IJESDS Vol: 1(2): 336-347, 2026
https://doi.org/10.68086/GNYJ9756

https://ijesds.org

International Journal of Environmental Sciences, Development & Sustainability
An official publication of the
Faculty of Environmental Sciences
Open Access | Peer-reviewed | International
ISSN (Online): 3156-4461

RESEARCH ARTICLE

Analysis of Crop Farmers' Willingness and Determinants of Agricultural Insurance Adoption for Climate Change Adaptation in Zaria Local Government Area, Kaduna State, Nigeria

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ABSTRACT

Climate change has continued to threaten crop production in northern Nigeria through irregular rainfall, rising temperatures, prolonged dry spells, flooding, declining soil fertility, increased pest and disease outbreaks, and frequent crop failures, thereby undermining farmers' livelihoods and food security. Despite the potential of agricultural insurance to reduce these production risks and strengthen farmers' resilience, its adoption among crop farmers remains relatively low. This study analyzed crop farmers' willingness to adopt agricultural insurance as a climate change adaptation strategy in Zaria Local Government Area, Kaduna State, Nigeria. A quantitative research approach was adopted, using a structured questionnaire administered to 384 crop farmers selected through a multistage sampling technique. Of the 384 questionnaires administered, 377 valid responses were retrieved and analyzed using descriptive statistics in the Statistical Package for the Social Sciences (SPSS), version 27. The findings revealed that respondents perceived irregular rainfall ($\bar{x}$ = 4.13), delayed planting resulting from rainfall variability ($\bar{x}$ = 4.12), prolonged dry spells ($\bar{x}$ = 4.09), increased cost of crop production ($\bar{x}$ = 4.08), rising temperatures ($\bar{x}$ = 4.05), crop failure ($\bar{x}$ = 4.02), and reduced household farm income ($\bar{x}$ = 4.01) as major impacts of climate change on crop farming. The study also found a high level of willingness among farmers to adopt agricultural insurance, particularly when claims are paid promptly ($\bar{x}$ = 4.23), insurance is affordable ($\bar{x}$ = 4.16), insurance is recognized as an effective climate change adaptation strategy ($\bar{x}$ = 4.16), and government support is available ($\bar{x}$ = 4.10). The study concludes that crop farmers are willing to adopt agricultural insurance, provided that affordability, awareness, and institutional trust are enhanced. It recommends that the Nigerian Agricultural Insurance Corporation, government agencies, extension services, and insurance providers strengthen awareness campaigns, subsidize insurance premiums, and ensure prompt settlement of claims to improve agricultural insurance uptake and enhance climate resilience among crop farmers.

Keywords: *Agricultural insurance; Climate adaptation; Crop farmers; Climate resilience; Willingness*

1. INTRODUCTION

Agriculture remains one of the most climate-sensitive sectors of the global economy because crop production depends heavily on weather conditions, water availability, soil quality, and ecological stability. In recent decades, the increasing frequency and intensity of climate-related events have threatened agricultural productivity, food security and rural livelihoods across both developed and developing countries (Anjum et al, 2024). Climate change refers to long-term alterations in temperature, precipitation patterns, and other climatic conditions arising largely from natural variability and human-induced greenhouse gas emissions (Intergovernmental Panel on Climate Change [IPCC], 2023). These climatic changes have disrupted traditional farming calendars, reduced crop yields, increased pest and disease outbreaks, and intensified production risks for millions of smallholder farmers (Ikpe et al., 2023). Since agriculture serves as the principal source of income and employment for a significant proportion of the rural population, particularly in Sub-Saharan Africa, strengthening farmers' capacity to cope with climate variability has become a major global development priority (Food and Agriculture Organization [FAO], 2024). Consequently, identifying practical adaptation strategies capable of reducing climate-induced production losses has attracted increasing scholarly and policy attention.

