International Journal of Agriculture and Environmental Research

ISSN: 2455-6939

Volume: 11, Issue: 04 "July-August 2025"

ASSESSMENT OF AGRICULTURAL RISK FINANCING STRATEGIES ON FOOD SECURITY AMONG SELECTED SMALLHOLDER FARMERS IN EKITI STATE, NIGERIA

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DOI: https://doi.org/10.51193/IJAER.2025.11421

Received: 30 Jul. 2025 / Accepted: 12 Aug. 2025 / Published: 14 Aug. 2025

ABSTRACT

Smallholder farmers in Nigeria face significant challenges in managing agricultural risks, which can lead to crop failure, livestock death, and reduced productivity, ultimately threatening food security and exacerbating poverty and hunger. The study aimed at identifying the agricultural risks, examining the effectiveness of agricultural risk financing strategies on food security, investigating the impact of agricultural risk financing strategies on farmers' decision-making and ascertaining the barriers to agricultural risk financing strategies among smallholder farmers in Ekiti State, Nigeria. A multi-stage sampling technique, with the aid of a well-structured questionnaire, was used to elicit information from 450 smallholder farmers from 3 Local Government Areas (i.e., 150 smallholder farmers from each Local Government Area (LGA)). The data obtained were analyzed with the aid of descriptive statistics, linear and logistic regression models. From the results, it was revealed that weather-related issues (89.3%), crop failure (85.3%), price volatility (70.7%) and pests and diseases (64.4%) were the notable and prevalent agricultural risks in the study area as reported by the farmers. The result further revealed that level of education; access to extension services, use of agricultural insurance and crop diversification were the significant predictors of food security while access to extension services, access to markets, membership of farmers' organization and amount of money saved were the statistically significant variables influencing farmers decision making to adopt agricultural risk financing strategies. The result also showed that limited access to financial services (68.4%), limited infrastructure (67.1%), limited financial literacy (60.2%), dependence on informal risk management strategies (62.4%) and lack of

ISSN: 2455-6939

Volume: 11, Issue: 04 "July-August 2025"

awareness (62.0%). The study therefore recommends that policymakers and financial institutions should work together to increase access to financial services, including agricultural risk financing products, for smallholder farmers.

Keywords: Agricultural risks, Financing strategies, Food security, Linear, Logistic models

1.0 INTRODUCTION

Agricultural productivity is a sine-quo-non to the survival of mankind, which can be guaranteed through food sustainability and safety. According to Alliance for Green Revolution in Africa (AGRA) (2018), not less than 70% of the African populace is said to be involved in agriculture. Submissions from various studies (such as 2022; Janye *et al*, 2021and Kanza et al, 2022;) had noted that agricultural innovation is the pathway to prosperity in Africa, because no region of the globe has developed into a diverse modern economy without establishing a successful foundation in agriculture. Oyetunde *et al,* (2021) stipulated that the agricultural developmental stride garnered, by any continent of the world, will determine the extent to which hunger and food deficiency can be eradicated. Therefore, to enable the agricultural value chain systems for robust economic advancement and productivity, it is imperative for numerous sources of agricultural risks to be managed by leveraging on agricultural insurance.

The world demand for food is progressively growing with the current rate of population growth and high-level consumption. To this end, the agricultural sector plays a leading role in satisfying future food requirements and safety (Zhai *et al*, 2023). Historically, considerable intensive efforts had been achieved in agricultural production. Statistical indication, between the years 1960 and 2015, noted that the adoption of green revolutionary advancement in the area of technologies, coupled with the huge expansion of raw materials (such as water, land, and other resources) into food products and global agricultural production had almost been tripled (Food and Agricultural Organization, 2021). However, sustaining agricultural production by building farmers' capacity to manage numerous agricultural barriers to enhance the demand and supply of agricultural produces is a key to developing Africa's economy.

