OPEN ACCESS Int. J. Agr. Ext. 14 (01) 2026. 15-23 DOI:-10.33687/ijae.014.01.6021

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Available Online at EScience Press

International Journal of Agricultural Extension

ISSN: 2311-6110 (Online), 2311-8547 (Print)

https://esciencepress.net/journals/IJAE

DETERMINANTS OF ADOPTION OF PADDY CROP INSURANCE SCHEMES: EMPIRICAL EVIDENCE FROM CHITWAN AND BARDIYA DISTRICTS OF NEPAL

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ARTICLE INFO

Article History

Received: October 20, 2025

Revised: January 26, 2026

Accepted: February 25, 2026

Keywords

Adoption

Determinants

Insurance

Paddy

Risk management

ABSTRACT

Paddy is an important crop from an economic and food security perspective in Nepal. Despite its importance, the adoption of the paddy crop insurance policy remains low. The study districts were purposively selected on the basis of official data from the Department of Agriculture, Nepal, as the highest insured of paddy crop among all the districts in fiscal year 2021/22. This study investigates the key factors affecting the uptake of the paddy crop insurance scheme using survey data from the Chitwan and Bardiya districts of Nepal. The survey comprised a total of 460 randomly selected farmers, representing equal numbers from each of the insured and non-insured categories. A semi-structured interview schedule was used to collect primary data due to differences in farmers' literacy levels and knowledge of insurance terminologies, and to obtain precise responses. SPPS and Stata software were used for data analysis. The logistic regression results showed that farmers' knowledge of insurance (*OR= 47.558, p < 0.001*) significantly increased the likelihood of insurance adoption, where receiving information through institutional channels and trusted institutional networks is seen to be noticeably increasing the probability of adoption of paddy insurance schemes. In contrast, factors such as age (*p = 0.926*), gender (*p = 0.625*), ethnicity (*p = 0.513*), education (*p = 0.069*), and occupation (p = 0.571) were not statistically significant at the 0.05 level and therefore did not significantly influence the adoption of insurance. Enhancing farmers' awareness programs and using trusted local communication channels can be effective in expanding paddy insurance uptake and strengthening resilience against farming risks.

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INTRODUCTION

Agriculture remains the backbone of Nepal's socio-economic system, providing employment to nearly two-thirds of the labor force and contributing significantly to the national economy (Pradhan, 2023). Despite gradual structural transformation, the sector still accounts for about 24.1% of the national Gross Domestic Product (GDP), reflecting its central role in livelihoods and food security (MoF, 2024). Beyond subsistence, agriculture plays a vital role in rural development and poverty reduction. Within the broader agricultural sector, cereals dominate production, and among them, paddy holds a particularly important position due to its socio-cultural, nutritional, and economic significance (Ministry of Agriculture and Livestock Development & Food and Agriculture Organization, 2020). Paddy is the staple food crop of Nepal, supplying more than 40% of the total calorie intake of the population (MoALD, 2023) and

nearly one-fifth of the agricultural GDP. Its cultivation has been rooted in Nepal's farming traditions for centuries, with its origin traced to the southern slopes of the Himalayas (Poudel and Bhandari, 2017). Currently, paddy is cultivated across all three ecological regions, but more than 70% of total production comes from the Terai, especially high-potential districts such as Chitwan and Bardiya (FAO, 2021). These districts are often described as the "rice baskets" of the country, contributing both to local consumption and domestic market supply. Thus, paddy cultivation is directly linked to national food security, household nutrition and rural income.

However, paddy farming in Nepal faces increased risks and uncertainties. Nepal's fragile ecological setting, combined with rising climatic variability, has made agriculture highly vulnerable to both biophysical and socio-economic shocks. In recent years, farmers have experienced more frequent floods, droughts, erratic and untimely rainfall, hailstorms, and pest outbreaks, events that have severely affected rice yields (MoFE, 2021). For instance, erratic monsoon rains have repeatedly led to severe yield losses in paddy, while prolonged droughts have resulted in disrupted and delayed transplanting, leading to reduced harvests. Similarly, floods in Terai districts such as Bardiya and Chitwan frequently damage large areas of standing rice crops, leaving farmers with substantial financial losses. Studies have documented significant yield fluctuation in cereals such as rice, maize, and wheat as a result of climate-induced stresses (Nayava and Gurung, 2010). Such persistent risks discourage long-term investment and undermine efforts to modernise agriculture.

