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Small-Scale Farmers' Resilience Strategies against the Effects of Insurgency on Yam Production and Distribution in Niger State, Nigeria

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Abstract
Insurgency has had significant impact on the yam supply chain in Niger State. Farmers however have adopted several coping strategies, in order to ensure continued production and distribution. This study assesses the adaptation strategies adopted by small-scale yam farmers in Niger State in response to the impact of insurgency on yam production and distribution. Adopting a quantitative research design, primary data was collected through structured questionnaires from a sample of 318 small-scale yam farmers across five (5) Local Government Areas (LGAs) in Niger State. A stratified random sampling technique was used to select respondents, and 313 completed questionnaires were analysed. Descriptive statistics such as mean statistics and ANOVA were adopted for data analysis. The findings revealed that insurgency had a major impact on yam production and distribution as it led to significant declines in output (mean = 4.97), loss of farmland (mean = 4.89), and increased cost of labour (mean = 4.83). To mitigate these effects, farmers adopted various coping strategies, such as prayer for safety, the payment of taxes to insurgents, making pact with insurgents, employment of security and diversification into other agricultural activities. The study concludes that safety issues, labour expenses, and transportation infrastructure are critical factors that affect yam production and successful distribution in Niger State. The study recommended enhancement of security, opening of new safer yam markets, encouraging collaboration in information dissemination among farmers, community leaders and security agencies and the provision of financial support to affected farmers to boost farmers' resilience.

Keywords: Resilience strategies; Insurgency; Yam distribution; Yam production; Small-scale farmers; ANOVA

1.0 Introduction
Agriculture still remains one of the key industries in the Nigerian economy, providing jobs, food, and a source of income to a significant percentage of the population. In this industry, small-scale farmers play an important role, as they produce over 70% of national food production (FAO, 2022). Their agricultural practices provide nutritional support to their households, rural earners, and local markets, especially in states like Niger where agriculture is the backbone of the economic system. However, small-scale farmers continue to face systematic problems, such as poor access to credit, poor mechanization, poor infrastructure, and market instability. Over the last few years, the threat of insecurity, i.e. insurgency and banditry, has been one of the worst threats to their viability.

In many areas in the Niger state, the insurgent attacks have led to displacement, loss of life and property, and destruction of farmlands. This has led to a situation where most farmers have abandoned farming due to the safety factor, leading to significant agricultural productivity and income losses (Mustapha et al., 2025; Ajiboye et al., 2024b). Yam, one of the major staple crops and sources of income to rural households, has been affected with severe production and market losses (Ogaji et al., 2022). Most of the Yam farmers are small-scale farmers living in remote villages that continue to be susceptible to attacks, making access to land, agricultural inputs, and transport channels more difficult (Yunusa et al., 2023).

Extant literature has mostly focused on the economic impact of insecurity on agriculture (Ajiboye, 2023; Ogaji et al., 2022). However, there remains a gap in understanding about the ways of adjustment of small-scale farmers and the impact that the adaptive responses have on the resilience of agriculture. To this end, the present study aims at assessing the adaptation measures undertaken by small-scale farmers to insurgency and to determine its effectiveness on yam production and distribution in Niger State.

2.0. Literature Review

2.1 Conceptual Review

2.1.1 Farmers Resilience against Insurgency

According to Bruck & d'Errico (2019), resilience is a complex idea that may be defined as the capacity to recover from a variety of shocks or disruptions without suffering long-term harm. Communities in some Local Government Areas in Niger State, such as Shiroro, Munya, Rafi have shown incredible resiliency in the face of insurgency and banditry by creating a variety of coping mechanisms to deal with the ongoing dangers. This is consistent with the results of Arias *et al.* (2019), who found that households impacted by war in rural areas had a high degree of shock tolerance. When outnumbered and without security support, one of the most important tactics is to temporarily reach agreements with the robbers and rebels (Hamza *et al.* 2022). Though these agreements are fragile and often breached, they provide temporary respite and a means of survival.

Communities in Munya Local Government Area have taken steps to guarantee that their children's education continues. They hold their classes outside of their schools despite the difficulties, and they give teachers food supplies as payment. This initiative demonstrates their dedication to making education a top priority, especially in times of crisis (Ajiboye, 2024a; Yakubu, 2021; Shaibu *et al* 2020). In line with Abraham Maslow's hierarchy of needs, accepting the circumstances that bandits and insurgents impose emphasises the significance of safety and security as basic wants (Hamza *et al.* 2022).