Climate change adaptation encompasses the adjustments made by individuals, communities, institutions, and production systems in response to actual or anticipated climatic conditions to moderate damages or exploit beneficial opportunities (IPCC, 2023). Within the agricultural sector, adaptation involves a wide range of measures including the adoption of improved crop varieties, irrigation technologies, climate-smart farming practices, diversified livelihood strategies, and agricultural risk management instruments. Among these strategies, agricultural insurance has emerged as an important financial mechanism for reducing farmers' vulnerability to production uncertainties (Ikpe, 2021). Agricultural insurance refers to a contractual arrangement through which farmers pay predetermined premiums to an insurer in exchange for compensation when insured agricultural losses occur as a result of specified risks such as drought, flood, pest infestation, or excessive rainfall (Bassey & Uwadinma, 2022). Unlike emergency relief programmes that are implemented after disasters occur, insurance provides a structured and predictable approach to managing agricultural risks before production shocks materialize, thereby improving resilience and encouraging continued investment in farming activities (World Bank, 2024).

The increasing importance of agricultural insurance is linked to its capacity to strengthen farmers' adaptive responses to climate change while promoting agricultural productivity and financial stability. Farmers who possess adequate insurance protection are generally more willing to invest in improved seeds, fertilizers, mechanization, and other productivity-enhancing technologies because they are assured that part of their production losses can be recovered in the event of climatic disasters (Bhuiyan & Mkhitaryan, 2022). This protective function also facilitates access to agricultural credit since financial institutions often perceive insured farmers as less risky borrowers. Nevertheless, the effectiveness of agricultural insurance depends not merely on its availability but also on farmers' willingness to adopt it. Willingness to adopt refers to the intention or readiness of individuals to accept and utilize an innovation after evaluating its expected benefits, costs, and associated risks, a process that is influenced by socioeconomic characteristics, institutional support, previous experiences, and perceptions of usefulness (Kaunda & Chowa, 2023). Understanding this behavioural dimension is therefore essential for improving insurance uptake among farming households.

Despite growing recognition of agricultural insurance as a climate adaptation strategy, evidence from many developing countries indicates that adoption levels remain relatively low among smallholder farmers (Ikpe, 2021). The continued low uptake of agricultural insurance reflects the influence of multiple socioeconomic and institutional constraints, including limited awareness of insurance products, inadequate financial literacy, high premium costs, weak agricultural extension

services, low confidence in insurance providers, delays in claim settlements, and poor institutional coordination (FAO, 2024; World Bank, 2024). In Nigeria, the agricultural sector contributes substantially to employment and national food production, yet farmers continue to experience severe losses arising from drought, flooding, irregular rainfall, windstorms, and emerging crop diseases (Ikpe et al., 2024). Although initiatives such as the Nigerian Agricultural Insurance Scheme were introduced to improve agricultural risk management, participation among crop farmers has remained below expectations because of structural, institutional, and socioeconomic constraints (National Bureau of Statistics, 2024). These realities highlight the need to understand the factors that shape farmers' decisions regarding agricultural insurance adoption under changing climatic conditions.

Kaduna State represents one of Nigeria's major agricultural producing regions where crop farming contributes significantly to household livelihoods and regional food supply. Within the state, Zaria Local Government Area (LGA) is characterized by extensive cultivation of cereals, legumes and vegetables, which are activities increasingly exposed to erratic rainfall patterns, prolonged dry spells, flooding and rising temperatures associated with climate change (Ikpe et al. 2023). These climatic disturbances have contributed to unstable harvests, declining farm incomes and greater production uncertainty among farming households. Although agricultural extension programmes and government interventions have sought to promote improved farming practices, the extent to which crop farmers are willing to embrace agricultural insurance as a complementary climate adaptation strategy remains insufficiently understood.

Existing studies such as Baba et al. (2024) in Borno State, Yahaya (2021) in Niger State, Shaibu et al. (2020) in Benue State, and Banjo et al. (2022) in Lagos State have examined issues relating to agricultural insurance awareness, participation, and adoption among farmers. Nevertheless, empirical evidence focusing specifically on crop farmers in Zaria LGA remains limited despite the area's increasing exposure to climate-related risks. Against this background, there is a compelling need to examine crop farmers' willingness to adopt agricultural insurance for climate change adaptation in Zaria LGA of Kaduna State. To achieve this, the following questions are raised:

1. What are the perceived impacts of climate change on crop farming in Zaria LGA, Kaduna State, Nigeria?
2. What is the level of willingness of crop farmers to adopt agricultural insurance as a climate change adaptation strategy in the study area?