In this context, crop insurance has emerged as an important risk management tool. Globally, agricultural insurance helps farmers reduce production risks, stabilise income, and invest in improved agricultural technologies. There are examples of some countries where agriculture insurance has successfully been implemented, including the United States (Agriculture Risk Protection Act, 2000), the Pradhan Mantri Fasal Bima Yojana in India (Global Agriculture, 2024), government-subsidized crop insurance programs in China (Hua and Yang, 2023), and index-based insurance schemes in Kenya and Rwanda (World Bank, 2015). For developing countries like Nepal, where agriculture is dominated by smallholder and subsistence farmers, insurance is essential for protecting rural livelihoods and enhancing resilience against climate-related shocks. Recognising this, the Government of Nepal introduced a subsidised crop and livestock insurance program in 2013 (MoAD, 2013). Under this scheme, farmers receive a subsidy of up to 75% of the insurance premium to encourage participation, reduce vulnerability, and support agricultural commercialisation.

Despite such policy efforts, the adoption of agricultural insurance in Nepal, including in rice, remains low. Recent statistics show that only about 4% of households are enrolled in agricultural insurance (CBS, 2023). Moreover, the coverage is heavily skewed: livestock accounts for 93.3% of total insured products, while crops represent only 6.7% (NIA, 2024). Even though paddy is the most widely cultivated and vulnerable crop, its insurance coverage remains limited. Several factors explain this slow uptake. Several reasons explain this low uptake. Farmers often lack awareness of insurance schemes, and information dissemination has been limited to a few farmer groups and geographic areas. In addition, complex procedures for premium payment and claim settlement, limited institutional trust, and weak extension support further discourage participation (Das, 2024).

Social and economic determinants further determine the adoption decisions. Prior research suggests that variables such as age, education, caste, gender, farm size, income level, cooperative membership, access to extension services, and past experiences with crop loss influence the willingness to adopt crop insurance (Timilsina, 2018; Swain and Hembram, 2020; Awasthi and Godara, 2025; Mlyuka et al., 2024). For example, farmers with higher education levels and better institutional support are more likely to understand and accept insurance as a risk management tool. Conversely, marginalised households often remain excluded due to a lack of access and financial constraints.

Therefore, understanding the determinants of the adoption of crop insurance is crucial for improving its effectiveness. It is particularly important in the case of paddy, given its overwhelming importance for food security and its high exposure to climatic shocks. The low adoption of paddy crop insurance in Nepal highlights a policy-research gap: while the scheme exists, the factors driving or hindering farmers' participation are not well-understood at the local level.

Against this backdrop, the present study examines the determinants of paddy crop insurance adoption in

Chitwan and Bardiya districts, two major rice-producing areas with high climatic vulnerability. These areas not only represent high paddy productivity but also high exposure to floods and droughts, making them appropriate for assessing adoption dynamics. By analyzing socioeconomic, demographic, and institutional variables, the study aims to identify the key drivers and barriers to adoption. The findings are expected to offer useful insights for improving insurance schemes, enhancing farmer participation, and strengthening agricultural resilience. Ultimately, the research contributes to the broader discourse on risk management and food security in Nepal.

The research question focused on how the socio-economic and institutional factors affect the uptake of insurance. The objective of this study is to identify the key factors influencing farmers' adoption of paddy insurance in the study areas. Besides, agricultural insurance is a major mechanism for administering agricultural risks and uncertainty; the involvement of farmers has been low after the implementation of ten years in Nepal. Therefore, this study is motivated to explore factors that influence the farmers' decision to adopt a paddy insurance scheme.

METHODOLOGY

Crop and Study Area Selection

Paddy crop was selected for study due to its importance as the staple food of Nepal, contributing significantly to national food security and accounting for nearly one-fifth of agricultural GDP. It contributes more than 40% of the daily calorie intake of the Nepalese population (NPC, 2020; MoALD, 2023). This study was conducted in two major paddy-producing Bardiya and Chitwan districts of Nepal, which ranked 13th and 15th in terms of paddy production (MoALD, 2023). Geographically, the Chitwan district lies in the Bagmati Province in the mid-east part of Nepal. It is characterised by fertile inner Terai plains surrounded by forested hills. Agriculture, livestock, agro-industries, and tourism are the major livelihood activities in this district. Paddy is the staple food crop and grows during both spring and rainy seasons (ADO, 2022).

