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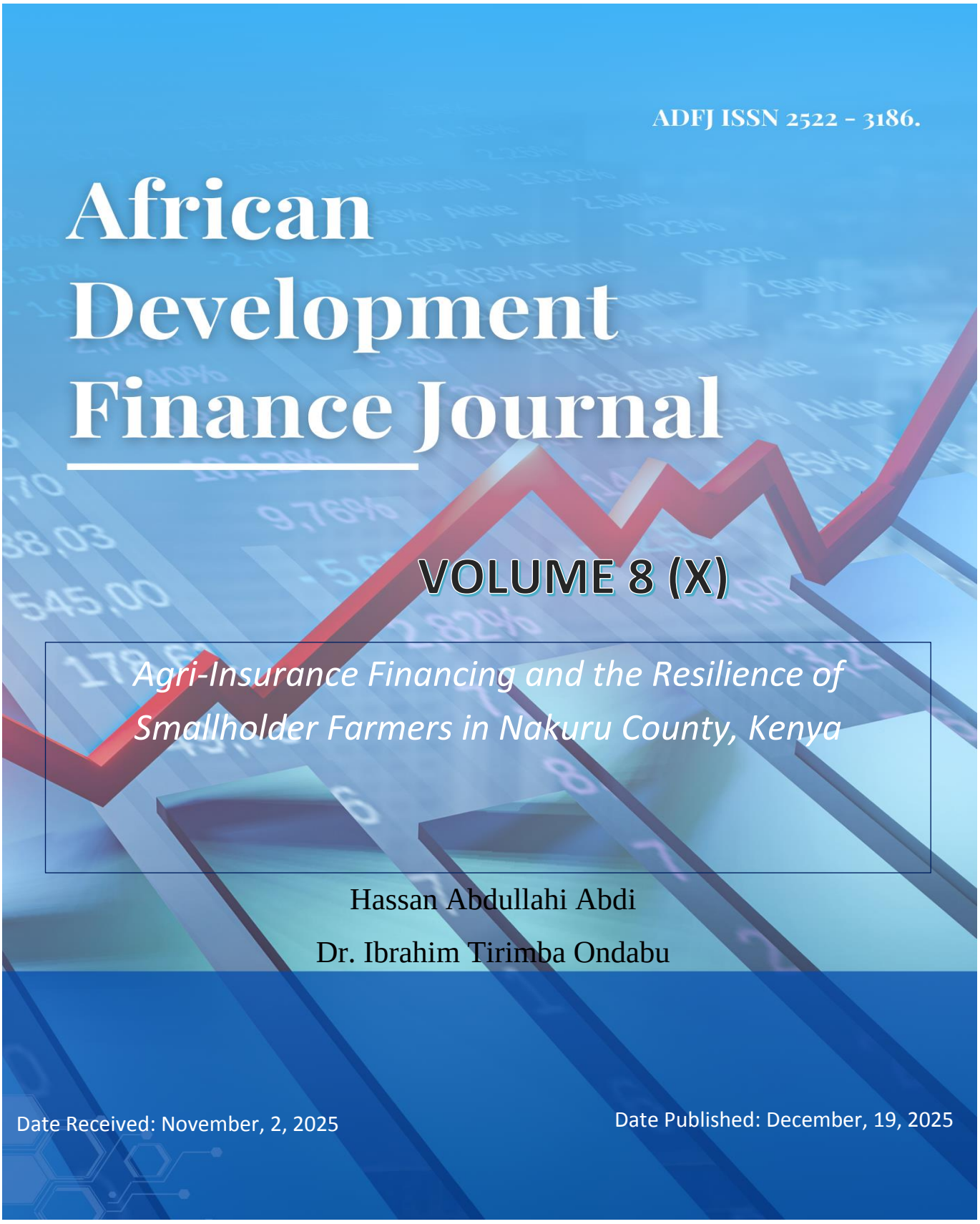

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Agri-Insurance Financing and the Resilience of Smallholder Farmers in Nakuru County, Kenya

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Abstract
Agricultural insurance has increasingly become a critical tool for stabilizing smallholder farmers' livelihoods, particularly in regions affected by climate variability and market shocks. This paper examines the influence of Agri-insurance financing on the productivity and resilience of smallholder farmers in Nakuru County. Using a descriptive quantitative design and data from 272 respondents, findings show that insurance significantly enhances productivity ($\beta = .258$, $p < .001$) by reducing farmers' risk exposure, strengthening investment confidence, and promoting adoption of new technologies. Despite high awareness levels, insurance uptake remains low due to unaffordable premiums, low trust in insurers, and limited experience with claim processing. The study recommends subsidized index-based insurance, bundling insurance with credit and inputs, digital claim-processing mechanisms, and cooperative-based outreach.