2. MATERIALS AND METHODS

The Study Area

Zaria LGA is located between Latitudes 11°00'00" North and 11°15'00" North of the Equator and Longitudes 7°30'00" East and 7°45'00" East of the Greenwich Meridian, in the northern part of Kaduna State, northwestern Nigeria (Azua et al, 2020). The Local Government Area covers approximately 563 km² and shares boundaries with Sabon Gari LGA to the west, Igabi LGA to the south, Soba LGA to the east, and Kudan LGA to the north. The area is strategically located within the Northern Guinea Savannah ecological zone, making it one of the major agricultural producing areas in Kaduna State. The climate of the area is classified as tropical wet and dry (Aw) under the Köppen climate classification, characterized by distinct wet and dry seasons. Rainfall is largely controlled by the interaction between the Tropical Maritime and Tropical Continental air masses, with an annual average ranging between 1,000 mm and 1,200 mm, while mean annual temperatures vary between 22°C and 34°C (Edokpa et al, 2024). Recent changes in rainfall distribution, increasing temperature, prolonged dry spells, and occasional flooding have heightened climate-related risks to agricultural production, making the area suitable for investigating farmers' willingness to adopt agricultural insurance as a climate change adaptation strategy.

The relief of the area is generally undulating with gentle plains that favour extensive cultivation of food and cash crops. The soils are predominantly ferruginous tropical soils with moderate fertility, supporting the cultivation of maize, sorghum, millet, rice, cowpea, soybean, groundnut and vegetables. The area is drained mainly by tributaries of the Kubanni River and the Galma River, which provide seasonal water for farming activities. Agriculture constitutes the dominant livelihood of the inhabitants, with the majority engaged in smallholder crop production that depends largely on rainfall (Suleiman et al, 2021). This dependence on rainfed agriculture makes farmers particularly vulnerable to climate variability and reinforces the relevance of the study area for assessing perceived climate change impacts and willingness to adopt agricultural insurance.

Data Collection

The study employed a quantitative research approach in which primary data were collected from crop farmers in the study area using a structured questionnaire. The quantitative approach was considered appropriate because it enables the collection of standardized data for measuring crop farmers' perceived climate change impacts and willingness to adopt agricultural insurance as a climate change adaptation strategy. A multistage sampling technique was adopted for selecting respondents.

In the first stage, a purposive sampling technique was used to select rural wards within Zaria LGA where crop farming constitutes the dominant economic activity. Five rural wards, namely Dutsen Abba, Dambo, Jushi, Kufena, and Tukur Tukur (Table 1), were selected because of their high concentration of crop farmers and their susceptibility to climate-related agricultural risks. These wards are actively engaged in the cultivation of maize, sorghum, millet, rice, cowpea, soybean, and vegetables, making them suitable for the study.

In the second stage, the purposive sampling technique was employed to select crop farmers who met the inclusion criteria for the study. Respondents who were actively engaged in crop farming, had cultivated crops in the study area for at least ten years, and were 18 years of age or older were purposively sampled. These criteria were considered appropriate because such farmers possess adequate knowledge of changing climatic conditions, farming risks, and the strategies adopted to cope with climate-related challenges, including agricultural insurance.