According to Adetunji *et al.,* (2020), most food crops produced in the country come from small-scale farmers who depend largely on traditional farming systems for their agricultural inputs. These categories of farmers are bedeviled with natural hazards such as theft, flood, diseases, farm destruction by pests, fire, accident, inadequate credit; variation in price; marketing and distribution-related risks, or any form of loss. These risks will, in turn, reduce agricultural productivity and expansion.

However, it is essential to recognise the pivotal role of agricultural risk financing methods (like agricultural risk retention and transfer strategies) in protecting agricultural producers against

ISSN: 2455-6939

Volume: 11, Issue: 04 "July-August 2025"

possible agricultural risks. Agricultural risk is a major focus area in farming globally due to the threats of pests and diseases, herders' activities, bush fires, drought, and price fluctuations. In Nigeria, farmers have been displaced and traumatized by the activities of herders, bandits, kidnappers, political thugs, among others; had caused a whole lot of food shortages and inadequate control. Yet a great majority of them, because of inadequate pecuniary means (like agricultural financing techniques), are rarely being managed, especially when it involves calamitous losses. Farmers in Nigeria have to contend with several risks: climate change, a high prevalence of pests and diseases, and other man-made threats, such as insecurity, herder encroachment, and market-related risks that impact farmers and their livelihoods and the economy. The resultant consequence, often, has a sharp decline on farmer's income; and thus, result in agricultural production risk exposures (Udemezue and Kanu, 2019). Thus, this underscores the need for this research to assess how agricultural risk financing strategies can be helpful to ensure food safety and control among smallholder farmers in Ekiti State.

2.0 METHODOLOGY

2.1 The Study Area

This study was carried out in Ekiti State. Ekiti State is in Southwest Nigeria, created on October 1st, 1996 alongside five other new States. Ekiti was carved out of the former Ondo State. Ekiti State is located in the tropical climate of distinct wet and dry seasons. Geographically, it is located between longitude 4º45" and 5º45" East of the Greenwich meridian and latitude on 7º15" and 8º5" North of the equator (Owoeye, 2018). It shares boundaries with Kogi State in the North-east, Kwara State in the North and Osun State in the South and South-east. The State enjoys a tropical climate with two distinct seasons: rainy season (April to October) and dry season (November to March). The temperature ranges from 21°C to 28°C, with relatively high humidity. The population of the inhabitants of the State, according to a 2006 population census, was 2,737,186. The men are predominantly farmers while the women engage mainly in trading activities; for the educated indigenes who are employed in the formal sector, farming remains their secondary occupation.

2.2 Data collection

Primary data was used for this study. This was done with the aid of a well-structured questionnaire using personal interviews. The questionnaire drew out information on the respondents' socio-economic characteristics; types of agricultural risks; effectiveness of risk financing strategies of food security and impact of farmers' decision-making and barriers affecting risk financing strategies

2.3 Sampling techniques

ISSN: 2455-6939

Volume: 11, Issue: 04 "July-August 2025"

The study made use of a multi-stage sampling technique. At the first stage the 3 Local Government Areas (LGAs) in Ekiti were selected for the study. Second stage involved the random selection of three communities from each LGA due to their presumed relevance to the study. The third and the last stage used random selection of 50 smallholder farmers from each community, making a total of 450 respondents for the study.

2.4 Data analysis

Data obtained from the respondents were analyzed with the aid of descriptive statistics (i.e. frequency, percentage, standard deviation, mean etc.), Logistic and linear regression models.

2.4.1 Descriptive statistics

This was used to analyze data obtained on the socio-economic characteristics of the smallholder farmers and barriers affecting risk financing strategies

2.4.2 Model specification

2.4.2.1 Linear regression model

In order to examine the effectiveness of risk financing strategies on food security, linear regression model was used. A linear regression model is a statistical technique used to analyze the relationship between a dependent variable (outcome) and one or more independent variables (predictors). It assumes a linear relationship between the variables, where the dependent variable is a linear combination of the independent variables. The model estimates the coefficients (β) of the independent variables, which represent the change in the dependent variable for a one-unit change in the independent variable, while holding all other variables constant. The model can be explicitly stated as;

$$Y = \beta 0 + \beta 1X1 + \beta 2X2 + \ldots + \beta nXn + \varepsilon$$

Y is the dependent variable (outcome) i. e. Food security outcome measured in crop yield (kg)