Keywords: *Agri-Insurance, Smallholder Farmers, Productivity, Risk Management, Kenya*

1. Introduction

Agriculture is one of the most climate-sensitive sectors in Kenya, a country whose rural livelihoods largely depend on rain-fed farming. Smallholder farmers, who represent the majority of agricultural producers in Nakuru County, face increasing vulnerability from erratic rainfall, drought, flooding, livestock diseases, and price volatility (Khan et al., 2024). These shocks not only reduce yields but also discourage farmers from adopting modern technologies that could enhance productivity. The fear of losing capital discourages risk-taking, often resulting in low-input, low-return farming systems.

Agri-insurance has emerged as a critical instrument for mitigating agricultural risks. Unlike traditional coping strategies such as borrowing, selling livestock, or reducing consumption, insurance provides a more structured and predictable mechanism for recovering from adverse events. Insurance cushions farmers against catastrophic losses, allowing them to invest in high-quality seeds, fertilizers, livestock feeds, and equipment with greater confidence. In recent years, Kenya has introduced various insurance products, including weather-index insurance, livestock insurance, and crop-specific packages, yet adoption remains relatively low in many rural areas.

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For smallholder farmers in Nakuru County, insurance has the potential to strengthen resilience, stabilize incomes, and promote long-term planning. However, understanding how agri-insurance financing directly influences productivity remains an area requiring more empirical research. This study therefore seeks to examine the relationship between agri-insurance financing and smallholder productivity, with particular emphasis on awareness levels, affordability, claim experiences, and farmers' perceptions of insurance as a risk-management tool.

2. Literature Review

2.1 Conceptual Review

Agricultural insurance refers to financial products designed to compensate farmers when adverse events, such as drought, pests, or disease, lead to reduced yields or livestock losses (Smith, 2016). These products may take the form of indemnity-based insurance, weather-index insurance, livestock policies, or bundled insurance packages linked to credit and input distribution.

Key dimensions of agricultural insurance include premium affordability, which determines whether smallholder farmers can consistently meet insurance costs (Ankrah et al., 2021), and awareness and understanding, which shape farmers' ability to evaluate the usefulness and relevance of insurance products. Another critical aspect is claim experience, as timely and fair compensation builds trust and encourages continued participation in insurance schemes. Additionally, risk reduction is a central function of agri-insurance, helping farmers manage uncertainty and make productivity-enhancing investments with greater confidence. Because of these combined benefits, agricultural insurance is increasingly integrated into broader rural development initiatives aimed at strengthening resilience, improving food security, and supporting sustainable agricultural transformation.

2.2 Theoretical Review

Knight (1921) distinguishes between measurable risks (where probabilities of events are known) and unmeasurable uncertainty (where probabilities are unknown). In agriculture, uncertainty dominates due to unpredictable weather patterns and volatile markets. Insurance helps farmers convert uncertainty into measurable risk, making recovery mechanisms more predictable and encouraging investment (Rakow, 2010).

The study was also anchored on the risk-pooling theory. The theory suggests that large groups with diverse risk exposures can reduce individual costs through contributory premiums (Monke, 2018). Insurance companies use this logic to spread agricultural risk across thousands of farmers.

2.3 Empirical Review

Global empirical studies consistently highlight agricultural insurance as a fundamental risk-management tool that stabilizes production and encourages investment among smallholder farmers. Fang et al. (2021) show that crop insurance significantly improves green total factor productivity in China by enabling farmers to adopt modern sustainable technologies such as precision seeding and no-tillage farming, ultimately enhancing long-term agricultural output. Their study demonstrates that insurance not only cushions farmers from climatic shocks but also promotes the uptake of environmentally friendly practices that farmers might otherwise avoid due to fear of loss (Fang et al., 2021). In broader global research, agricultural insurance has also been identified as a mechanism that strengthens resilience by reducing farmers' dependence on emergency coping strategies, thereby enabling more consistent and planned investments in production (Smith, 2016).