Similarly, Bardiya district lies in Lumbini Province in the western Terai. Paddy is a major crop of Bansgadhi Municipality and plays a crucial role in household food security and income. However, in both districts, paddy productivity has been affected by climatic fluctuations, floods, droughts, disease and pest outbreaks, leading to recurring yield losses (Bansgadhi Municipality, 2017).

The local bodies of Madi Municipality, Khaireni Municipality, and Bharatpur Metropolitan City in Chitwan, and Bansgadhi Municipality in Bardiya were purposively selected because these areas recorded the highest number of insured paddy crops in fiscal year 2021/22 (DoA, 2022).

Population and Sample Size

For the sample collection, a total of 11 wards (6 from Bardiya district and 5 from Chitwan district) along with 4 local bodies (3 from Chitwan and 1 from Bardiya) were selected. Wards with fewer than 10 insured households were omitted from the study. The sample size for the remaining wards had been framed and proportionately calculated. The study population consisted of all paddy farming households with or without crop insurance in the selected local bodies.

The sampling frame was prepared using the list of insured paddy farmers from the Department of Agriculture of fiscal year 2021/22. Two categories of respondents were considered: insured and non-insured farmer households. The sample size was determined by using Cochran's (1977) formula with 95% confidence level. A total of 460 respondents (230 insured and 230 non-insured) were selected. Moreover, 125 and 105 insured and equal numbers of non-insured sample sizes were determined for Chitwan and Bardiya districts, respectively.

Sampling and Data Collection

A simple random sampling approach was applied for selecting the individual respondents for the household interviews. Primary data were collected using structured and semi-structured questionnaires due to differences in farmers' literacy levels and knowledge of insurance terminologies, and to obtain precise responses.

To validate household-level information, farmers' group discussions and key informants' information were also conducted in both study areas. Secondary data were collected from relevant publications of governmental organizations, journals and books.

Data Analysis

This study followed a descriptive, exploratory, and explanatory research design. Data were initially coded and tabulated in MS Excel, then analysed using SPSS and

Stata. Descriptive statistics (frequencies, means and percentages) were used to summarize the characteristics of insured and non-insured farmers. Composite index and scaling techniques were used for perception-based variables.

To examine the relationship between variables, Chi-square tests and a binary logit regression model were used. A binary logit model was used to calculate the probability of paddy insurance adoption, as specified below.

$$\text{Logit}(p) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_n X_n$$

where Logit (p) is the log odds of the dependent variable taking the value 1 (the probability of success), X_n is the vector of explanatory variables, and β_n represent coefficients of the independent variables.

β1, β2, ..., βn represent coefficients of the independent variables X1, X2, ..., Xn

X1, X1, …. Xn represent independent variables.

X1 = Age
X2 = Gender
X3 = Ethnicity
X4 = Education
X5 = Knowledge
X6 = Awareness,
X7 = Involvement in organization
X8 = Training received
X9 = Awareness on insurance covered
X10 = Risk management strategy
X11 = Insurance company as source of information
X12 = Insurance agent as source of information
X13 = Agriculture technician as source of information
X14 = Cooperative as source of information
X15 = Primary occupation of respondent
X16 = Insurance agent as a medium of information
X17= Agriculture technician as a medium of information, and
n = n^{th} independent variable.

Odds ratio (OR) tells how much more or less likely an event is to occur in one group compared to another. Therefore, in logistic regression, it measures the multiplicative effect of a unit change in an explanatory variable on the odds of the outcome. The formula which is used to calculate the odds ratio is as follows:

$$OR = e^{\beta}$$

Where;

β is the estimated coefficient from the logistic regression. Interpretation: A one-unit increase in the explanatory variable multiplies the odds of the outcome by eβ.

RESULTS

Socio-demographic characteristics of respondents

Table 1 summarizes the socio-demographic and institutional characteristics of respondents from Chitwan and Bardiya districts. Male respondents constituted the majority in both districts, accounting for 66.8% in Chitwan and 62.38% in Bardiya, with no statistically significant difference. The age of respondents ranged from 20 to 86 years, with an overall mean of 49.6 years, representing that most respondents were middle-aged.

Ethnic composition varied among the districts. Chitwan had a higher percentage of Brahmin respondents at 37.6% and Chhetri participants at 24.4%. In contrast, Bardiya had a majority of Janajati ethnic groups at 73.33%. Literacy rates were higher in Chitwan at 86.4% compared to Bardiya's 60.48%. Chitwan also had a larger percentage of people with higher education.