Hellige (2018) looked at risk, threats, equilibrium, social norms, and stress in order to create a taxonomy of resilience. In response to bandit and insurgent assaults, most communities have established vigilante organisations. These groups are in line with Reisman and Their (2018) assumptions regarding the frequency of these attacks and their effects on agricultural activity. These communities often rely on symbiotic relationships with their neighbours to survive, as they are far from urban centres where law enforcement presence is stronger.

2.2 Theoretical Framework

2.2.1 Resilience Theory

In 1973, Holling created the resilience theory which now serves as an important framework for understanding system and community reactions to disturbances while keeping their essential goals intact. Holling (1973) defined resilience as the ability of a system to endure change and rebuild while maintaining its essential identity and functions. This theory points out the relationship between human and environmental processes and has been applied to different

fields even outside its intended area of focus (Folke *et al*., 2010). The three basic aspects of the theory are transformability, adaptability, and persistence. According to Walker *et al*. (2004), the terms "persistence," "adaptability," and "transformability" describe a system's capacity to hold onto its stable state in the face of external shocks, modify procedures to reduce vulnerabilities, and develop whole new systems in the event that the existing ones prove to be unworkable.

Resilience theory has been employed in several fields ranging from disaster management, climate change as well as sustainable development. According to Adger (2000), the theory explains how communities respond, adjust or recover from tragedies. This makes this theory ideal for this study as it studies how small-scale farmers tend to respond to the impact of insurgency on the yam production and distribution. Farmers' ability to welcome or embrace new farming techniques is an indication of their flexibility, their ability to continue farming despite challenges is an indication of their tenacity while their efforts to try out new methods and markets show their transformability as evidenced in the studies (Ajiboye, 2023; Hamza *et al.*, 2022; Ibana *et al*., 2009).

The resilience theory is especially useful in understanding how small-scale farmers in the state of Niger adapted to insurgency. The fact that the farmers were able to continue producing yams despite the insecurity and disruption issues is an element of persistence in the theory. Adaptability can be seen in their attempts to adapt farming methods, including shifting planting seasons or planting different crops, and changing their methods in order to adapt to the altered environment. Also, there is the aspect of transformability demonstrated by the diversification of the farmers, who are venturing into other forms of agriculture and looking into newer markets in their effort to construct more robust production and distribution systems against the threats that have been posed on them. The framework, in turn, enables us to describe how farmers are not merely coping with the consequences of the insurgency but are proactively changing and adjusting their tactics to be able to continue living.

2.3 Empirical Review

Adisa *et al*. (2022) evaluated the tactics used by crop farmers in Osun state, Nigeria to lessen hostilities with livestock herders. Their study analysed the causes, impacts and coping methods of these farmers in order to lessen the effects of their disputes with herders in Osun state. In this study, a purposive and proportional sampling strategy was utilised in choosing a total of 120 vulnerable crop producers from around the state using a quantitative research design. After that, a structured, closed-ended interview schedule was used to gather pertinent study data while both descriptive and inferential statistics were used to examine the collected data. Result from the study revealed that crops loss as well as reduced farmers output and income were the major effects of conflict. Improved farm security, praying for peace and requesting support from friends and relatives were the major strategies adopted by farmers in the areas. The study also revealed that years of residence of farmers, farming experiences and the effects of the conflicts determined the coping strategies adopted by the farmers. The study recommended that relief materials should be provided by government and donor agencies to farmers to help cushion the effects of the conflicts.

Rabiu *et al.,* (2022) analysed the effect insurgency had on food crop production in Gaidam Local Government Area of Yobe state, Nigeria. The study adopted a quantitative research design utilising a multi-stage sampling method to select 100 respondents for the population. Structured questionnaires were distributed as instrument of data collection to the respondents. Descriptive statistics such as frequencies, means and percentages were adopted for data analysis while inferential statistics like multiple regression model was adopted for hypothesis testing. The study revealed that low crop production, inaccessibility of farm land, inaccessibility of rural market, poor nutrition, unemployment, reduced income, increased social

vices, increased hunger, hike sin prices of commodities, loss of invested money as well as loss of crop harvested to insurgents were some of the effects that the insurgency had on crop production in the study area. The study also identified diversion to other forms of agriculture like livestock rearing, fishing, poultry farming as some coping strategies adopted. Others adopted back yard farming, dry season farming, begging, petty trading, craft making and processing of agricultural products as coping strategies adopted to cushion the effects. The study recommended the provision of training and literacy classes for farmers by educational authorities to enlighten the farmers of best practices and broaden their scope to aid them adopt better strategies.

