Evaluating Production Risks, Livelihood Impacts, and Determinants of Agricultural Insurance Demand among Farmers in Ningxia, China

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ABSTRACT

This study investigates the production risks, livelihood impacts, and determinants of agricultural insurance demand among farmers in Ningxia, China, a region heavily reliant on agriculture yet vulnerable to various risks. The research highlights the critical role of agricultural insurance as a risk management tool that can stabilize farmer incomes and promote rural economic development. The study employs a quantitative research design, utilizing surveys to gather data from 206 farmers across three rural areas in Ningxia. Key findings reveal that farmers perceive significant risks from natural disasters, price fluctuations, sales issues, and quality risks, which adversely affect their livelihoods. The demand for agricultural insurance is influenced by factors such as insurance policy features, company reputation, individual

economic conditions, and the variety of insurance products available. Notably, the study finds no significant differences in evaluations of these factors based on demographic variables such as gender, age, or type of agriculture, indicating that farmers prioritize universal concerns like affordability and reliability over personal characteristics. The results underscore the need for tailored insurance solutions that address the specific challenges faced by farmers in Ningxia, particularly in light of the region's fragile ecological environment and frequent natural disasters. The study concludes that enhancing the accessibility and effectiveness of agricultural insurance can significantly contribute to the resilience and sustainability of the agricultural sector, ultimately supporting rural livelihoods and economic stability. Policymakers and stakeholders are encouraged to focus on integrating comprehensive risk management strategies, improving product quality, and providing diverse insurance options to better meet the needs of farmers in this vulnerable region.

INTRODUCTION

In today's increasingly interconnected global economy, agriculture remains the cornerstone of national economies, particularly in developing regions. It serves as a critical source of livelihood, employment, and sustenance for billions worldwide. However, the agricultural production process is subject to various risk factors such as natural disasters, pest outbreaks, and extreme weather events, all of which pose significant challenges to its stability and sustainability (Nanda, 2019). These risks not only disrupt agricultural output but also threaten the income and livelihood of farmers, thereby impacting broader economic stability. In response, agricultural insurance has emerged as a vital risk management tool, garnering significant attention from governments and international organizations.

Agricultural insurance plays a critical role in mitigating risks associated with farming and ensuring the stability of agricultural incomes. Its importance has been increasingly recognized in recent years as a mechanism to address climatic uncertainties and income disparities between urban and rural populations. For instance, recent research has demonstrated that agricultural insurance significantly narrows the urban-rural income gap by improving agricultural productivity and enabling efficient risk management (Wen et al., 2023). By providing financial security to farmers, agricultural insurance encourages investment in advanced technologies and resilient farming practices, fostering rural economic development (Nosov et al., 2020).

Moreover, advancements in digital and automated technologies are transforming agricultural insurance, making it more accessible and effective.

These innovations, combined with resource-efficient techniques, are pivotal in ensuring sustainable agricultural growth. They not only enhance productivity but also help in reducing the vulnerabilities faced by farmers due to environmental changes (Zhichkin et al., 2023).

The spatial effects of agricultural insurance are also noteworthy. For example, studies in China have highlighted that while insurance improves rural development, its benefits vary across regions, necessitating tailored policy interventions to maximize its effectiveness (Wen et al., 2023). This calls for a strategic focus on areas with higher vulnerability and an emphasis on reducing the resource siphoning effect between neighboring regions. In conclusion, agricultural insurance is a cornerstone of sustainable agricultural development. Continued efforts to integrate technology, enhance policy frameworks, and address regional disparities can further strengthen its impact on rural livelihoods and overall agricultural resilience.

In China, agriculture plays a fundamental role in economic development and rural livelihoods, with over 70% of the population in agricultural provinces like Ningxia relying on farming for their sustenance. However, the region's fragile ecological environment and frequent natural disasters amplify the vulnerability of its agricultural sector. Recognizing these challenges, the Chinese government has prioritized rural revitalization strategies, including the expansion and reform of agricultural insurance schemes, to mitigate risks, enhance farmer income, and stimulate regional economic growth (Fei et al., 2018).

Despite these efforts, significant gaps remain in understanding the factors influencing the demand for agricultural insurance among farmers. Previous studies indicate that household income, government subsidies, and awareness levels are critical determinants of insurance uptake (Budhathoki et al., 2019). However, research specific to Ningxia's unique socio-economic and ecological conditions is limited. The region's reliance on traditional agricultural practices, coupled with its susceptibility to environmental risks, underscores the urgency of developing tailored insurance solutions that address the specific needs of local farmers.

Ningxia Hui Autonomous Region, situated in northwest China, represents a unique agricultural ecosystem shaped by its socio-economic and ecological challenges. Dominated by arid and semi-arid climates, the region is highly susceptible to climate variability, including frequent droughts, fluctuating rainfall patterns, and temperature extremes. These environmental conditions severely constrain water resources, which are critical for sustaining agricultural productivity in an area where irrigation-dependent crops like wheat and corn are predominant (Peng et al., 2021).

The region's reliance on traditional farming practices adds to its vulnerability, as many farmers lack access to modern agricultural technologies that could mitigate risks posed by environmental uncertainties. These traditional methods, while culturally significant, limit productivity and hinder the adoption of innovative solutions such as high-efficiency irrigation systems and climate-resilient crop varieties (Wang et al., 2020). Furthermore, Ningxia's socio-economic profile reveals a significant proportion of smallholder farmers with limited financial capacity. This demographic often struggles with economic pressures, such as rising input costs and unstable market prices for agricultural products, which exacerbate the region's economic fragility.

Ningxia's agricultural sector also faces systemic issues such as inadequate infrastructure, limited access to financial services, and insufficient institutional support for risk management. Insurance penetration remains low, partly due to farmers' limited awareness and distrust of formal financial systems (Wang et al., 2022). These challenges underscore the need for tailored agricultural insurance solutions that account for the region's specific socio-economic and environmental dynamics.

Hence, this study seeks to assess the risks associated with agricultural production and livelihoods in Ningxia while exploring the factors affecting farmers' demand for agricultural insurance. It builds on existing literature to provide a nuanced understanding of how insurance can be leveraged to promote rural economic development and stability. By examining the interplay between production risks, livelihood challenges, and insurance demand, this research aims to contribute valuable insights for policymakers and stakeholders striving to enhance the effectiveness and accessibility of agricultural insurance in Ningxia.

