., Masyhuri, M., & Suryantini, A. (2021). Determinant factors for cattle insurance as a risk management strategy. *Agriekonomika*, 10(1), 113–124. doi: 10.21107/agriekonomika.v10i1.10147
- Pant, P. K., Dutta, J. P., Kattel, R. R., & Dhungana, S. M. (2019). Farmer's Willingness to Pay for Insurance in Chitwan District, Nepal. *Journal of Agriculture and Environment*, 20, 93-99. doi: 10.3126/aej.v20i0.25036
- Petrović, M., Tomić, V., Radišić, R., & Ljiljanić, N. (2020). Analysis of Insurance in Agriculture of the Republic of Serbia in the Period 2009-2018. *Western Balkan Journal of Agricultural Economics and Rural Development (WBJAERD)*, 2(2), 99-109.
- Ratnagar Municipality. (2024). Annual Municipal Development Plan Booklet 2024/25. Retrieved from <https://ratnanagarmun.gov.np/sites/ratnanagarmun.gov.np/filesfinal.pdf>

- Sahu, D. (2017). Economic analysis of Livestock insurance scheme as a risk management tool in Bhanjanagar sub division of Ganjam district in Odisha. *Krishikosh*. Retrieved from <http://krishikosh.egranth.ac.in/handle/1/5810035868>
- Singh and Hlophe. (2017). Factors affecting adoption of livestock insurance: a case study of livestock farmers in Manzini Region, Swaziland. *Research Journal of Agriculture and Forestry Sciences*, 5(8), 6-14.
- Subedi, S., & Kattel, R.R. (2021a). Determining factors and impact of household income on dairy cattle insurance in Nepal. *Journal of Agriculture and Forestry University*, 5, 229-238.
- Subedi, S., & Kattel, R.R. (2021b). Farmers' perception and determinants of dairy cattle insurance in Nepal. *Cogent Food & Agriculture*, 7, 1911422. doi: 10.1080/23311932.2021.1911422
- Ugwumba, C.O., Okoh, R.N., Ike, P.C., Nnabuiife, E.L.C., & Orji, E.C. (2010). Integrated farming system and its effect on farm cash income in Awka South agricultural zone of Anambra state, Nigeria. *American-Eurasian J. Agric. & Environ. Sci.*, 8(1), 01-06.
- VHLSEC. (2023). Annual book fiscal year 2021/22. Bharatpur, Chitwan. Retrieved from vhlsecchitwan.bagamati.gov.np/publication/
- Yamane, T. (1967). *Statistics: An introductory analysis* (2nd ed.). Harper & Row.