Chibundu *et al*. (2022) conducted a study assessing the strategies employed by crop farmers in Imo state, Nigeria against the effects of agricultural land conflict. The study employed a descriptive research method. Farmers were selected from different local government areas within the state using a mixed sampling technique namely, purposive, proportionate, simple random and snowball sampling techniques. Structure interview schedule was then employed as instrument for data collection. The collected data were analysed using percentages and weighted mean. The study revealed that increased cost of inputs, lack of market for produce, land redundancy, improperly time farming activities, loss of lives and reduction in crop size were the major effects of agricultural land conflicts. The study also discovered that diversification from crop production, appeasing other parties, praying for peace, and adoption of less risky income generating activities were strategies employed to cope with the identified effects. The study therefore recommended that there should be a review of existing land governance system in order to accommodate recent happenings.

While these reviewed studies provide significant contributions, they share some common limitations. Most of the studies focused on the general effects of conflicts and insecurity on crop production, without a specific emphasis on particular crops or the nuanced impact on local food systems. Additionally, these studies were region-specific, and their findings may not fully reflect the unique challenges faced by farmers in other regions, particularly in Niger State, which is not represented in the reviewed studies. The current study fills these empirical gaps by focusing specifically on the effects of insurgency on yam production and distribution in Niger State, a region that has not been extensively studied in the existing literature. By collecting data from farmers in five Local Government Areas (LGAs) of Niger State, the study aims to identify region-specific coping strategies, while also employing advanced inferential statistics such as ANOVA to analyse the variation in adaptation strategies across different farmer groups. This approach offers a novel perspective on how insurgency affects yam production and distribution in Niger State, contributing new insights to the broader discourse on agri-food resilience in conflict-affected regions.

3.0 Methodology

The study was carried out in Niger East Senatorial District of Niger State, Nigeria, adopting a quantitative research design. The population for the study consisted of 1,553 small-scale yam farmers which were selected from the list of registered yam farmers with the Agriculture Department of the LGAs, with 287 from Rafi LGA, 380 from Paikoro LGA, 465 from Shiroro LGA, 187 from Munya LGA, and 234 from Gurara LGA. These are the major yam producing LGAs in Niger State and are majorly affected by insurgency due to their accessibility to Kaduna State. A sample size of 318 small-scale farmers, calculated using the Taro Yamane formula, was adopted for the study. Using the proportion formula, a sample of 59 farmers were taken from Rafi LGA, 95 from Shiroro LGA, 78 from Paikoro LGA, 38 from Munya LGA, and 48 from Gurara LGA. A stratified sampling technique was employed to select the respondents.

The study focused on yam-producing areas where insurgent activities had been reported or occurred, limiting the scope to five LGAs: Gurara, Munya, Paikoro, Rafi, and Shiroro which are major yam producing areas but are majorly affected by the insurgency due to their accessibility to Kaduna State (See Figure 1). Small-scale yam farmers were selected from the nine wards in each of the five LGAs, with one community chosen from each ward. Out of the total 318 administered questionnaires, 313 completed questionnaires were used for analysis. Descriptive statistics, such as mean statistics, were employed for the analysis, and a one-way ANOVA was performed to test the null hypothesis that there is no statistically significant difference in the mean responses of farmers on the strategies adopted to mitigate the effects of insurgency on yam production and distribution, at a 95% confidence level.