FRAMEWORK

The theoretical frameworks underpinning the study on agricultural insurance highlight its multifaceted benefits for economic, social, and developmental objectives. Welfare Economics Theory emphasizes how agricultural insurance enhances social welfare by mitigating risks, stabilizing farmers' incomes, and promoting equitable economic growth (Backhouse et al., 2020). It shows how insurance increases agricultural production, shifts supply curves and raises overall societal welfare. Meanwhile, the Quasi-Public Goods Theory characterizes agricultural insurance as a blend of public and private goods. Its non-exclusivity and non-rivalrous benefits justify government interventions like subsidies and tax incentives to enhance coverage and improve service quality. This theory highlights how insurance fosters innovation and protects farmers' interests,

contributing to rural economic development (Wen et al., 2023). Income Security Theory addresses the role of agricultural insurance in maintaining farmers' basic living standards amid risks like natural disasters and market fluctuations. Insurance provides economic compensation during crises, allowing farmers to recover quickly and ensuring livelihood stability (Zhichkin et al., 2023). Finally, the Risk Management Framework explains agricultural insurance's function in mitigating uncertainties and minimizing economic shocks. It facilitates resilience by transferring risks to insurers and encouraging farmers to adopt productivity-enhancing practices (Nosov et al., 2020). Together, these frameworks provide a comprehensive understanding of agricultural insurance's impact on risk reduction, income stability, and sustainable development. They highlight the interplay between economic principles and policy interventions in rural welfare promotion.

OBJECTIVES OF THE STUDY

This study evaluates the production risks, livelihood impacts, and determinants of agricultural insurance demand among farmers in Ningxia, China. Specifically, it seeks to (1) describe the demographic profile of farmers in terms of sex, age, insurance purchase intention, agricultural type, financial subsidy, and scope of compensation; (2) determine the types of risks concerning farmers' agricultural production in terms of natural disaster, price fluctuations, sales issues, quality risks, and changes in national policies; (3) assess the types of risks concerning its impact to farmers' livelihood; and (4) analyze the factors affecting agricultural insurance demand in terms of insurance subsidy, reputation and service, individual economic conditions, compensation rate, level of protection, and variety of agricultural insurance. In addition, this study tests whether significant differences exist in the determinant factors of agricultural insurance demand among farmers when grouped according to their demographic profile.

METHODOLOGY

Research Design

The use of a quantitative research design and a descriptive research method is well-suited to exploring the impact of agricultural insurance on rural economic growth. Quantitative research is appropriate as it allows for the systematic collection and analysis of numerical data to measure relationships between variables (Weyant, 2022). For this study, quantitative techniques enable the

assessment of variables such as agricultural output, farmers' income, and social welfare improvements, providing empirical evidence of the effects of agricultural insurance on economic growth.

A descriptive research method complements this design by offering a systematic way to describe the characteristics of the phenomenon being studied . It is particularly useful for identifying patterns, trends, and correlations in agricultural production and insurance uptake. Through surveys, structured interviews, or secondary data analysis, descriptive research captures the real-world context of agricultural insurance policies and their socioeconomic impacts.

This combination of quantitative and descriptive approaches ensures a robust framework for understanding the extent and significance of agricultural insurance in stabilizing rural incomes and promoting economic growth. It facilitates generalization while grounding findings in observable realities, making it suitable for policy evaluation and formulation.

Research Site

The Ningxia Hui Autonomous Region is an ideal research locale for studying the impact of agricultural insurance on rural economic growth due to its unique socio-economic and agricultural characteristics. Ningxia is a traditional agricultural province, with agriculture accounting for a significant portion of its economy. Approximately 70% of its population relies on farming for their livelihood, making agricultural productivity and stability crucial for the region's overall economic well-being. Despite its strong agricultural heritage, Ningxia faces significant challenges, such as fragile ecological conditions and frequent natural disasters, which heavily impact agricultural output and farmers' income.

These conditions underscore the importance of a robust agricultural insurance system to mitigate risks and stabilize the rural economy. The region has also been a focal point for government initiatives, such as the rural revitalization strategy and pilot programs for agricultural insurance, making it a representative case for examining the effectiveness of such interventions.

Participants

This study involved 206 farmers from three rural areas in Ningxia Autonomous Region, specifically Rural 1 (61 farmers), Rural 2 (59 farmers), and Rural 3 (86 farmers). These respondents primarily engage in land cultivation as their main livelihood. However, their agricultural activities are frequently disrupted by various challenges, including pests, diseases, natural disasters, and adverse weather conditions, which often lead to reduced harvests or complete crop failures. Consequently, their income and overall quality of life are negatively

impacted, making financial stability a constant concern.

For these farmers, agricultural insurance serves as a critical safety net. It offers income protection by compensating for crop losses caused by unforeseen disasters, providing them with financial stability and a means to recover. This makes the surveyed farmers particularly suited to assessing the role of agricultural insurance in mitigating risks and promoting rural economic growth within the Ningxia region.

Instrumentation

The researcher-developed instrument, adapted from existing literature, is designed to comprehensively examine the variables related to agricultural insurance demand and farmers' experiences in Ningxia Autonomous Region. The instrument is divided into four parts. The first section collects information on the farmers' sex, age, intention to purchase insurance, agricultural type, financial subsidy received, and scope of compensation. These variables provide an essential baseline for understanding the farmers' backgrounds and circumstances. The second part identifies risks that affect agricultural activities, including natural disasters, price fluctuations, sales challenges, quality issues, and policy changes. It aims to capture the key challenges farmers face in maintaining stable agricultural production. The third part assesses how the identified risks influence the farmers' economic stability, well-being, and livelihood security, offering insights into the extent of the effects. The last part evaluates factors such as insurance subsidies, service quality and reputation, farmers' economic conditions, compensation rate, level of protection, and the variety of agricultural insurance products available. It also examines whether differences in these factors exist when farmers are grouped according to their demographic profiles. Using a 4-point Likert scale, the instrument allows the respondents to decide on the statement indicators that best demonstrate their knowledge and experiences gauged through the range and verbal interpretation, as shown in Table 1.