Regionally, evidence from West and Southern Africa paints a mixed but insightful picture regarding agricultural insurance uptake and its productivity effects. Empirical work by Mponela and Kizito (2022) in the Guinea Savannah zone of West Africa shows that crop insurance enhances farmers' willingness to adopt high-productivity technologies such as fertilizer and improved seed varieties, increasing maize marketed surplus by 113% and improving food security by 42%. In Zambia, however, Kayula et al. (2022) find weaker productivity effects, noting that subsidized public programs such as the Farmer Input Support Programme (FISP) overshadow private insurance schemes, making insurance less influential in driving output among smallholders. These regional studies emphasize that insurance effectiveness depends heavily on affordability, institutional design, and farmer perceptions.

Further evidence from Ghana provides additional insights into farmer behavior and insurance adoption barriers. Ankrah et al. (2021) find that although 90% of smallholder farmers in Ghana perceive insurance as an essential risk-management tool, only 14% are actually insured due to

limited product awareness, unaffordable premiums, and lack of suitable cover options. Appiah-Twumasi et al. (2022) similarly show that innovative financing models, including bundled insurance and village savings associations, can significantly improve farmers' economic and technical efficiency by reducing exposure to shocks and easing access to input capital. These studies suggest that while African farmers value insurance, structural and informational constraints limit participation, reducing the potential productivity gains insurance can deliver.

Locally, the research provides strong empirical evidence that agri-insurance financing has a high positive correlation with smallholder productivity in Nakuru County, with a statistically significant effect ($\beta = 0.258$, $p < 0.001$). Insurance cushions farmers against climate risks, pest outbreaks, and unpredictable market shifts, factors that commonly disrupt production cycles in the county. The findings align with Knight's Risk and Uncertainty Theory, which explains that insurance transforms unpredictable agricultural uncertainty into manageable risk that farmers can plan around. However, the research also highlights persistent barriers, such as high premiums, limited awareness, and inaccessibility that mirror regional and global trends and restrict broader adoption of insurance in Nakuru County. These gaps underscore the need for targeted policy interventions to make insurance more affordable, accessible, and integrated into local agricultural financing systems.

3. Research Methodology

This study adopted a descriptive quantitative research design, which is appropriate for assessing relationships among variables in a structured and statistically reliable manner while also providing a clear description of population characteristics (Siedlecki, 2020). The design allowed for systematic measurement of smallholder farmers' levels of insurance awareness, affordability perceptions, claim experiences, and access to available insurance products. The target population consisted of 1,288 smallholder farmers in Nakuru County engaged in diverse agricultural activities such as dairy, horticulture, subsistence farming, livestock keeping, and crop production. To ensure fair representation across these farming categories, a sample of 272 farmers was selected using a stratified random sampling technique. Stratification helped capture the heterogeneity of farming systems in the county and minimized sampling error by ensuring that both resource-poor and commercially oriented farmers were proportionately included.

Data were collected using a structured questionnaire designed to assess four key dimensions of agricultural insurance: awareness, premium affordability, claim experience, and insurance availability. The instrument included both closed-ended items and Likert-scale statements to capture farmers' attitudes and perceptions in a standardized format. Prior to the main data collection, the questionnaire underwent pilot testing in a neighboring county with similar agricultural characteristics. The pilot results generated a Cronbach's alpha coefficient above .80, demonstrating strong internal consistency and confirming that the items reliably measured the intended constructs. Necessary refinements were made following the pilot to improve clarity, flow, and interpretability of the items.

Data analysis followed a two-step statistical procedure. Descriptive statistics such as frequencies, percentages, means, and standard deviations were computed to summarize general patterns in insurance uptake, perceptions, and experiences among the respondents. Multiple regression analysis was conducted to examine the predictive effect of agricultural insurance financing on smallholder productivity. This model assessed whether variations in insurance awareness, affordability, claims history, and product accessibility significantly influenced productivity outcomes, while also accounting for demographic control variables such as age, gender, education level, and farm size. Throughout the research process, strict ethical protocols were upheld, including obtaining informed consent, guaranteeing confidentiality, and ensuring voluntary participation. These measures helped protect respondents' rights and enhanced the credibility and integrity of the study's findings.