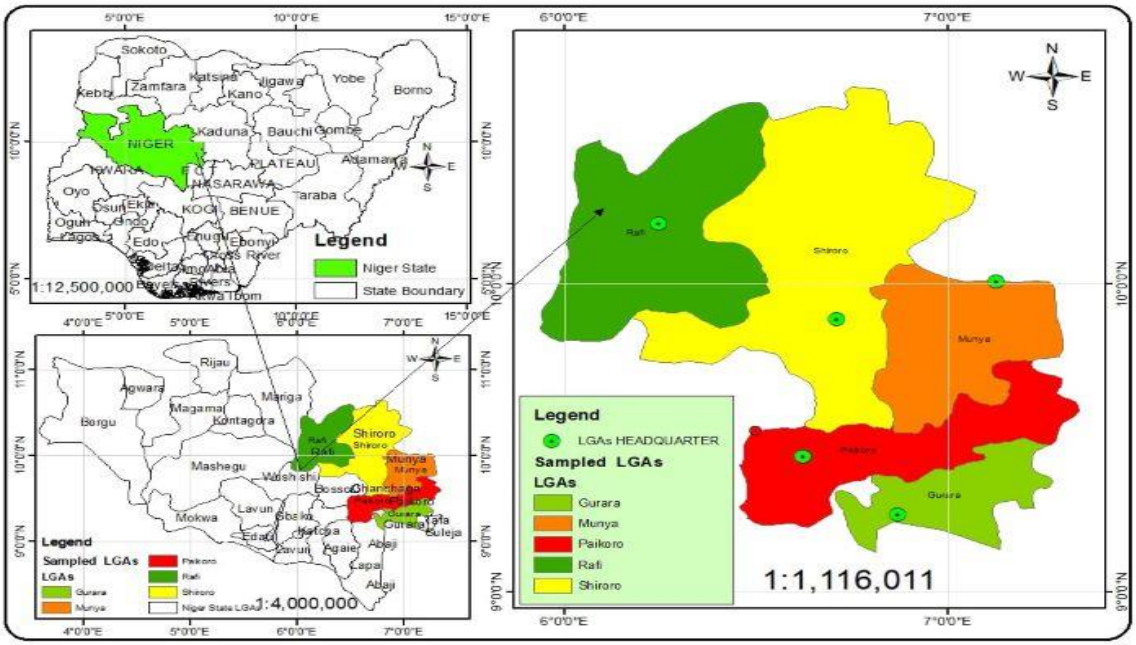

Figure 1: Map of the Selected LGAs in Niger East Senatorial District

4.0 Results and Discussion

4.1 Impact of Insurgency on Yam production and distribution

The research findings showed that the insurgency has affected every stage of yam production such as obtaining supplies for farming activities before the planting of seeds, planting of the seeds, harvesting and marketing of the harvested yams. According to the data presented in Table 1, it was found that the presence of insurgency has resulted in a decrease in the amount of yam produced with a value of 4.97. Additionally, farm lands have been taken over by insurgents with a value of 4.89. Moreover, businesses have suffered from a loss of capital and funds due to attacks by insurgents with a value of 4.85. There has also been a rise in labour costs with a value of 4.83 and a decrease in job opportunities and business activities with a value of 4.78. Furthermore, losses have been incurred due to attacks, on storage facilities resulting in a value of 4.78.

The grand mean score of 4.16 indicates that the insurgency has greatly affected the cultivation of yams as all aspects of yam farming have been impacted in some way or the other. This influence has resulted in increased cost of production, reduced yields resulting in inability to meet demand of yam thereby resulting in increased price of yam. This agrees with the research findings of Yusuf *et al*. (2018) and Ajiboye (2023), which studies highlighted that insecurity has adverse effect on agricultural production.

Table 1. Effect of Insurgency on Yam Production and Distribution (n = 313)

S/No	Effect of Insurgency on Yam Production and Distribution	Mean Average
1.	Inability to get Yam seeds or seedlings for planting	4.33
2.	Inability to acquire fertilizer	2.34
3.	Difficulty in getting pesticides and herbicides	3.14
4.	Disruption in transport infrastructure	2.44
5.	Damage to seedling markets and store houses	4.55
6.	Loss of capital and fund for business	4.85
7.	Increased cost of farm inputs	4.57
8.	Increased cost of transportation	4.67
9.	Increased cost of labour	4.83
10.	Loss of harvests	4.78
11.	Loss harvests during transportation	3.65
12.	Loss of Occupation and business	3.78
13.	Decline in Quality of Yam produced	4.67
14.	Decline in Quantity of yam produced	4.97
15.	Loss of farm land to insurgents	4.89
	Grand mean	4.16

Source: Authors' Survey (2024)

4.2 Resilience Strategies adopted by Yam farmers and their effectiveness

In a bid to ensure continued production and distribution of yam by the small-scale farmers, several strategies have been adopted to cushion, reduce or even eliminate the effects of insurgency on yam production and marketing. The study as shown in Table 2 revealed that paying of taxes to leaders of the insurgent groups, making pacts with insurgents, migration to safer areas, collaboration in disseminating information on security situation, organising prayers, diversification to other agricultural activities, hiding harvests underground to prevent detection by insurgents were the major strategies adopted. This agrees with the findings of Chibundu *et al.* (2022) and Adisa *et al*. (2022). In agreement with Rabiu *et al* (2022) the study also discovered that the farmers tend to diversify to other agricultural activities such as livestock rearing to minimise losses and remain productive in other areas. Making pacts with insurgents or paying taxes to the insurgents were discovered to be more widely adopted by the farmers than relying on security from security agencies or vigilantes. This is a worrying development showing increasing loss of trust and confidence on the ability of the security agencies to provide protection.