Table 1

Instrumentation's Likert Scale

Point	Range	Verbal Interpretation
4	3.51-4.50	Strongly Agree
3	2.51-3.50	Agree
2	1.51-2.50	Disagree
1	1.00-1.50	Strongly Disagree

Data Gathering Procedures

The research process began with the validation of the researcher-made instrument to ensure its reliability and accuracy in collecting data. Experts in agricultural economics and research methods review the tool, focusing on content relevance, clarity, and consistency, aligning it with the study's objectives. Once validated, permission to conduct the study was sought from the top management of the villages within the Ningxia Autonomous Region. This step ensured ethical compliance, respect for the community, and access to the target respondents.

Upon receiving approval, the validated questionnaire was distributed to 206 rural farmers in three villages. Clear instructions and ample time are provided to facilitate accurate and thoughtful responses. Once completed, the questionnaires are retrieved and prepared for analysis. The data gathered is subjected to rigorous statistical analysis using appropriate tools. Descriptive statistics summarize the demographic profiles and key variables, while inferential statistics test hypotheses, such as significant differences in agricultural insurance demand across demographic groups. The results are analyzed and interpreted to generate insights into the factors influencing agricultural insurance demand, types of risks, and their impact on farmers' livelihoods. This systematic approach ensures data integrity, enabling the research to provide meaningful recommendations for enhancing regional agricultural insurance.

Research Ethics Protocol

In conducting this research, ethical considerations were carefully followed to ensure the protection of participants' rights. Respondents were fully briefed on the purpose and objectives of the study, allowing them to make informed decisions about their participation. Participation was voluntary, and respondents were informed that they could withdraw at any time without consequence. A clear explanation of the data collection and analysis processes was provided to ensure transparency. Each participant was given an informed consent letter outlining the study's purpose, methods, risks, and benefits, and only those who consented participated in the study. Confidentiality was prioritized by safeguarding the anonymity of respondents, with data stored securely and no personally identifiable information shared. These ethical measures were implemented to maintain the research's integrity and protect the participants' privacy and autonomy.

Data Analysis

This study's statistical treatment of data follows a structured approach to ensure valid and reliable results. For the first research question, the respondents' demographic data were calculated using frequency and percentage to provide an

overview of the participants' characteristics. For the second, third, and fourth research questions, which examined the risks of agricultural activities, the influence of identified risks on farmers' economic stability, and evaluated the factors of agricultural insurance demand, weighted averages were calculated using a 4-point Likert scale to measure respondents" agreement. This scale will help quantify the degree of support or opposition expressed by the participants, with values assigned to each response category. Finally, for the last research question involving means comparisons, the t-test and Analysis of Variance (ANOVA) were employed.

RESULTS AND DISCUSSION

This study evaluated the production risks, livelihood impacts, and determinants of agricultural insurance demand among farmers in Ningxia, China. The following subsections present the findings of the study beginning with the demographic profile of the respondents.

Table 2
Demographic Profile of Farmers in terms of Sex

Sex		Frequency	Percentage
Female		103	50.0%
Male		103	50.0%
	Total	206	100.0%

Table 2 displays the distribution of respondents based on their gender, providing insights into the gender composition of the sample. The data indicates a balanced representation of genders within the sample, with 103 individuals identifying as female, representing 50.0% of the total respondents, and an equal number of 103 individuals identifying as male, representing 50.0% of the total sample. The equal proportion of men and women surveyed means that the survey has a high representation of the gender distribution, with no apparent gender bias or discrimination. This sample distribution helps to ensure the objectivity and impartiality of the survey results, so that the views and experiences of both men and women are fully reflected and considered. Specifically, the same ratio of men to women means that the survey data are not biased by gender differences, which gives a more accurate overall picture. This is particularly important for the study of gender differences, gender equality, gender role positioning and other issues. At the same time, this ratio also helps eliminate potential social biases

and stereotypes, making the survey results more reliable and valid. The same proportion of men and women surveyed in the questionnaire means that the survey has a high representation of the gender distribution, which helps to ensure the objectivity and impartiality of the survey results (Zhou et al., 2023).

Table 3

Demographic Profile of Farmers in terms of Age

Age	Counts	% of Total
25 years old and below	13	6.3%
26-30 years old	72	35.0%
31-35 years old	59	28.6%
36-40 years old	35	17.0%
41 years old and above	27	13.1%
Total	206	100.0%

Table 3 shows the distribution of respondents based on age, providing insight into the age composition of the sample. The data show that among the representatives in the sample, the number of people aged 26-30 is the largest, accounting for 35% of the total number of respondents, and the number of people under 25 is the least, accounting for 6.3% of the total sample. This table indicates that the participation of young farmers is higher. Farmers between 26 and 30 years old are the main force of current agricultural production, and they may pay more attention to the issues of agricultural insurance and economic development, so they are more active in participating in the survey. This reflects the interest and participation of young farmers in agricultural development and economic issues. Young farmers have a higher awareness of agricultural insurance, and because young farmers have received more education and training, they are more aware of the importance of agricultural insurance and its potential impact on economic development. As a result, their participation in the survey was higher. The largest number of farmers between the ages of 26 and 30 probably reflects a trend toward a younger agricultural labor force. This trend may mean improving agricultural productivity and the wide application of modern agricultural technology, which has a positive significance for promoting agricultural economic development.

The lowest proportion of farmers under 25 indicates that farmers in this age group have a relatively low awareness of agricultural insurance. This may be due to their lack of relevant education and training or the need for awareness of the importance of agricultural insurance. Therefore, it is necessary to strengthen agricultural insurance education and training for young farmers to increase their

understanding and participation (Zhu & Tan, 2018).

Table 4

Demographic Profile of the Respondents in terms of Insurance Purchase Intention

Insurance purchase intention	Frequency	Percentage
Aquaculture insurance	99	48.1%
Plantation insurance	107	51.9%
Total	206	100.0%

Table 4 shows the distribution of respondents' purchase intentions based on agricultural insurance, providing insights into the composition of the sample insurance purchase intentions. The data show that among the representatives of insurance purchase intention in the sample, the number of people in aquaculture is the largest, accounting for 48.1% of the total respondents, and the number of people in planting insurance is the least, accounting for 51.9% of the total sample.