X is the independent variable (predictor)

β0 is the intercept or constant term

β1 is the slope coefficient (change in Y for a one-unit change in X)

ε is the error term (residuals or unexplained variation)

While the independent variables are stated below;

X_1 = Age (years)

ISSN: 2455-6939

Volume: 11, Issue: 04 "July-August 2025"

X_2 = Farming experience (years)

X_3 = Level of education (no formal education = 0, primary education = 1, secondary education = 2, tertiary education = 3)

X_4 = Access to credit (yes =1 otherwise = 0)

X_5 = Farm size (hectares)

X_6 = Access to extension service (yes =1 otherwise = 0)

X_7 = Use of agricultural insurance (yes =1 otherwise = 0)

X_8 = Use of credit and loan programs (yes =1 otherwise = 0)

X_9 = Savings and emergency funds (yes =1 otherwise = 0)

X_{10} = Crop diversification (yes =1 otherwise = 0)

X_{11} = Futures and options markets (yes =1 otherwise = 0)

2.4.2.2 Logistic regression model

This was used to investigate the impact of farmers' decision-making on adoption of new technology. Logistic regression is a statistical model used to analyze binary outcomes (0/1, yes/no, etc.) based on one or more predictor variables. It estimates probabilities using a logistic function, predicting the likelihood of an event occurring. The model provides odds ratios, which measure the change in odds of the outcome for a one-unit change in the predictor variable. Logistic regression is widely used in fields like medicine, social sciences, and marketing to predict outcomes, identify risk factors, and inform decision-making. It's a powerful tool for analyzing categorical data and predicting binary outcomes. Explicitly, the model is hereby stated.

$$\log(p/(1-p)) = \beta 0 + \beta 1X + \varepsilon$$

Where:

p is the probability of the outcome (success) i.e. Adoption of new technology (yes =1 otherwise = 0)

X is the independent variable (predictor)

$\beta 0$ is the intercept or constant term

$\beta 1$ is the coefficient (change in log-odds for a one-unit change in X)

ε is the error term

ISSN: 2455-6939

Volume: 11, Issue: 04 "July-August 2025"

The independent variables are hereby stated below;

X_1 = Age (years)

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X_4 = Access to credit (yes =1 otherwise = 0)

X_5 = Farm size (hectares)

X_6 = Access to extension service (yes =1 otherwise = 0)

X_7 = Use of agricultural insurance (yes =1 otherwise = 0)

X_8 = Access to markets (yes =1 otherwise = 0)

X_9 = Membership of farmers organization (yes =1 otherwise = 0)

X_{10} = Risk financing options (credit =1, insurance = 2, savings = 3)

X_{11} = Amount of money saved (₦)

3.0 RESULTS AND DISCUSSION

3.1 Notable agricultural risks in the study area

Result in table 1 shows the various types of agricultural risks being experienced by farmers, with weather-related risks being the most frequently experienced (89.3%), followed closely by crop failure (85.3%). This suggests that farmers are highly vulnerable to weather-related risks, which can have a devastating impact on their crops and livelihoods. According to Abubakar et al. (2023), understanding farmers' risk attitudes is crucial in developing effective risk management strategies. The results also show that price volatility (70.7%) and pests and diseases (64.4%) are significant risks faced by farmers. This is consistent with previous studies that have highlighted the impact of market fluctuations and biotic stresses on agricultural productivity and farmer livelihoods. For example, a study by Adenekan (2025) notes that climate change is a major threat to Nigerian agriculture, citing erratic weather patterns, prolonged droughts, and extreme weather events.