Table 2: Resilience Strategies to Yam Production and Distribution (n=313)

S/No	Resilience Strategies	Mean Average
1.	Changing planting schedule	2.27
2.	Diversification to other crops or other agricultural activities	3.63
3.	Paying taxes to insurgents	4.33
4.	Making pacts with insurgents	4.25
5.	Migration to safer areas	4.72
6.	Collaboration in information dissemination between farmers to get firsthand information on terrorist movements, so as to evade attacks	4.53
7.	Masking heaps in between denser plants to prevent detection	2.75
8.	Hiding harvests underground to prevent detection by insurgents.	3.87
9.	Following alternative safer routes to transport harvests to market	4.88
10.	Employing securities or vigilantes for protection during cultivation and harvests	3.56
11.	Transporting harvests to other safer markets within towns and cities	4.78
12.	Organising prayers for protection	4.89

Source: Authors' Survey (2024)

4.3 Hypothesis Test Results

A one-way ANOVA was performed to test the null hypothesis that there is no statistically significant difference in the mean responses of farmers on the strategies adopted to mitigate the effects of insurgency on the yam production and distribution. The result is presented in Table 4.

Table 3: ANOVA result

Source of Variation	SS	Df	MS	F	p-value
Between LGAs	180.25	4	60.08	5.23	0.0016
Within LGAs	3370.75	309	11.43		
Total	2551.00	211			

Source: Authors' Computation

Table 3 shows the result of the ANOVA analysis on the mean responses of farmers on the adaptation strategies adopted to mitigate the effects of insurgency on the yam production and distribution in various Local Government Areas**.** The values (SS = 180.25, MS = 60.08, F = 5.23, p = 0.0016) indicates the variation in mean responses between farmers from the five Local Government Areas: Gurara, Munya, Paikoro, Rafi and Shiroro. The result shows an F-value of 5.23, with a p-value of 0.0016. Since the p-value is less than 0.05, hypothesis one is rejected, which therefore shows that there are statistically significant differences in the mean responses of farmers across these Local Government Areas. This means the differences in the adaptation strategies used by farmers are unlikely to have occurred by random chance. This result implies that the farmers in different Local Government Areas have varied approaches to dealing with

the challenges posed by insurgency. For instance, some areas might have more effective strategies than others.

5.0 Conclusion and Recommendations

5.1 Conclusion

This study assessed the coping mechanisms adopted by the small-scale farmers on the effects of insurgency on yam production and supply chain in Niger State. Data was collected using questionnaires and analysed using descriptive statistics and one-way ANOVA analysis technique. The research findings indicate that insurgency greatly affected the yam production and distribution, thus, resulting to low yield, loss of farmlands, high production costs, disruption in yam supply chain, high cost of transportation, damage and burning of storage infrastructure among others. In dealing with these situations, the farmers have resorted to measures like payment of taxes to insurgents, alliances, burying yams in pits and diversification to other agricultural activities. The study concludes that the adoption of these strategies is an indication of farmers' resilience in the face of threats to yam production. However, this also shows growing dependence on insurgent groups due to the perceived failure of security agencies.

5.2 Recommendations

The study recommends that government should enhance security in the impacted regions. This can be done by the intensification of patrols and development of the community policing in the communities and local markets which can help in restoring security and trust with farmers.

Secondly, newer safe yam markets may be established for these individuals to engage in the yam production sector. This will keep the farmers and their families within the yam production chain while also increasing the chances of growth.

Thirdly, government should invest in the improvement of the transport infrastructure in order to ensure the safe and efficient delivery of yam produce to the markets which has been hampered by insurgency.

Fourthly, collaboration in information dissemination between farmers, community leaders and security agencies should be encouraged in order to get firsthand information on terrorist movements, so as to evade attacks should be encouraged.

Finally, the state government should provide financial aid to farmers, while also encouraging diversification into other forms of agriculture or other areas within the yam supply chain in order to lessen dependence on yam production as and boost their resilience to the threat of insurgency.

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