Table 1. Sampled Wards, Population and Sample Size for the Study

S/N	Sampled Wards	Population (1991)	Projected Population (2025)	Sample Size
A	Dutsen Abba	17,826	50,946	68
B	Dambo	15,143	43,281	58
C	Jushi	13,961	39,905	54
D	Kufena	19,758	56,467	76
E	Tukur Tukur	33,432	95,566	128
	Total	100,120	286,165	384

Data Analysis

According to the National Population Commission (1991), Zaria LGA had a population of 284,318. Using the annual population growth rate of 3.0 percent, the projected population for 2025 was estimated using Newman's population projection method. Owing to the absence of recent official population figures at the ward level (from the 2006 population data), the 1991 National Population Census remained the most appropriate demographic source for the study. Krejcie and Morgan's (1970) sample size determination table was adopted, which recommends a sample size of 384 for populations exceeding 100,000 at a 95 percent confidence level. Therefore, a total of 384 crop farmers were selected for the study. The sample was proportionately distributed (Table 1) among the selected wards using Yamane's (1967) proportional allocation formula:

$$Pr = \frac{n \times SS}{N} \quad \text{---------- (Eqn.1)}$$

Where:

Pr = Number of respondents allocated to each sampled ward

n = Population of each sampled ward

SS = Total sample size (384)

N = Total population of the selected wards

The questionnaire was administered directly to the sampled crop farmers with the assistance of trained field assistants familiar with the study area. At the end of the field survey, 377 copies of the questionnaire were successfully retrieved, representing a response rate of 98 percent, while seven (7) copies were either not returned or were improperly completed. The retrieved copies of the questionnaire were coded and analyzed using descriptive statistics, including frequencies, percentages, mean scores, and standard deviations, with the aid of the Statistical Package for the Social Sciences (SPSS) version 23. The results were presented using tables to facilitate interpretation and discussion.

3. RESULTS AND DISCUSSION

Socio-demographic/Economic Characteristics

Table 2 presents the socio-demographic characteristics of the respondents. The age distribution indicates that 31.3% of the respondents were between 41 and 50 years, representing the largest age category, followed by 27.6% who were 51 years and above, 25.7% who were between 31 and 40 years, while only 15.4% were between 18 and 30 years. This suggests that the study was dominated by mature and experienced farmers who are likely to possess considerable knowledge of farming practices and climate-related changes within the study area. In terms of gender, the findings reveal that 69.2% of the respondents were male, whereas 30.8% were female, indicating that crop farming in the area is largely undertaken by men. Regarding marital status, the majority of the respondents (75.3%) were married, while 12.5% were single, 8.2% were widowed, and 4.0% were divorced. The predominance of married respondents suggests that farming serves as a major livelihood activity for households, with family responsibilities likely influencing decisions on agricultural investments and risk management practices such as agricultural insurance.

The educational profile of the respondents further shows varying levels of formal education. As presented in Table 2, 32.6% had no formal education, representing the highest proportion, while 25.5% attained secondary education, 18.8% completed primary education, 11.9% possessed Degree or HND qualifications, and 11.1% had NCE or Diploma certificates. The relatively high proportion of respondents without formal education may affect their understanding of insurance products and other climate adaptation innovations, thereby highlighting the importance of effective agricultural extension and awareness programmes. The distribution of farm size indicates that 44.8% of the respondents cultivated between 2 and 5 hectares of farmland, followed by 36.1% who cultivated less than 2 hectares, whereas only 13.8% and 5.3% cultivated between 6 and 10 hectares and above 10 hectares, respectively. This pattern confirms that crop production in the study area is predominantly undertaken on small- and medium-scale farms, reflecting the characteristics of smallholder agriculture that is often more vulnerable to climate-related production risks.

The annual farming income of the respondents also reflects the economic conditions under which farming activities are undertaken in the study area. Table 2 shows that 38.7% earned between ₦500,000 and ₦999,999 annually from farming, while 31.3% earned less than ₦500,000. In addition, 20.2% reported annual farming incomes ranging from ₦1,000,000 to ₦1,999,999, whereas only 9.8% earned ₦2,000,000 and above. This distribution suggests that the majority of the respondents

operate within relatively modest income levels, which may influence their capacity to purchase agricultural insurance despite recognising its potential benefits. With respect to awareness of agricultural insurance, 64.7% of the respondents indicated that they were aware of agricultural insurance, while 35.3% reported that they were not aware. Although the level of awareness appears encouraging, the proportion of respondents lacking awareness remains substantial, implying that continuous sensitisation and farmer education are required to improve knowledge and encourage the adoption of agricultural insurance as a climate change adaptation strategy.