The relatively lower frequency of livestock diseases (22.7%) and soil degradation (40.0%) may suggest that these risks are being managed more effectively by farmers or are less prevalent in the study area. However, it's essential to note that these risks can still have a significant impact on agricultural productivity and farmer livelihoods. Comparing the results, it's clear that weather-related risks and crop failure are the most significant challenges faced by farmers, followed by

ISSN: 2455-6939

Volume: 11, Issue: 04 "July-August 2025"

price volatility and pests and diseases. These findings have important implications for agricultural risk management strategies and policies, which should prioritize weather risk management, crop insurance, and market stabilization initiatives to support farmers in managing these risks. Additionally, the results highlight the need for integrated pest management and soil conservation practices to mitigate the impact of pests and diseases and soil degradation on agricultural productivity.

Table 1: Distribution of the smallholder farmers by agricultural risks being experienced

Types of agricultural risks	Frequency	Percentage
Crop failure	384	85.3
Livestock diseases	102	22.7
Price volatility	318	70.7
Weather-related risks	402	89.3
Pests and diseases	290	64.4
Soil degradation	180	40.0
Market access risks	242	53.7

Computed field survey data, 2024
Multiple responses

3.2 Effectiveness of agricultural risk financing strategies on food security

The linear regression model provides valuable insights into the relationship between agricultural risk financing strategies and food security outcomes. The R-square value (0.721) indicates that about 72% of the variation in food security outcomes is explained by the independent variables, suggesting a good fit of the model. The adjusted R-square value (0.472) is relatively lower, which is expected given the number of predictors in the model. Despite this, the model's explanatory power is still substantial, and the significant variables provide important insights. Notably, level of education ($\beta = 42130.213$, $p < 0.01$), access to extension services ($\beta = 1.029$, $p < 0.01$), use of agricultural insurance ($\beta = 284898.943$, $p < 0.05$) and crop diversification ($\beta = 74383.408$, $p < 0.05$) are significant predictors of food security outcomes. These findings suggest that investing in education, extension services, and agricultural insurance can have a positive impact on food security outcomes. This is consistent with previous studies, which have shown that education enhances farmers' ability to adopt new technologies and manage risks (Aker, 2017; World Bank, 2020), extension services play a critical role in improving farmers' productivity and resilience (Davis et al., 2018), and agricultural insurance can improve farmers' food security outcomes (Hazell et al., 2020).

The positive relationship between level of education and food security outcomes highlights the importance of investing in education for farmers. Education can enhance farmers' ability to adopt new technologies, manage risks, and make informed decisions, ultimately leading to better food

ISSN: 2455-6939

Volume: 11, Issue: 04 "July-August 2025"

security outcomes. Policymakers can support initiatives that improve access to education for farmers, such as training programs, workshops, and online resources. The significant relationship between access to extension services and food security outcomes underscores the critical role that extension services play in improving farmers' productivity and resilience. Extension services provide farmers with valuable information, training, and support, enabling them to adopt best practices and make informed decisions. Policymakers can invest in extension services, such as farmer field schools, demonstration plots, and mobile-based advisory services, to support farmers in improving their food security outcomes.

The positive relationship between use of agricultural insurance and food security outcomes suggests that agricultural insurance can be an effective risk management tool for farmers. Agricultural insurance can help farmers manage risks and invest in their farms with confidence, ultimately leading to improved productivity and resilience. Policymakers can support initiatives that promote access to agricultural insurance, such as index-based insurance products and premium subsidies, to help farmers manage risks and improve their food security outcomes.