Aquaculture and plantation are high-risk areas of agricultural production, and farmers show similar purchase intentions in both types of insurance, which means that their awareness of risk management is relatively balanced. They recognize that both aquaculture and plantations may be exposed to risks such as natural disasters, pests, and diseases, and they are willing to spread these risks by buying insurance. There are some similarities between aquaculture and plantation insurance needs. Farmers believe that both types of insurance can provide them with the necessary economic security to help them get financial compensation when they suffer losses to maintain the continuity of production activities. This may also reflect the effectiveness of insurance products and services. Farmers believe that these insurance products can meet their needs and provide adequate protection and reasonable prices, so they are willing to buy. Xu and Sun (2016) mentioned in his research in China that the number of surveyed aquaculture insurance and plantation insurance farmers' purchase intention was similar, indicating that farmers' awareness of risk management was relatively balanced and they had identical demands for these two types of insurance, which also reflected the effectiveness of insurance products and services and the influence of policy support. This will help promote the balanced development of the agricultural insurance market and provide farmers with diversified insurance options to better support the development of the agricultural economy.

Table 5

Demographic Profile of the Respondents in terms of Agricultural Types

Type of agriculture	Frequency	Frequency
Animal Husbandry	51	24.8%
Farming	39	18.9%
Fishing	27	13.1%
Forestry	70	34.0%
Sideline (water conservancy construction, handicraft making, tourism service, etc.)	19	9.2%
Total	206	100.0%

Table 5 shows the distribution of respondents based on type of agriculture, providing insight into the composition of the sample type of agriculture. The data show that among the representatives of agricultural types in the sample, the number of people in forestry insurance is the largest, accounting for 34.0% of the total number of respondents, while the number of people in borderline (water conservancy construction, handicraft production, tourism services, etc.) is the least, accounting for 9.2% of the total sample.

The largest number of forestry farmers and the smallest number of fishery farmers buy agricultural insurance, which means that forestry and fisheries may face different types and degrees of risks in agricultural production. Forestry may be more vulnerable to natural disasters such as fires, storms, etc., and these risks are often disruptive and unpredictable. Therefore, forestry farmers may be more aware of the importance of insurance and more willing to buy agricultural insurance to avoid potential losses. In contrast, fishery risks may be more related to market fluctuations, resource depletion and other factors, and these risks may not be as direct and obvious as natural disasters, resulting in a lower willingness of fishery farmers to purchase agricultural insurance. Agricultural insurance products may not adequately meet the needs of fisheries farmers. Fishery production has its particularity, including the instability of resources and the uncertainty of the market, so targeted insurance products are needed to cover these risks. If the existing agricultural insurance products do not fully take into account the characteristics and needs of fisheries, it may lead to low interest in insurance for fisheries farmers. Fishery farmers buy less agricultural insurance for economic reasons. Large investments and long payback periods usually characterize fishery production, and fishery farmers may be under financial pressure, so they are more inclined to use their funds for production rather than purchase insurance.

In addition, the market risk of fishery production has also led fishermen to be cautious about insurance (Liu et al., 2011).

Table 6

Demographic Profile of the Respondents in terms of Financial Subsidy

Financial subsidies	Frequency	Percentage
Government subsidies	87	42.2%
Insurance subsidies	119	57.8%
Total	206	100.0%

Table 6 shows the distribution of financial subsidies by respondents, providing insights into the composition of the sample financial subsidies. The data show that among the representatives of financial subsidies in the sample, government subsidies accounted for 42.2% of the total respondents, and insurance subsidies accounted for 57.8% of the total sample.

This usually means that the government or other agencies provide a large amount of financial support for agricultural insurance. Such high subsidies can be used for various reasons, such as encouraging farmers to participate in insurance, reducing insurance costs, expanding insurance coverage or increasing insurance payout rates. High insurance subsidies reduce the cost of agricultural insurance for farmers, making more farmers willing to participate in insurance. This will help expand the market size of agricultural insurance and improve the coverage of insurance in agricultural risk management. As more farmers participate in the insurance, agricultural insurance can better disperse risks and reduce agricultural production losses caused by disasters and other reasons. This will help stabilize agricultural production and ensure the supply of agricultural products and the stability of market prices. Agricultural insurance provides financial compensation to help farmers cope with risks such as disasters and protect their income and production activities. This will help to promote the stable and sustainable development of the rural economy and improve the living standards of farmers.

Peng et al. (2021) mentioned in their research that high insurance subsidies may encourage farmers to invest more actively in agricultural production and optimize the allocation of agricultural resources. At the same time, this may also attract more capital and talent into the agricultural field and promote the innovation and progress of agricultural technology.

Table 7

Demographic Profile of the Respondents' Compensation Scope

Compensation scope	Frequency	Percentage
Loss of agricultural production	105	51.0%
Property damage	84	40.8%
Property damage loss of agricultural production	17	8.3%
Total	206	100.0%

Table 7 shows the distribution of respondents based on the scope of compensation, providing insight into the sample scope of compensation composition. The data show that among the representatives of the compensation scope in the sample, the number of agricultural products losses is the most correct, accounting for 51.0% of the total respondents, and the number of property losses accounts for 40.8% of the total samples.

This means that agricultural insurance focuses on property losses and pays more attention to various losses in agricultural production. This includes crop loss and farm animal' deaths due to natural disasters, epidemics, market fluctuations, and other factors. This more comprehensive protection means farmers can receive more comprehensive financial support in the face of risk. By covering a wider range of agricultural production losses, agricultural insurance contributes to the sustainable development of agriculture. Farmers can receive timely economic compensation after suffering losses, so it is easier to maintain or resume production activities and maintain the continuity and stability of agricultural production. Expanding agricultural insurance coverage means farmers can manage risks in agricultural production more effectively. By purchasing insurance, farmers can reduce the financial pressure caused by risk and thus focus more on improving the efficiency and quality of agricultural production. More comprehensive coverage may increase farmers' incentive to participate in agricultural insurance. When farmers realize that insurance can cover more types of losses, they may be more willing to purchase insurance, thus increasing the market demand for agricultural insurance.