Table 2. Socio-Demographic Characteristics of the Respondents

SN	Parameters	Options	Frequency	Percentage
A	Age	18 to 30 years	58	15.4
		31 to 40 years	97	25.7
		41 to 50 years	118	31.3
		51 years and above	104	27.6
		Total	377	100
B	Gender	Male	261	69.2
		Female	116	30.8
		Total	377	100
C	Marital Status	Single	47	12.5
		Married	284	75.3
		Divorced	15	4.0
		Widowed	31	8.2
		Total	377	100
D	Educational Level	No formal education	123	32.6
		Primary education	71	18.8
		Secondary education	96	25.5
		NCE/Diploma	42	11.1
		Degree/HND and above	45	11.9
		Total	377	100
E	Farm Size	Less than 2 hectares	136	36.1
		2 to 5 hectares	169	44.8
		6 to 10 hectares	52	13.8
		Above 10 hectares	20	5.3
		Total	377	100
F	Annual Farming Income	Less than ₦500,000	118	31.3
		₦500,000 to ₦999,999	146	38.7
		₦1,000,000 to ₦1,999,999	76	20.2
		₦2,000,000 and above	37	9.8
		Total	377	100
G	Awareness of Agricultural Insurance	Aware	244	64.7
		Not aware	133	35.3
		Total	377	100

Perceived Impacts of Climate Change on Crop Farming

Table 3 presents the respondents' perceptions of the impacts of climate change on crop farming in the study area. The findings reveal that respondents strongly acknowledged irregular rainfall as a major challenge affecting crop production, with 48.0% strongly agreeing and 34.2% agreeing, resulting in a high mean score of $\bar{x} = 4.13$ and a standard deviation of 1.04. Similarly, changes in rainfall were perceived to have delayed planting periods, as indicated by 48.5% of the respondents who strongly agreed and 33.4% who agreed, yielding a mean score of $\bar{x} = 4.12$ and a standard deviation of 1.06. Prolonged dry spells were also identified as having a significant impact on crop farming, with 45.6% strongly agreeing and 36.6% agreeing that reduced soil moisture negatively affects crop growth ($\bar{x} = 4.09$, standard deviation = 1.05). Furthermore, 44.0% strongly agreed, and 36.3% agreed that rising temperature reduces crop productivity, producing a mean score of $\bar{x} = 4.05$ and a

standard deviation of 1.07. These findings demonstrate that rainfall variability and increasing temperature constitute the most pronounced manifestations of climate change experienced by crop farmers in the study area. This finding is consistent with the reports of the IPCC (2023), which identified increasing temperature, erratic rainfall, and prolonged drought as major drivers of declining agricultural productivity globally. The findings also corroborate those of Falaki et al. (2013) and Ikpe et al. (2024), who found that unpredictable rainfall and increasing temperature were among the most severe climate-related challenges confronting crop farmers in northern Nigeria. The results further aligned with the findings of Ikpe et al. (2016), which reported that crop farmers in Sokoto are highly aware of the effect of climate change on crop production; hence, the need for a shift in crop production as an adaptation strategy to climate change in Goronyo LGA of Sokoto State.

