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FACTORS INFLUENCING FOOD SECURITY AMONG SMALL-HOLDER YAM FARMERS IN ZANGON-KATAF LOCAL GOVERNMENT AREA OF KADUNA STATE, NIGERIA

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Abstract

Yam (Dioscorea spp.) is an energetic crop in Nigeria, contributing significantly to food security, income generation and cultural identity. Despite its importance, small-holder yam farmers in Zangon-Kataf Local Government Area (LGA), Kaduna State, face persistent food insecurity challenges, due to socio-economic, institutional and environmental factors. This study analyzes these factors, focusing on food security indicators like Household Food Insecurity Access Scale (HFIAS) and Food Consumption Score (FCS). The research employs a mixed-methods approach, integrating quantitative survey and qualitative interviews, to explore the socio-economic characteristics of farmers, institutional barriers such as access to credit and extension services, and adaptive strategies like crop diversification and soil management practices. Findings revealed that income, education and farming experience significantly influenced food security, while constraints such as limited access to resources and climate change impacts exacerbate vulnerabilities. The study recommended the role of adaptive farming techniques, including the use of drought-resistant yam varieties and mixed cropping, in mitigating food insecurity. It stresses the need for targeted interventions to enhance institutional support, improve resource access and promote sustainable farming practices among small-holder farmers. Other recommendations include, policy reforms to address gender disparities, expand credit facilities and strengthen agricultural extension services to build resilience against socio-economic and environmental challenges.

Keywords: Factors**,** Influencing**,**Food, Security, Small-holder Yam Farmers.

1.0 Introduction

Yam (*Dioscorea spp*.) is an energetic crop in Nigeria, recognized for its significant contributions to food security, income generation and cultural identity. As one of the largest yam-producing nations, Nigeria's agricultural sector heavily relies on the productivity of small-holder farmers, who account for the majority of yam production. These farmers are pivotal in meeting the growing food demand in rural and urban areas alike. Historically, yam cultivation has been integral to the livelihoods of many communities in Zangon-Kataf Local Government Area (LGA), Kaduna State. The area's agricultural heritage is shaped by traditional farming methods, cultural practices and reliance on small-holder systems. However, evolving challenges have made it imperative to investigate the factors influencing food security among yam farmers.

Food security, defined as the availability, accessibility and utilization of food, is a pressing issue in many rural communities. Despite the strategic importance of yam farming, many small-holder farmers in Zangon-Kataf LGA face constraints such as limited access to credit, extension services and improved agricultural inputs. These challenges, compounded by socio-economic and institutional factors, affect productivity, income levels and overall food security. Additionally, climate change and fluctuating market conditions exacerbate vulnerabilities, making it critical to explore adaptive strategies that enhance food systems and reduce household food insecurity.

1.1 Statement of the Problem

Food insecurity remains a significant challenge in Nigeria, particularly among rural households who dependent on subsistance agriculture. Despite Zangon-Kataf LGA being a major yam-producing region, a considerable proportion of its small-holder yam

farmers continue to face food insecurity. The reliance on traditional farming methods, low productivity and socio-economic disparities exacerbate this issue, threatening the livelihoods and nutritional well-being of the local population (Nkeng *et al*., 2019; Ezeaku & Akpan, 2018).

Socio-economic factors such as age, gender, education, farm size and income have been identified as critical determinants of food security among small-holder farmers. Institutional constraints, including inadequate access to extension services, credit facilities and market linkages, further undermine the capacity of yam farmers to enhance productivity and adopt sustainable practices (National Population Commission, 2006). These barriers hinder adoption of essential adaptation strategies such as early-maturing and drought-resistant yam varieties, mixed cropping and improved soil management practices that are critical for building resilience against climate change and other shocks.

While existing studies highlight the importance of adaptive farming techniques in addressing food insecurity, there is limited research on how these strategies are implemented by small-holder yam farmers in Zangon-Kataf LGA. Additionally, the interplay between socio-economic, institutional and environmental factors influencing food security in the area remains underexplored. This research seeks to fill this gap by analysing the factors influencing food security among small-holder yam farmers, with the aim of formulating policies and interventions tailored to their unique challenges.

2.0 Objectives of the Study

The broad objective was to analyse socio-economic and institutional factors influencing food security among small-holder yam farmers in Zangon-Kataf Local

Government Area of Kaduna State.. The specific objectives were to:

i. describe the socio-economic characteristics of small-holder yam farmers in the study area and

ii. identify factors affecting food security in the study area.

3.0 Research Methodology

3.1 The Study Area

The study was carried out in Zangon-Kataf Local Government Area (LGA) with the headquarters at Zonkwa. The area is located between latitudes $9^0 25^/N$ and $10^0 20^/N$ and longitudes $7^0 45^/E$ and $8^0 40^/E$ is bounded by Kajuru L.G.A. in the North, Jama'a in the South, Kachia in the West and Kaura LGA in the East (The Information Division of Zangon-Kataf Secretariat, 1999).