Farming was the primary occupation for most respondents (88.4% in Chitwan; 84.76% in Bardiya), while Bardiya had a higher share of daily wage labourers as a secondary occupation (18.10%). Insurance participation was evenly distributed, with 50% insured and 50% non-insured across both districts.

Institutional engagement varied between districts. Organisational membership was higher in Chitwan (70.4%) than in Bardiya (42.86%), and more farmers in Chitwan had received agricultural training (35.6% vs. 20.48%). Very few respondents in either district received subsidies directly from government agencies in other activities of agricultural practices, but all insured respondents of paddy crop obtained 80 percent of subsidy on premium from federal government, although Chitwan had a higher proportion of farmers receiving support from Agricultural Knowledge Centers (AKC), Agriculture Development Offices (ADO), and local governments (30.4% vs. 4.76% in Bardiya).

Farming experience ranged widely, from 1 to 60 years in Chitwan and 2 to 55 years in Bardiya. Average land under paddy was 2.069 ha in Chitwan and 1.588 ha in Bardiya**,** indicating relatively larger landholdings among Chitwan farmers. Overall, these results show notable heterogeneity in socio-demographic, occupational, and institutional characteristics between the two districts.

Table 1. Socio-demographic Characteristics of Respondents.

Variables	Category	Districts		χ^2 / t-value
		Chitwan (n=250)	Bardiya (n=210)	
Gender	Male	167 (66.8)	131 (62.38)	0.977
	Female	83 (33.2)	79 (37.62)	
Age (in years)	Min =20	Min = 24	Min = 20	
	Max = 86	Max = 86	Max = 73	
	$\bar{x}$ = 49.59	$\bar{x}$ = 51.60	$\bar{x}$ = 47.18	
	σ = 11.98	σ = 12.00	σ = 11.53	
Insurance	Insured	125 (50)	105 (50)	
	Non-insured	125 (50)	105 (50)	
Involvement in the organization	Yes	176 (70.4)	90 (42.86)	35.502*
	No	74 (29.6)	120 (57.14)	
Training received	Yes	89 (35.6)	43 (20.48)	12.758*
	No	161 (64.4)	167 (79.52)	
Local level respondents	Khairahani	210 (84)	0 (0)	
	Madi	26 (10.4)	0 (0)	
	Bharatpur	14 (5.6)	0 (0)	
	Bansgadi	0 (0)	210 (100)	
Ethnicity	Bhramin	94 (37.6)	5 (2.38)	115.74*
	Chhetri	61 (24.4)	35 (16.67)	
	Janajati	73 (29.2)	154 (73.33)	
	Dalit	14 (5.6)	7 (3.33)	
	Madheshi	8 (3.2)	9 (4.29)	
Educational level	Illiterate	34 (13.6)	83 (39.52)	42.920*
	Only read and write	110 (44)	66 (31.43)	
	Less than SLC	66 (26.4)	43 (20.48)	
	Intermediate level	28 (11.2)	15 (7.14)	
	Bachelors level	10 (4)	3 (1.43)	
Occupation (Primary)	Farming	221(88.4)	178 (84.76)	10.157
	Government job	6 (2.4)	10 (4.76)	
	Daily wages	2 (0.8)	9 (4.29)	
	Job at private sector	8 (3.2)	5 (2.38)	
	Foreign employment	4 (1.6)	4 (1.9)	
	Business	7 (2.8)	2 (0.95)	
	Others	2 (0.8)	2 (0.95)	
Occupation (secondary)	Farming	32 (12.8)	50 (23.81)	
	Government job	2 (0.8)	9 (4.29)	
	Daily wages	0 (0)	38 (18.10)	
	Job at private sector	6 (2.4)	8 (3.81)	
	Foreign employment	5 (2)	10 (4.76)	
	Business	5 (2)	11(5.24)	
	Others	2 (0.8)	2 (0.95)	
Received subsidy	Yes	76 (30.4)	10 (4.76)	49.354*
	No	174 (69.6)	200 (95.24)	
Farming experience (in years)	Min= 1	Min= 1	Min= 2	
	Max= 60	Max= 60	Max= 55	
	$\bar{x}$ = 23.83	$\bar{x}$ = 22.93	$\bar{x}$ = 24.90	
	σ =12.91	σ =13.22	σ =12.47	
Land under paddy cultivation (ha)	Min= 0.07	Min= 0.07	Min= 0.12	
	Max= 4.06	Max= 4.06	Max= 3.05	
	$\bar{x}$ = 2.06	$\bar{x}$ = 2.06	$\bar{x}$ = 1.58	
	σ = 1.15	σ = 1.15	σ = 0.84	

Source: Field survey, 2023. Note: Figures in parentheses represent percentages. Significance levels: $p < 0.10$ (*), $p < 0.05$ (**), $p < 0.01$ (***).