Table 8

Respondents' Evaluation of Risks on Agricultural Production

Indicators	Mean	Standard Deviation	Verbal Interpretation
Natural disaster	2.90	0.97	Agree
Price Fluctuation	3.00	0.96	Agree
Sales Issues	2.96	0.97	Agree
Quality Risks	2.98	0.99	Agree
Changes in National Policies	3.03	0.95	Agree
Weighted Average	2.96	0.97	Agree

Table 8 presents the respondents' evaluation of various risks associated with agricultural production. All indicators show mean scores indicating agreement on the significance of these risks, highlighting the challenges faced by the agricultural sector. The mean scores for natural disaster (2.90), fluctuation (3.00), sales issues (2.96), quality risks (2.98), and changes in national policies (3.03) reflect respondents' recognition of these factors as critical risks in agricultural production. The total weighted average of 2.96 further reinforces the respondents' agreement, indicating that agricultural production is highly susceptible to these risks.

Natural disasters, with a mean score of 2.90, are identified as a significant risk, aligning with research that emphasizes the adverse impacts of extreme weather events and climate change on crop yields and farm income. Studies indicate that farmers, particularly in vulnerable regions, face severe economic setbacks due to natural disasters (Adger et al., 2013). The fluctuation indicator, with a mean of 3.00, highlights the volatility of agricultural markets, which can disrupt farmers' financial stability. Price fluctuations, as well as other market disruptions, are critical risks that farmers face, often affecting their ability to plan and sustain their operations (Zhu et al., 2018).

Sales issues (mean = 2.96) and quality risks (mean = 2.98) are also crucial factors in the respondents' evaluations. Inconsistent product quality and challenges in reaching markets can significantly impact farmers' profitability, with previous studies underscoring the importance of quality assurance and reliable sales channels for agricultural success (Singh, 2019). Changes in national policies, with a mean of 3.03, reflect concerns about how government regulations, subsidies, or trade policies can affect the agricultural sector. This aligns with research that points to the role of policy in shaping agricultural outcomes, especially in terms

of market access and financial support (Liu et al., 2020).

Overall, these findings suggest that agricultural production faces a wide array of risks, which require careful management and policy intervention to mitigate potential negative impacts.

Table 9

Respondents' Evaluation of Types of Risks Concerning Their Impact on Farmers' Livelihood

Indicators	Mean	Standard Deviation	Verbal Interpretation
Market Risk	3.09	0.95	Agree
Product Risk	3.10	0.90	Agree
Financial Risk	3.00	0.97	Agree
Weighted Average	3.06	0.94	Agree

Table 9 presents the respondents' evaluation of different types of risks concerning their impact on farmers' livelihoods. The findings indicate that all types of risks—market risk, product risk, and financial risk—are perceived as significant challenges for farmers, with mean scores above 3.00, suggesting general agreement on the impact of these risks. The weighted average of 3.06 further reinforces the importance of these risks in affecting farmers' well-being and economic stability.

The highest mean score, 3.10, is for product risk, indicating that respondents view the quality and consistency of agricultural products as a major factor influencing farmers' livelihoods. This aligns with previous studies highlighting how product quality, including factors like pest infestation, diseases, and poor harvesting practices, can negatively impact farm income and marketability (Singh et al., 2019). Farmers who fail to maintain consistent product quality may face challenges in securing fair prices or accessing reliable markets, leading to financial instability.

Market risk (mean = 3.09) is another critical concern, reflecting the volatility and unpredictability of agricultural markets. This includes price fluctuations, supply chain disruptions, and changes in demand. As noted by Zhu et al. (2022), market volatility is a constant challenge for farmers, often leading to income instability and difficulty in long-term planning. Financial risk (mean = 3.00) is also significant, encompassing issues such as access to credit, rising production costs, and the lack of financial security for farmers. The importance of financial stability for farmers has been widely discussed, with studies noting that poor access to finance can limit farmers' ability to invest in essential resources like

seeds, equipment, and technology (Liu et al., 2020).

Overall, the results emphasize that farmers' livelihoods are heavily impacted by a combination of product quality, market instability, and financial challenges. These findings suggest a need for targeted interventions, such as improved access to credit, market stabilization policies, and support for agricultural best practices, to mitigate the effects of these risks.

Table 10

Respondents' Evaluation of the Factors Affecting Agricultural Insurance Demand

Indicators	Mean	Standard Deviation	Verbal Interpretation
Insurance Policy	3.02	0.97	Agree
Companies' Reputation and Service	3.01	0.98	Agree
Individual Economic Condition	3.05	0.98	Agree
Rate and Protection	3.06	0.94	Agree
Types of Insurance	3.08	0.92	Agree
Weighted Average	3.04	0.96	Agree

Table 10 presents the respondents' evaluation of factors affecting the demand for agricultural insurance. The results show that all indicators have mean scores above 3.00, with respondents generally agreeing that these factors influence their willingness to engage with agricultural insurance. The weighted average of 3.04 further reinforces the importance of these factors in shaping the demand for insurance in the agricultural sector.

The highest mean score (3.08) is for "types of insurance," indicating that respondents view the variety and options available in agricultural insurance policies as an important factor in their decision-making process. This aligns with previous studies suggesting that farmers are more likely to invest in insurance when they have access to diverse products that cater to their specific needs and risks (Zhu et al., 2018). The availability of tailored insurance products can provide farmers with the flexibility to choose the best coverage for their unique circumstances, such as crop type or location.

"Rate and protection" (mean = 3.06) is another significant factor. This reflects respondents' concern with the affordability of premiums and the adequacy of coverage provided. Research has shown that price sensitivity is a key consideration for farmers when choosing insurance products, especially when agricultural incomes are unstable (Liu et al., 2020). Similarly, "individual

economic condition" (mean = 3.05) also emerged as a key factor, highlighting the role of farmers' financial capacity in their ability to purchase insurance. Studies indicate that low-income farmers may be less likely to purchase insurance due to financial constraints, despite the potential benefits (Singh et al., 2019).