Table 2: Linear regression result of effectiveness of agricultural risk financing strategies on food security

Variables	Coefficient	Std. Error	t-value
Age	63233.422	110006.404	.575
Farming experience	-3662.186	7368.488	-.497
Level of education	42130.213***	11282.662	3.734
Household size	-24466.462	137725.373	-.178
Farm size	82438.604	79689.711	1.034
Access to extension services	1.029***	.214	4.818
Use of agricultural insurance	284898.943**	115880.913	2.459
Use of credit and loan programs	7875.783	15298.844	.515
Savings and emergency funds	-17775.307	59237.806	-.300
Crop diversification	74383.408**	33097.320	2.247
Futures and options markets	87123.080	79149.312	1.100
R square	0.721		
Adjusted R square	0.472		

Computed field survey data, 2024

ISSN: 2455-6939

Volume: 11, Issue: 04 "July-August 2025"

3.3 Impact of agricultural risk financing strategies on farmers' decision-making

The logistic regression model provides a good fit to the data, as indicated by the significant LR Chi-square value (61.55), which suggests that the independent variables collectively have a significant impact on farmers' decision-making. The model shows that access to extension services has a significant negative impact on farmers' decision-making ($\beta = -0.916$, $p < 0.01$), indicating that farmers with access to extension services are less likely to make risky decisions. This finding is consistent with previous studies, which have shown that extension services can improve farmers' decision-making capacity by providing them with valuable information and training (Ali et al., 2022). On the other hand, access to market ($\beta = 0.802$, $p < 0.01$) and membership of farmers organization ($\beta = 1.477$, $p < 0.01$) have significant positive impacts on farmers' decision-making, suggesting that farmers with access to markets and those who are members of farmers' organizations are more likely to make informed decisions. These findings are supported by recent studies, which have highlighted the importance of market access and collective organizations in improving farmers' livelihoods and decision-making capacity (Khan et al., 2020; Martey et al., 2021). Additionally, amount of money saved ($\beta = 0.842$, $p < 0.05$) has a significant positive impact on farmers' decision-making, indicating that farmers who save more money are more likely to make informed decisions. This finding is consistent with previous studies, which have shown that savings can provide farmers with a financial safety net and improve their decision-making capacity (Dercon et al., 2020).

The significant negative impact of access to extension services on farmers' decision-making highlights the importance of extension services in providing farmers with valuable information, training, and support. This enables them to make informed decisions and manage risks effectively. Policymakers can invest in extension services to enhance farmers' decision-making capacity, as suggested by recent studies (Ali et al., 2022). The positive impact of access to market on farmers' decision-making underscores the importance of market access in providing farmers with opportunities to sell their products and get better prices. Policymakers can support initiatives that promote market access, such as infrastructure development and market information systems, as highlighted by recent studies (Khan et al., 2020).

The significant positive impact of membership of farmers' organization on farmers' decision-making highlights the importance of collective organizations in providing farmers with collective bargaining power and access to information and resources. Policymakers can support initiatives that promote collective organizations and farmer empowerment, as suggested by recent studies (Martey et al., 2021).

The positive impact of amount of money saved on farmers' decision-making suggests that savings can provide farmers with a financial safety net, enabling them to invest in their farms and manage

ISSN: 2455-6939

Volume: 11, Issue: 04 "July-August 2025"

risks effectively. Policymakers can support initiatives that promote savings and financial inclusion among farmers, as highlighted by recent studies (Dercon et al., 2020).

Table 3: Logistic regression result of the impact of agricultural risk financing strategies on farmers' decision-making

Variables		Coefficients	Std. Error	p-value
Age		-0.586	0.564	0.298
Farming experience		-0.249	0.207	0.227
Level of education		0.338	0.229	0.140
Access to credit		-0.046	0.204	0.821
Farm size		-0.044	0.027	0.112
Access to extension services		-0.916***	0.215	0.000
Use of agricultural insurance		-0.044	0.047	0.347
Access to market		0.802***	0.203	0.000
Membership of farmers organization		1.477***	0.325	0.000
Risk financing options		0.438	0.732	0.810
Amount of money saved		0.842**	0.387	0.043
Constant		1.319	1.378	0.338
Log Likelihood Function	-41.024			
LR Chi-square	61.55			

Computed field survey data, 2024

3.4 Barriers to agricultural risk financing strategies

The table 4 result highlights the significant barriers to agricultural risk financing strategies among smallholder farmers. The top barriers include limited access to financial services (68.4%), limited infrastructure (67.1%), dependence on informal risk management strategies (62.4%), and lack of awareness (62.0%). These findings are consistent with previous studies that have highlighted the challenges faced by smallholder farmers in accessing financial services and managing agricultural risks (Chimanga & Kawimbe, 2024). The high frequency of dependence on informal risk management strategies also underscores the need for formal risk financing products that cater to the needs of smallholder farmers, as noted by the World Bank (2024).