Factors Influencing the Adoption of the Paddy Crop Insurance Scheme

Table 2 provides an overview of logistic regression analysis that concluded that knowledge of insurance (OR= 47.558, $p < 0.001$) significantly improved the likelihood of insurance adoption. Likewise, receiving information through institutional channels such as cooperatives (OR= 1160.331), insurance agents (OR = 70.933), agricultural technicians (OR = 80.493), and insurance companies (OR= 27.661) noticeably increased the probability of adoption. Marginal significance was observed for risk management strategy (OR=18.719, p= 0.087) and organisational involvement (OR = 0.338, p = 0.090), indicating a possible influence at the 10% level. Conversely, demographic variables, including age, gender, ethnicity, education, and occupation, were not statistically significant predictors of insurance adoption. Likewise, training and general awareness did not show a significant effect in the model. Overall, the results indicate that informational and institutional factors exert a stronger influence on insurance adoption compared to socio-demographic characteristics.

Table 2. Logit regression outcomes of factors that influences the paddy crop insurance.

Predictor Variable	β	Odds Ratio (e^{β})	Standard Error	z-value	p	95% Confidence Interval (OR)
Age of Respondent	-0.0031	0.997	0.033	-0.09	0.926	[0.935 – 1.064]
Gender of respondent (Female=1)	-0.327	0.721	0.481	-0.49	0.625	[0.195 – 2.669]
Ethnicity of respondent (Ref: Base cat.)	-0.206	0.814	0.257	-0.65	0.513	[0.439 – 1.509]
Education of respondent (Years/level)	-0.563	0.569	0.176	-1.82	0.069	[0.310 – 1.044]
Knowledge on insurance	3.862	47.558	42.194	4.35	0.000	[8.357–270.655]
Awareness on insurance	1.520	4.578	9.875	0.71	0.481	[0.067–313.884]
Involvement in the organization	-1.085	0.338	0.216	-1.70	0.090	[0.096 – 1.183]
Training received	-1.128	0.323	0.229	-1.60	0.110	[0.081 – 1.292]
Awareness on risks covered	0.871	2.392	2.953	0.71	0.480	[0.213 – 26.897]
Risk management strategy	2.931	18.719	32.005	1.71	0.087	[0.656–534.150]
Insurance company as source of Information	3.321	27.661	35.594	2.58	0.010	[2.221–344.500]
Insurance agent as source of information	4.263	70.933	76.268	3.96	0.000	[8.622–583.548]
Ag technician as source of Information	0.687	1.988	2.058	0k.66	0.507	[0.261 – 15.121]
Co-operatives as source of Information	7.056	1160.331	1212.476	6.75	0.000	[149.66–8995.7]
Primary occupation of respondent	0.161	1.175	0.334	0.57	0.571	[0.673 – 2.052]
Farming experience of respondent	0.028	1.028	0.031	0.92	0.358	[0.969 – 1.092]
Insurance agent as a medium of insurance	3.726	41.591	46.692	3.32	0.001	[4.607 – 375.49]
Agriculture technician as medium of insurance	4.387	80.493	102.749	3.44	0.001	[6.595 – 982.45]
Constant	-5.351	0.0047	0.013	-1.91	0.056	[0.00002 – 1.15]

Source: Field survey,2023

DISCUSSION

The respondents of Chitwan and Bardiya districts show the dominance of males in gender dynamics in decision-making in agricultural activities; as stated by Sindhu and Ariff (2017), the respondents showed dominance of males in farm-related decisions. Most of the respondents in the study area were of middle age, which moderately supports the statement of Timilsina (2018) that there is a positive association between age and insurance adoption, while negative associations were observed in contrary studies (Johari et al., 2024; KC et al., 2023). The dominance of middle-aged people in agricultural activities also matches the outmigration of youth from the country, leaving farming activities to middle-aged people (CBS, 2021).