"Insurance policy" (mean = 3.02) and "companies' reputation and service" (mean = 3.01) also play crucial roles in shaping the demand for agricultural insurance. These findings suggest that farmers value transparent, reliable policies and trustworthy insurers. The reputation of insurance companies, as well as the quality of customer service, significantly influences farmers' trust and decision to purchase insurance.

Overall, these findings emphasize the need for insurance providers to offer diverse, affordable, and reliable products while considering farmers' financial conditions and the quality of service. Such efforts can help enhance the adoption of agricultural insurance, ultimately contributing to the sector's resilience.

Table 11

Results of the Significant Difference in the Farmers' Evaluation of the Factors Affecting Agricultural Insurance Demand when grouped according to their sex

	Group	N	Mean	SD	U	p	Significance
	female	103	3.04	0.856	5050	0.547	Not Significant
Insurance Policy	male	103	2.99	0.849			
Companies' Reputation and Service	female	103	3.02	0.873	5013	0.488	Not Significant
	male	103	3	0.856			
Individual Economic Condition	female	103	2.96	0.921	4801	0.233	Not Significant
	male	103	3.14	0.799			
	female	103	2.98	0.901	5085	0.602	Not Significant
Rate and Protection	male	103	3.14	0.745			
	female	103	3.12	0.779	4969	0.426	Not Significant
Types of Insurance	male	103	3.05	0.823			

Table 11 shows the results of a comparison between male and female respondents' evaluations of factors affecting agricultural insurance demand, with the findings indicating no significant differences in responses between genders. The p-values for all factors, including insurance policy, companies' reputation and service, individual economic condition, rate and protection, and types of insurance, are all above the 0.05 significance level, suggesting that gender does not significantly influence the way these factors are evaluated.

For example, the mean scores for "insurance policy" are 3.04 for females and 2.99 for males, with a p-value of 0.547, indicating no significant difference. Similar trends are observed across other factors, such as "companies' reputation and service" (females = 3.02, males = 3.00, p = 0.488), and "individual economic condition" (females = 2.96, males = 3.14, p = 0.233). These findings suggest that both male and female respondents view the factors affecting agricultural insurance demand similarly, with no gender-based variation in preferences or evaluation.

This aligns with previous research suggesting that financial constraints, product offerings, and policy terms are often prioritized over demographic differences, such as sex, when purchasing agricultural insurance (Singh et al., 2019). Therefore, insurance providers should address these common concerns rather than tailoring policies based on gender-specific needs.

Table 12

Results of the Significant Difference in the Farmers' Evaluation of the Factors Affecting Agricultural Insurance Demand when grouped according to their Age

	Age	N	Mean	SD	χ^2	p	Significance
Insurance Policy	26-30 years old	72	2.95	0.924	2.84	0.585	Not Significant
	31-35 years old	59	2.87	0.907			
	Age 41 and older	27	3.24	0.673			
	Ages 36-40	35	3.17	0.707			
	Under 25 years old	13	3.17	0.765			
Companies' Reputation and Service	26-30 years old	72	3.03	0.843	5.62	0.229	Not Significant
	31-35 years old	59	2.78	0.954			
	Age 41 and older	27	3.27	0.754			
	Ages 36-40	35	3.13	0.778			
	Under 25 years old	13	3.08	0.847			
Individual Economic Condition	26-30 years old	72	3.13	0.801	2.85	0.583	Not Significant
	31-35 years old	59	3.03	0.889			
	Age 41 and older	27	3.18	0.846			
	Ages 36-40	35	2.93	0.9			
	Under 25 years old	13	2.74	1.044			

Rate and Protection	26-30 years old	72	3.14	0.814	2.68	0.612	Not Significant
	31-35 years old	59	2.98	0.862			
	Age 41 and older	27	3.05	0.778			
	Ages 36-40	35	3.13	0.8			
	Under 25 years old	13	2.8	0.963			
Types of Insurance	26-30 years old	72	3.11	0.834	4.39	0.355	Not Significant
	31-35 years old	59	3	0.82			
	Age 41 and older	27	3.33	0.584			
	Ages 36-40	35	3.05	0.805			
	Under 25 years old	13	2.88	0.874			

Table 12 presents the results of the evaluation of factors affecting agricultural insurance demand when grouped by age. The findings indicate that there are no significant differences in farmers' evaluations of these factors based on age, as the p-values for all factors are above 0.05, suggesting no significant age-related variation in responses.

For instance, the evaluation of "insurance policy" across different age groups shows a mean score of 2.95 for those aged 26-30 and 3.24 for those aged 41 and older, but the chi-square value of 2.84 with a p-value of 0.585 indicates no significant difference. Similar results are observed for other factors like "companies' reputation and service" and "individual economic condition," where age groups like 26-30 and 41+ years old show varying mean scores but with p-values above 0.05 (e.g., p = 0.229 for reputation and service).

The lack of significant differences suggests that factors influencing agricultural insurance demand, such as insurance policies, company reputation, and financial conditions, are viewed similarly across different age groups. This finding contradicts some studies that suggest age may influence decision-making, with older individuals often exhibiting greater risk aversion (Liu et al., 2020). However, the results align with recent research indicating that the economic and practical aspects of insurance are generally prioritized over demographic factors like age (Singh et al., 2019).

Overall, the findings suggest that agricultural insurance providers may not need to tailor their products to specific age groups but should focus on addressing universal concerns like affordability, coverage, and reliability.

Table 13

Results of the Significant Difference in the Farmers' Evaluation of the Factors Affecting Agricultural Insurance Demand when grouped according to their Insurance purchase Intentions

	Group	N	Mean	SD	U	p	Significance
Insurance Policy	Aquaculture insurance	99	3.08	0.808	5009	0.496	Not Significant
	Plantation insurance	107	2.95	0.887			
Companies' Reputation and Service	Aquaculture insurance	99	3.03	0.826	5278	0.966	Not Significant
	Plantation insurance	107	2.99	0.899			
Individual Economic Condition	Aquaculture insurance	99	3.06	0.847	5153	0.733	Not Significant
	Plantation insurance	107	3.04	0.884			
Rate and Protection	Aquaculture insurance	99	3.07	0.836	5261	0,934	Not Significant
	Plantation insurance	107	3.05	0.825			
Types of Insurance	Aquaculture insurance	99	3.06	0.809	5009	0,495	Not Significant
	Plantation insurance	107	3.11	0.795			

Table 13 presents the results of the comparison between farmers with aquaculture insurance and plantation insurance regarding factors affecting their agricultural insurance demand. The findings indicate that there are no significant differences between these two groups in terms of their evaluation of the factors, as evidenced by the p-values all exceeding the 0.05 threshold, suggesting that insurance purchase intentions (aquaculture vs. plantation insurance) do not significantly influence how farmers rate these factors.