4. Findings and Discussions

4.1 Descriptive Findings

Table 1: Descriptive Findings of Agri-Insurance Financing

Statement	N	Minimum	Maximum	Mean	Std. Deviation
1. Mitigates risks, enhancing financial stability for farmers	272	1	5	3.69	0.900
2. Incentivizes investment in productivity-enhancing practices	272	1	5	3.68	0.875
3. Risk pooling contributes to community resilience in farming communities	272	1	5	3.67	0.850

Table 1 gives a descriptive statistic of agri-insurance financing among 272 respondents in Nakuru County. The agri-insurance was also found to reduce risks, increase financial stability (mean = 3.69, SD = 0.900), encourage investment in productivity-enhancing practices (mean = 3.68, SD = 0.875) and create community resilience by risk pooling (mean = 3.67, SD = 0.850). The average scores were above 3.6, demonstrate the overall positive attitude towards agri-insurance as a financial instrument that helps farmers to overcome risks and enhance their productivity. Deviations that are less than that are indicative of moderate agreement among the respondents indicating consistent opinions. The implications of these findings are that agri-insurance financing is considered an important tool to mitigate vulnerability, stimulate strategic investment and promote collective resilience of farming communities. All in all, the statistics indicate that agri-insurance can be used to increase individual and community level productivity within Nakuru County.

4.2 Regression Findings

TABLE 2: Regression Coefficients for Predicting Smallholder Farmers' Productivity

Model	Variable	B	Std. Error	Beta	t	Sig.
1	(Constant)	0.409	0.164		2.499	0.013
	Agri-Insurance Financing	0.252	0.057	0.258	4.450	0.000

Note. a = Dependent Variable: Smallholder Farmers' Productivity.

Table 2 shows the regression coefficients of predicting the productivity of smallholder farmers using four agricultural financing mechanisms. The constant (intercept) = 0.409 (p=0.013) represents the level of productivity the country has when all the predictors take the value of zero. The effect was positive and significant. Agri-insurance financing exhibits a better impact (B = 0.252, 8 = 0.258, $p < 0.001$), which means it has a significant impact on productivity.

5. Conclusion and Recommendations

5.1 Conclusion

Agri-insurance financing significantly improves farmers' productivity and resilience in Nakuru County. By reducing fear of losses, insurance enables farmers to adopt improved technologies,

diversify production, and make more informed investment choices. While awareness is relatively high, uptake is constrained by premium costs, low trust, and minimal claims experience. Strengthening insurance infrastructure and integrating insurance into value chain financing would dramatically enhance smallholder resilience and productivity.

5.2 Recommendations

To strengthen the effectiveness of agricultural insurance for smallholder farmers in Nakuru County, there is an urgent need to address affordability and accessibility constraints. One of the most impactful strategies is the subsidization of weather-index insurance, which would lower premium costs and encourage broader farmer participation, particularly among low-income households. Alongside this, financing institutions should bundle insurance with input loans and credit facilities, allowing farmers to automatically access insurance when acquiring seeds, fertilizers, or working capital. This approach not only simplifies the enrollment process but also ensures that farmers remain protected throughout the production cycle. Furthermore, digitizing claims processing through mobile-based reporting and automated verification would significantly reduce delays and improve trust in insurance services, an essential factor in strengthening uptake and retention.

Equally important is the role of farmer institutions in expanding insurance coverage. Cooperatives should be empowered to educate farmers, negotiate group premiums, and act as intermediaries between insurers and rural communities. Their close proximity to farmers places them in a unique position to clarify insurance terms, assist with documentation, and support claim submissions. Finally, insurers should develop customized agricultural insurance products tailored to the specific production risks faced by dairy, horticulture, and crop farmers in Nakuru County. Such tailored policies would respond more effectively to local climatic patterns, pest pressures, and crop cycles, ensuring that insurance remains both relevant and reliable for diverse farming households. Overall, these measures would help strengthen resilience, improve productivity, and create a more inclusive agricultural risk-management framework.

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