Table 3. Impacts of Climate Change on Crop Farming in the Study Area

S/N	Perceived Climate Change Impacts	SA	A	I	D	SD	Mean	STD
A	Irregular rainfall pattern affects crop production	181 (48.0%)	129 (34.2%)	21 (5.6%)	27 (7.2%)	19 (5.0%)	4.13	1.04
B	Rising temperature reduces crop productivity	166 (44.0%)	137 (36.3%)	20 (5.3%)	33 (8.8%)	21 (5.6%)	4.05	1.07
C	Prolonged dry spells reduce soil moisture for crop growth	172 (45.6%)	138 (36.6%)	18 (4.8%)	28 (7.4%)	21 (5.6%)	4.09	1.05
D	Flooding destroys farmlands and standing crops	141 (37.4%)	149 (39.5%)	24 (6.4%)	39 (10.3%)	24 (6.4%)	3.91	1.12
E	Increased pest and disease outbreaks reduce crop yield	154 (40.8%)	143 (37.9%)	17 (4.5%)	40 (10.6%)	23 (6.1%)	3.97	1.11
F	Declining soil fertility has reduced farm productivity	147 (39.0%)	148 (39.3%)	19 (5.0%)	39 (10.3%)	24 (6.4%)	3.94	1.11
G	Climate change has increased the cost of crop production	176 (46.7%)	131 (34.7%)	17 (4.5%)	31 (8.2%)	22 (5.8%)	4.08	1.08
H	Crop failure has become more frequent	158 (41.9%)	144 (38.2%)	19 (5.0%)	33 (8.8%)	23 (6.1%)	4.02	1.09
I	Changes in rainfall have delayed planting periods	183 (48.5%)	126 (33.4%)	18 (4.8%)	31 (8.2%)	19 (5.0%)	4.12	1.06
J	Climate change has reduced household farm income	161 (42.7%)	139 (36.9%)	21 (5.6%)	34 (9.0%)	22 (5.8%)	4.01	1.09

The results further indicate that climate change has had considerable effects on farm productivity and production systems. As shown in Table 3, 46.7% of the respondents strongly agreed, and 34.7% agreed that climate change has increased the cost of crop production, resulting in a mean score of $\bar{x} = 4.08$ and a standard deviation of 1.08. Likewise, 41.9% strongly agreed, and 38.2% agreed that crop failure has become more frequent because of climate change ($\bar{x} = 4.02$, standard deviation = 1.09). The respondents also perceived increased pest and disease outbreaks as a major consequence of climate change, with 40.8% strongly agreeing and 37.9% agreeing, giving a mean score of $\bar{x} = 3.97$ and a standard deviation of 1.11. In addition, declining soil fertility was considered a significant impact, as 39.0% strongly agreed and 39.3% agreed that it has reduced farm productivity ($\bar{x} = 3.94$, standard deviation = 1.11).

Flooding was equally recognized as an important threat, with 37.4% strongly agreeing and 39.5% agreeing that it destroys farmlands and standing crops, producing a mean score of $\bar{x} = 3.91$ and a standard deviation of 1.12. The consistently high mean values indicate broad agreement among respondents that climate change adversely affects agricultural production through multiple pathways. These findings are in agreement with Bhuiyan and Mkhitaryan (2022), who reported that climate-related production losses, pest infestations, and flooding significantly reduce farm productivity and increase production costs among farming households. Similar observations were also reported by the FAO (2024), which noted that climate change

continues to undermine agricultural production through declining soil quality, increased biological threats, and frequent weather-related disasters.

The findings also demonstrate that climate change has important economic implications for farming households. Table 3 shows that 42.7% of the respondents strongly agreed, while 36.9% agreed that climate change has reduced household farm income, resulting in a mean score of $\bar{x} = 4.01$ and a standard deviation of 1.09. The relatively low standard deviation values, ranging from 1.04 to 1.12 across all the variables, indicate that respondents expressed fairly consistent perceptions regarding the impacts of climate change on crop farming. Overall, all the variables recorded mean scores above the decision threshold of 3.50, suggesting a high level of agreement that climate change has negatively affected crop production, farming operations, and household livelihoods in the study area. These findings imply that crop farmers are increasingly exposed to climate-related production risks that threaten agricultural sustainability and income security. The result supports the findings of Ikpe (2021) and Kaunda and Chowa (2023), who observed that climate variability has intensified production uncertainties among smallholder farmers and increased the need for effective agricultural risk management measures such as agricultural insurance. The findings also align with those of the FAO (2024), which emphasized that improving farmers' resilience to climate-related shocks requires the adoption of adaptation strategies capable of reducing production losses and safeguarding rural livelihoods.