The ethnic composition of the study areas seemed to affect the involvement of respondents in the insurance program. Higher representation of ethnic groups such as Brahmin and Chhetri in Chitwan district was linked with slightly higher uptake of insurance, while the Janajati ethnic population predominated in Bardiya district showed different participation patterns. These results align with Budhathoki et al. (2019), who observed that more adoption of insurance among upper- caste groups. The education and literacy levels were higher in Chitwan district; however, the adoption of insurance rates was similar across districts. The study results are consistent with mixed evidence from Chang et al. (2024), who noted that education alone does not necessarily guarantee adoption.

Respondents' involvement in the institution and their receipt of training appeared as an important aspect. Respondents of Chitwan district exhibited higher organisational involvement and more participation in agricultural training programs compared to Bardiya district. These factors positively influence the uptake of insurance policies. Similar trends were observed by Devkota et al. (2021) and Kumari et al. (2017) in their studies that group participation and training positively influence the adoption of agricultural technologies, including insurance. Farming experience and landholding also appeared relevant, with Chitwan farmers having larger average paddy holdings and longer farming experience. The study results are consistent with findings of Sujarwo and Rukmi (2018), indicating that experience and land size facilitate the adoption of insurance.

The variation of livelihood strategies is highlighted by differences in secondary occupations. The respondents of Bardiya district had a higher proportion of daily wage labourers, reflecting a need for diversified income sources, which may influence farmers' risk perception and decision-making regarding insurance. Overall, the results highlight heterogeneity in socio-demographic, institutional, and economic factors among the two districts, which likely shape insurance adoption behaviour.

These findings from the logistic regression model support the importance of reducing information asymmetry and enhancing farmers' understanding of insurance mechanisms. Similar trends were observed by Johari et al. (2024), Zhang et al. (2018), and Cole et al. (2013), who highlighted that knowledge diffusion and intermediaries play an important role in influencing insurance adoption.

Likewise, the highly significant influence of information received through cooperatives, insurance agents, agricultural technicians, and insurance companies highlights the importance of trusted and accessible communication channels. These institutional actors likely reduce uncertainty, build trust, and facilitate informed decision-making among farmers.

The results show that risk management strategies and organisational strategy were only minimally significant predictors for insurance purchase propensity. This supports the theory that farmers involved in social organizations are likely to purchase insurance. These results corroborate the findings of Dercon et al. (2014), who suggested that social capital tends to increase Insurance participation. There are non-significant results of demographic aspects such as age, gender, ethnicity, education, and occupation, which suggest that socio-demographic factors alone may not determine insurance adoption decisions.

The discussion underscores that knowledge diffusion, effective communication channels, and operative institutional arrangements are more important determinants of insurance take-up than are socio-demographic or economic factors.

CONCLUSION

Study concludes that respondents' knowledge of insurance and their sources of information significantly increase the likelihood of adopting paddy insurance. The involvement of respondents in the organization and risk management strategy is marginally significant. Thus, knowledge increases the capacity of decision-making, and trusted sources of information raise credibility and persuasion, jointly resulting in increasing the likelihood of uptake of insurance schemes. Therefore, findings show that communication channels powerfully affect the uptake of the insurance scheme, along with interpersonal communication channels that are more effective This study is limited by its geographical scope, cross-sectional design, and dependence on self-reported data.

On the Basis of key findings of the study, the following recommendations are suggested to improve paddy insurance adoption in the study areas. Firstly, the policymaker should improve the insurance literacy program through agriculture extension services and cooperatives, confirming a transparent and timely claim settlement mechanism. Secondly, the insurance provider needs to disseminate information through trusted interpersonal and institutional sources, which are more influential than mass media, in improving the uptake of the insurance scheme. Subsequently, subsidy distribution policies should be reformed to ensure equitable and timely premium support. Meanwhile, it is necessary to expand research to additional districts and diverse farming systems to better understand regional differences and the scale of insurance adoption. Finally, by addressing these institutional and informational challenges, paddy insurance can become a more effective tool for safeguarding farmer livelihoods and contributing to national food security.

ACKNOWLEDGEMENTS

The authors would like to express their appreciation to respondents and enumerators, as well as colleagues of the Institute of Agriculture and Animal Science, Tribhuvan University of Nepal, for their cooperation and valuable suggestions during the study.

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