The results also show that high premiums (45.3%), complexity of products (46.4%), and high transaction costs (40.6%) are significant barriers to agricultural risk financing. These findings are supported by studies that have emphasized the importance of designing and delivering risk financing products that are affordable and accessible to smallholder farmers (Matsvai, 2024; Abiodun Olorundenro, 2025). The relatively lower frequency of basis risk (19.3%) and regulatory challenges (24.4%) may suggest that these barriers are less significant or are being addressed through existing initiatives (Evbuomwan, 2014; Offio et al., 2024).

Comparing the results, it is clear that limited access to financial services, limited infrastructure, and lack of awareness are the most significant barriers to agricultural risk financing among

ISSN: 2455-6939

Volume: 11, Issue: 04 "July-August 2025"

smallholder farmers. These findings have important implications for policy and practice, highlighting the need for initiatives that improve access to financial services, infrastructure, and awareness about agricultural risk financing products (Matsvai, 2024). Additionally, the results suggest that risk financing products should be designed with the needs and constraints of smallholder farmers in mind, taking into account their limited financial literacy and dependence on informal risk management strategies (World Bank, 2024).

Table 4: Distribution of the smallholder farmers by barriers to agricultural risk financing strategies

Barriers to agricultural risk financing	Frequency	Percentage
Limited access to financial services	308	68.4
High premiums	204	45.3
Lack of awareness	279	62.0
Complexity of products	209	46.4
Insufficient data	140	31.1
High transaction costs	183	40.6
Basis risk	87	19.3
Regulatory challenges	110	24.4
Limited infrastructure	302	67.1
Farmers' risk perception	182	40.4
Limited financial literacy	271	60.2
Dependence on informal risk management strategies	281	62.4

Computed field survey data, 2024

4. CONCLUSION

This study provided valuable insights into the barriers to agricultural risk financing strategies among smallholder farmers. The findings highlight the significant challenges faced by smallholder farmers in accessing financial services, infrastructure, and awareness about agricultural risk financing products. It also underscores the need for targeted interventions to address these barriers and improve the resilience and productivity of smallholder farmers.

The study's results have important implications for policy and practice, emphasizing the need for initiatives that improve access to financial services, infrastructure, and awareness about agricultural risk financing products. By addressing these barriers, policymakers and stakeholders can help smallholder farmers better manage agricultural risks and improve their livelihoods.

Ultimately, this study contributes to the ongoing efforts to promote sustainable agricultural development and food security in Nigeria. By understanding the barriers to agricultural risk

ISSN: 2455-6939

Volume: 11, Issue: 04 "July-August 2025"

financing among smallholder farmers, policymakers and stakeholders can develop more effective solutions to support these farmers and enhance their productivity and resilience.

5. RECOMMENDATIONS

Arising from the study, it is therefore suggested that;

Policymakers and financial institutions should work together to increase access to financial services, including agricultural risk financing products, for smallholder farmers.

Governments and private sector stakeholders should invest in rural infrastructure, such as roads, storage facilities, and communication networks, to improve access to markets and reduce transaction costs for smallholder farmers

Financial institutions and extension services should provide training and education to smallholder farmers on financial literacy, risk management, and agricultural risk financing products.

Financial institutions should design risk financing products that are tailored to the needs and constraints of smallholder farmers, taking into account their limited financial literacy and dependence on informal risk management strategies.

Policymakers and stakeholders should promote awareness and adoption of agricultural risk financing products among smallholder farmers, highlighting the benefits and potential impacts on their livelihoods.

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