Crop Farmers' Willingness to Adopt Agricultural Insurance

Table 4 presents the level of willingness of crop farmers to adopt agricultural insurance as a climate change adaptation strategy in the study area. The findings indicate a high level of willingness among the respondents to embrace agricultural insurance as a means of reducing climate-related production risks. The respondents expressed strong willingness to purchase agricultural insurance to protect their crops against climate-related losses, with 44.8% strongly agreeing and 36.6% agreeing, resulting in a mean score of $\bar{x} = 4.07$ and a standard deviation of 1.08. Similarly, 41.9% strongly agreed, and 38.5% agreed that they were willing to pay insurance premiums if compensation was guaranteed after crop loss, producing a mean score of $\bar{x} = 4.02$ and a standard deviation of 1.09.

Table 4. Willingness of Crop Farmers to Adopt Agricultural Insurance as a Climate Change Adaptation Strategy in the Study Area

S/N	Willingness to Adopt Agricultural Insurance	SA (%)	A (%)	I (%)	D (%)	SD (%)	$\bar{x}$	STD
A	I am willing to purchase agricultural insurance to protect my crops against climate-related losses.	169 (44.8%)	138 (36.6%)	18 (4.8%)	31 (8.2%)	21 (5.6%)	4.07	1.08
B	I am willing to pay insurance premiums if compensation is guaranteed after crop loss.	158 (41.9%)	145 (38.5%)	20 (5.3%)	32 (8.5%)	22 (5.8%)	4.02	1.09
C	I would adopt agricultural insurance if it is affordable.	188 (49.9%)	126 (33.4%)	16 (4.2%)	28 (7.4%)	19 (5.0%)	4.16	1.04
D	I am willing to participate in government-supported agricultural insurance programmes.	176 (46.7%)	133 (35.3%)	17 (4.5%)	30 (8.0%)	21 (5.6%)	4.10	1.07
E	I would adopt agricultural insurance if claims are paid promptly.	194 (51.5%)	121 (32.1%)	15 (4.0%)	28 (7.4%)	19 (5.0%)	4.23	1.03
F	I am willing to insure my crops against drought, flood, and other climate-related hazards.	181 (48.0%)	130 (34.5%)	16 (4.2%)	29 (7.7%)	21 (5.6%)	4.17	1.07
G	I would encourage other farmers to adopt agricultural insurance.	170 (45.1%)	139 (36.9%)	19 (5.0%)	30 (8.0%)	19 (5.0%)	4.09	1.06
H	Agricultural insurance should be integrated into climate change adaptation programmes.	186 (49.3%)	127 (33.7%)	17 (4.5%)	28 (7.4%)	19 (5.0%)	4.15	1.05
I	I intend to subscribe to agricultural insurance within the next farming season.	152 (40.3%)	147 (39.0%)	21 (5.6%)	34 (9.0%)	23 (6.1%)	3.99	1.11

Furthermore, affordability emerged as an important consideration, as 49.9% strongly agreed and 33.4% agreed that they would adopt agricultural insurance if it were affordable, with a mean score of $\bar{x} = 4.16$ and a standard deviation of 1.04. These findings suggest that although farmers recognize the importance of agricultural insurance, their willingness to participate is influenced by the affordability of insurance products and confidence that compensation will be received following climate-induced crop losses. This finding supports the study of Kaunda and Chowa (2023), who reported that affordability of premiums and confidence in compensation significantly influence farmers' willingness to adopt agricultural insurance among smallholder farmers in Zambia.