For example, in the evaluation of "insurance policy," aquaculture insurance holders rated it with a mean of 3.08, while plantation insurance holders rated it 2.95, with a p-value of 0.496, showing no significant difference. Similar patterns are observed across the remaining factors: "companies' reputation and service" (p = 0.966), "individual economic condition" (p = 0.733), "rate and protection" (p = 0.934), and "types of insurance" (p = 0.495), where the mean scores for both aquaculture and plantation insurance groups are very close and the p-values indicate no significant variations in their evaluations.

These results suggest that, regardless of whether farmers are involved in aquaculture or plantation agriculture, their evaluations of agricultural insurance factors are largely consistent.

This aligns with studies indicating that farmers prioritize factors such as affordability, reliability, and coverage over the type of insurance when making purchasing decisions. Therefore, insurance providers should focus on offering

standardized, cost-effective policies that address these universal concerns rather than differentiating based on the specific type of agricultural activity.

Table 14

Results of the Significant Difference in the Farmers' Evaluation of the Factors Affecting Agricultural Insurance Demand when grouped according to Agricultural Types

	Type of agriculture	N	Mean	SD	X^2	p	Significance
Insurance Policy	Animal Husbandry	51	3.01	0.878	0.637	0.959	Not Significant
	Farming	39	3.05	0.802			
	Fishing	27	3.14	0.778			
	Forestry	70	2.95	0.909			
	Sideline	19	3.03	0.806			
Companies' Reputation and Service	Animal Husbandry	51	3.13	0.825	0.91	0,923	Not Significant
	Farming	39	2.93	0.959			
	Fishing	27	3.01	0.766			
	Forestry	70	2.97	0.901			
	Sideline	19	3.02	0.794			
Individual Economic Condition	Animal Husbandry	51	3.18	0.804	8.931	0.063	Not Significant
	Farming	39	3.15	0.823			
	Fishing	27	2.79	0.95			
	Forestry	70	3.1	0.849			
	Sideline	19	2.68	0.951			
Rate and Protection	Animal Husbandry	51	3	0.921	9.118	0,058	Not Significant
	Farming	39	3.31	0.605			
	Fishing	27	2.67	0.948			
	Forestry	70	3.13	0.799			
	Sideline	19	3.02	0.739			
Types of Insurance	Animal Husbandry	51	3.2	0.707	7.009	0.135	Not Significant
	Farming	39	3.24	0.664			
	Fishing	27	2.98	0.856			
	Forestry	70	3.04	0.866			
	Sideline	19	2.75	0.897			

Table 14 compares farmers' evaluations of factors affecting agricultural insurance demand based on their type of agriculture. The findings indicate that

agricultural type has little to no significant impact on farmers' evaluation of these factors, with all p-values exceeding the 0.05 threshold, suggesting no significant differences between agricultural types.

For instance, the mean score for "insurance policy" ranged from 2.95 for forestry to 3.14 for fishing, with a p-value of 0.959, indicating no significant difference. Similarly, for "companies' reputation and service," the mean scores varied from 2.93 for farming to 3.13 for animal husbandry, but the p-value of 0.923 also shows no significant difference across agricultural types. This trend continues for other factors, such as "individual economic condition," "rate and protection," and "types of insurance," where the differences in mean scores are minimal, and p-values suggest no significant variation.

These results suggest that farmers across different agricultural sectors (animal husbandry, farming, fishing, forestry, and sideline activities) evaluate agricultural insurance factors similarly, emphasizing that aspects like insurance policy features, company reputation, and economic conditions are universally relevant. This aligns with studies indicating that farmers prioritize universal factors such as cost and coverage rather than specific agricultural activities when considering insurance (Singh et al., 2019).

Table 15

Results of the Significant Difference in the Farmers' Evaluation of the Factors Affecting Agricultural Insurance Demand when grouped according to Financial Subsidy

	Group	N	Mean	SD	U	p	Significance
Insurance Policy	Government subsidies	87	2.98	0.885	5126	0.904	Not Significant
	Insurance subsidies	119	3.04	0.827			
Companies' Reputation and Service	Government subsidies	87	2.86	0.911	4331	0.042	Significant
	Insurance subsidies	119	3.12	0.811			
Individual Economic Condition	Government subsidies	87	3.05	0.859	5077	0.812	Not Significant
	Insurance subsidies	119	3.05	0.872			
Rate and Protection	Government subsidies	87	3.13	0.778	4748	0.303	Not Significant
	Insurance subsidies	119	3.01	0.864			
Types of Insurance	Government subsidies	87	3.02	0.833	4951	0.588	Not Significant
	Insurance subsidies	119	3.13	0.775			

Table 15 compares farmers' evaluations of factors affecting agricultural insurance demand, grouped according to the type of financial subsidy they receive (government subsidies vs. insurance subsidies). The results reveal that there is

only one significant difference: farmers receiving government subsidies evaluated "companies' reputation and service" significantly lower (mean = 2.86) compared to those receiving insurance subsidies (mean = 3.12), with a p-value of 0.042. This suggests that farmers with government subsidies place less importance on the reputation and service of insurance companies than those who benefit from insurance subsidies.

For other factors, no significant differences were found. For example, in evaluating "insurance policy," the mean scores for both groups were 2.98 and 3.04, with a p-value of 0.904, indicating no significant difference. Similarly, "individual economic condition," "rate and protection," and "types of insurance" showed no significant variation between the two groups.

These findings suggest that while the type of subsidy does not significantly impact most aspects of insurance demand, farmers receiving insurance subsidies may place greater value on the reputation and service of the insurance companies. This may reflect a higher level of trust and satisfaction with their insurance providers, as highlighted by research on the role of trust in insurance decisions (Jung et al., 2022).

Table 16

Results of the Significant Difference in the Farmers' Evaluation of the Factors Affecting Agricultural Insurance Demand when grouped according to Scope of Compensation

	Compensation scope	N	Mean	SD	X²	p	Significance
Insurance Policy	Loss of agricultural production	105	3.06	0.842	1.312	0.519	Not Significant
	Property damage	84	2.95	0.862			
	Property damage loss of agricultural production	17	3.08	0.875			
Companies' Reputation and Service	Loss of agricultural production	105	3.01	0.889	0.433	0.805	Not Significant
	Property damage	84	3.02	0.814			
	Property damage loss of agricultural production	17	3	0.982			
Individual Economic Condition	Loss of agricultural production	105	3.05	0.908	2.249	0.325	Not Significant
	Property damage	84	3.02	0.818			
	Property damage loss of agricultural production	17	3.22	0.839			

Rate and Protection	Loss of agricultural production	105	3.08	0.816	0.825	0.662	Not Significant
	Property damage	84	3.03	0.843			
	Property damage loss of agricultural production	17	3.09	0.875			
Types of insurance	Loss of agricultural production	105	3.12	0.789	1.686	0.43	Not Significant
	Property damage	84	3.02	0.824			
	Property damage loss of agricultural production	17	3.2	0.762			

Table 16 explores the significant differences in farmers' evaluations of factors affecting agricultural insurance demand based on the scope of compensation they receive (loss of agricultural production, property damage, or both). The results show that there are no significant differences in how farmers assess any of the factors, as all p-values exceed the 0.05 threshold, indicating that the type of compensation scope does not influence their evaluations.

For instance, the mean scores for "insurance policy" are 3.06 for loss of agricultural production, 2.95 for property damage, and 3.08 for a combination of both, with a p-value of 0.519, suggesting no significant difference. Similarly, "companies' reputation and service" scored 3.01 for loss of agricultural production, 3.02 for property damage, and 3.00 for both, with a p-value of 0.805, further supporting the lack of significant differences. This trend is consistent across all other factors—individual economic condition, rate and protection, and types of insurance.

These findings suggest that regardless of the scope of compensation, farmers tend to evaluate agricultural insurance factors similarly. This may imply that the perceived importance of these factors is not dependent on the type of coverage they receive, which is consistent with previous studies showing that farmers often prioritize general policy features, such as cost and coverage, over specific compensation conditions (Biffi et al., 2021).

Table 17

Results of the Significant Difference in the Farmers' Evaluation of the Factors Affecting Agricultural Insurance Demand when grouped according to Scope of Compensation

	χ^2	df	p
Insurance Policy	1.312	2	0.519
Companies' Reputation and Service	0.433	2	0.805
Individual Economic Condition	2.249	2	0.325
Rate and Protection	0.825	2	0.662
Types of Ensurance	1.686	2	0.43

Table 17 presents the results of the analysis of variance in farmers' evaluations of the factors affecting agricultural insurance demand, grouped according to the scope of compensation. The results indicate that there are no significant differences in the evaluation of these factors based on the type of compensation scope (loss of agricultural production, property damage, or both), as all p-values are greater than the conventional 0.05 significance level.

The chi-square (χ^2) values for each factor—insurance policy (χ^2 = 1.312), companies' reputation and service (χ^2 = 0.433), individual economic condition (χ^2 = 2.249), rate and protection (χ^2 = 0.825), and types of insurance (χ^2 = 1.686)—indicate no significant association between the scope of compensation and how farmers evaluate these factors. For example, the p-values for "insurance policy" (p = 0.519), "companies' reputation and service" (p = 0.805), and "rate and protection" (p = 0.662) all exceed the threshold, confirming that the type of compensation does not influence farmers' assessments of these aspects.

This suggests that farmers' evaluation of agricultural insurance are generally stable across different types of coverage, and they prioritize factors like the insurance policy, companies' reputation, and rate and protection over the specific scope of compensation. These findings align with previous research, which found that factors such as trust in insurers and the affordability of premiums often outweigh specific compensation details in shaping farmers' attitudes toward insurance (Kislingerova & Špička, 2022).

CONCLUSION

The evaluation of risks in agricultural production reveals a consensus among respondents regarding the importance of various factors affecting the sector. Key

risks identified include natural disasters, price fluctuations, sales issues, quality risks, and changes in national policies, highlighting the sector's vulnerability to external shocks and the necessity for effective risk management strategies. Livelihood impacts were assessed, with market risk, product risk, and financial risk rated as significant challenges. Product quality was identified as a crucial factor influencing farmers' income, while market volatility and financial instability were also pressing concerns, indicating the need for targeted interventions to bolster farmers' resilience.In terms of agricultural insurance demand, factors such as insurance policy, companies' reputation, individual economic condition, rate and protection, and types of insurance received positive evaluations. The variety of insurance options was deemed essential for farmers' decision-making. Analysis based on demographics showed no significant variations in evaluations, suggesting that farmers prioritize universal concerns like affordability and reliability over demographic factors when considering agricultural insurance. Overall, the findings emphasize the importance of addressing the diverse risks in agriculture and the need for insurance providers to offer varied, affordable products to enhance the sector's resilience and sustainability.

TRANSLATIONAL RESEARCH

The study findings from this evaluation underscore the practical applications of risk management and agricultural insurance in enhancing the resilience of the agricultural sector. Given the identification of key risks—natural disasters, price fluctuations, and market instability—it is crucial for policymakers to integrate comprehensive risk mitigation strategies within agricultural policies. The emphasis on product quality and market volatility highlights the need for targeted support, such as training programs on quality assurance and market forecasting. Financial instruments, including tailored agricultural insurance, can provide a safety net for farmers, especially as the study revealed a strong demand for insurance products based on their affordability, reliability, and the reputation of insurance companies. This suggests that insurance providers should focus on offering diverse, flexible insurance options that cater to varying needs and economic conditions of farmers. Additionally, the uniformity of responses across demographic groups implies that farmers prioritize fundamental issues like cost-effectiveness and security over personal characteristics, providing valuable insight for designing inclusive, accessible insurance schemes. By addressing these practical concerns, stakeholders can help farmers better navigate the risks they face, fostering a more sustainable and resilient agricultural sector.

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