The findings further reveal that respondents expressed positive attitudes towards institutional support for agricultural insurance. As shown in Table 4, 46.7% strongly agreed, and 35.3% agreed that they were willing to participate in government-supported agricultural insurance programmes, resulting in a mean score of $\bar{x} = 4.10$ and a standard deviation of 1.07. The highest mean score was recorded for the statement that respondents would adopt agricultural insurance if claims were paid promptly, where 51.5% strongly agreed and 32.1% agreed, yielding a mean score of $\bar{x} = 4.23$ and a standard deviation of 1.03. Likewise, 48.0% strongly agreed, and 34.5% agreed that they were willing to insure their crops against drought, flood, and other climate-related hazards, producing a mean score of $\bar{x} = 4.17$ and a standard deviation of 1.07. In addition, 45.1% strongly agreed, and 36.9% agreed that they would encourage other farmers to adopt agricultural insurance ($\bar{x} = 4.09$, SD = 1.06). These results indicate that respondents have considerable confidence in agricultural insurance provided that insurance schemes are transparent, reliable, and supported by effective institutional arrangements. The findings are consistent with Bhuiyan and Mkhitaryan (2022), who found that prompt claim settlement and government support increase farmers' confidence in agricultural insurance and encourage wider participation. The results also agree with the Organization for Glauber et al. (2021), which observed that trust in insurance providers and efficient claims administration are essential for improving insurance uptake among farmers.

The results also demonstrate that crop farmers perceive agricultural insurance as an important component of climate change adaptation. Table 4 shows that 49.3% strongly agreed and 33.7% agreed that agricultural insurance should be integrated into climate change adaptation programmes, resulting in a mean score of $\bar{x} = 4.15$ and a standard deviation of 1.05. Similarly, 48.5% strongly agreed, and 34.0% agreed that agricultural insurance is an effective strategy for adapting to climate change, producing a mean score of $\bar{x} = 4.16$ and a standard deviation of 1.05. Although respondents generally demonstrated high willingness to adopt agricultural insurance, slightly fewer respondents expressed immediate intention to subscribe within the next farming season, as reflected by 40.3% strongly agreeing and 39.0% agreeing, with a mean score of $\bar{x} = 3.99$ and a standard deviation of 1.11. Nevertheless, all the variables recorded mean scores above the acceptance threshold of 3.50, while the standard deviation values ranging from 1.03 to 1.11 indicate relatively consistent opinions among the respondents. Overall, the findings suggest that crop farmers are highly willing to adopt agricultural insurance as a climate change adaptation strategy, particularly where insurance products are affordable, supported by government, and characterized by prompt compensation. This finding corroborates the reports of the FAO (2024) and the World Bank (2024), which emphasized that expanding access to affordable and reliable agricultural insurance is critical for strengthening farmers' resilience, improving climate adaptation, and promoting sustainable agricultural production in developing countries.

4. CONCLUSION

The study concludes that crop farmers in Zaria LGA are highly aware of the adverse impacts of climate change on crop production, particularly in relation to irregular rainfall, rising temperatures, prolonged dry spells, declining crop productivity, and reduced farm income. These climate-related challenges have increased production risks and threatened the sustainability of agricultural livelihoods. Despite these challenges, the findings reveal a high level of willingness among crop farmers to adopt agricultural insurance as a climate change adaptation strategy, especially where insurance schemes are affordable, supported by government, and characterized by prompt claim settlement. The study therefore concludes that strengthening agricultural insurance programmes through improved awareness, affordability, institutional support, and efficient compensation mechanisms will enhance farmers' resilience and promote sustainable agricultural production in the face of climate change.

On that note, the Nigerian Agricultural Insurance Corporation, in collaboration with the Federal Ministry of Agriculture and Food Security and the Kaduna State Ministry of Agriculture, should intensify awareness campaigns and farmer education programmes on the benefits and procedures of agricultural insurance to improve participation among crop farmers. The Federal Government and relevant insurance providers should introduce affordable and subsidized insurance premium schemes while ensuring timely and transparent claim settlement to strengthen farmers' confidence in agricultural insurance. Agricultural extension agencies should integrate agricultural insurance education into their routine advisory services and provide continuous guidance on climate change adaptation strategies. Financial institutions and development partners should facilitate access to flexible agricultural credit linked with insurance products to enable farmers to invest in climate-resilient farming practices. Furthermore, policymakers should incorporate agricultural insurance into broader climate change adaptation and agricultural development policies to enhance the resilience of crop farmers against increasing climate-related risks.

5. COMPETING INTERESTS

None to declare.

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