The soil in Zangon-Kataf LGA is predominantly ferruginous tropical soils that is suitable for yam cultivation, but requires fertilizers and organic amendments due to fertility variability. The indigenous population is largely rural, with agriculture being the main source of livelihood. Yam is a major crop, cultivated both for subsistence and commercial purposes. However, small-holder farmers in the area face numerous challenges, including limited access to capital, agricultural inputs and market infrastructure (Ezeaku & Akpan, 2018). The impacts of climate change such as altered rainfall patterns, increased temperatures and more frequent extreme weather events, affect crop yields and food security (Nkeng *et al*., 2019). This study is significant as it provides perceptions into how small-holder yam farmers in Zangon-Kataf LGA are adapting their agricultural practices in response to these challenges.

3.2 Population of the Study

Zangon-Kataf LGA has a population of approximately 318,991 with a significant portion engaged in agriculture (NPC, 2006). The specific population for this study includes small-holder yam farmers, totaling 2,193 individuals. Based on the sample size determination formula by Krejcie and Morgan (1970), a sample size of 384 was deemed suitable for a 95% confidence level with a 5% margin of error. However, due to the focus on yam farming, the study focused on 2,193 yam farmers in the area.

3.2.1 Sample size and Sampling Techniques

A multi-stage sampling technique was used to select respondents from the study area. The first stage involved purposively selecting Zangon Kataf LGA due to the high concentration of yam farmers. In the second stage, two chiefdoms – Atyap and Bajju were selected using simple random sampling. Within these chiefdoms, two districts were purposively chosen from Atyap and randomly selected from Bajju. The final stage involved selecting two villages from each district, resulting in eight villages being selected for the study. This approach ensures that both the diversity of farming practices and the impact of conflict (particularly in Atyap) on farming activities are adequately captured.

The purposive sampling technique adopted in Atyap chiefdom was because; the researcher relied on personal judgment with the perception that yam farmers as a result of persistent attacks in many of the Atyap villages must have been displaced, only yam farmers in villages relatively free from the attacks were selected. The adoption of the simple random sampling in Bajju chiefdom was because; the chiefdom did not experience incessant attacks as the case with the Atyap chiefdom. The final stage was

random selection from the sampling frame of 2,193 to give a sample size of 219 farmers, that is, 10% of the population or sample frame.

3.2.2 Data Collection Methods

The study employed both quantitative and qualitative methods. Quantitative data were collected through surveys, while qualitative perceptions were gathered through semi-structured interviews with farmers and agricultural experts. This mixed approach allowed for a complete analysis of adaptive practices and the challenges faced by farmers in the context of climate change.

3.2.3 Data Analysis Techniques

The data for this study were analysed using both descriptive and inferential statistics Multivariate probit regression model was used to determine factors influencing adoption of adaptation strategies. Tesfaye and Nayak (2022) buttressed the formula of the multivariate probit model for the observations as follows:

$$Y_i = 1 \text{ if } \beta_i x + \varepsilon_i > 0 \ldots\ldots\ldots\

by Adebayo (2020), who reported similar findings in sub-Saharan Africa. The limited participation of younger farmers may result from rural-urban migration or their preference for non-agricultural livelihoods.

Table 1 also reveals that yam farming is predominantly male-dominated (86.76%), Agboola (2019) similarly observed that socio-cultural norms and land ownership constraints limit women's participation in agriculture in Nigeria. This under representation of women (13.24%) highlights the need for policies that address gender disparities in access to land, credit and inputs.

Majority (63.93%) of the respondents 10–15 years of farming experience, indicating that yam farming is sustained by seasoned participants. Experience contributes to improved productivity through better adaptation to environmental conditions and refined farming techniques. As noted by Oni and Yusuf (2021), experienced farmers are more likely to achieve higher yields and adopt sustainable practices. Medium-sized households (10–15 members) dominate the study area, comprising 38.36% of the sample, with 64.84% of farmers relying on household labour. This reflects the prevalence of family labour in small-holder farming, as financial constraints limit the hiring of external workers. Reliance on household labour may hinder productivity during peak farming periods, as also noted by Oni and Yusuf (2021).

Table 1 further reveals that 61.18% of the respondents had having tertiary education. This is advantageous, as educated farmers are more likely to adopt innovative practices and access marketing information. Ajani (2018) emphasized that literacy enhances productivity and adaptation to agricultural innovations. The majority of farmers (86.3%) operated on farms smaller than 4 hectares, this limiting production

capacity and discouraging mechanized farming. This finding supports Ayinde (2021) who highlighted that, small-holder farmers had been facing structural constraints that hinder scaling up.

Despite small farm sizes, yam farming appears profitable with 64.37% earning more than ₦1,500,000 annually. However, 13.25% of farmers earned less than ₦400,000 indicating disparities likely driven by variations in resource access, farm size and market opportunities. Only 17.81% of respondents rely solely on farming, while others supplement their income through activities such as artisanal work (26.48%), civil service (21.92%) and business (25.11%). This diversification stresses the importance of

Table 1: Socio-economic Characteristics of Yam Farmers (n = 219)

Variables	Percentage (%)
Age (years)	
<35	7.77
35-55	54.7
>55	37.53
Gender	
Male	86.76
Female	13.24
Years of farming experience	20.53
<10	63.93
10-15	15.55
>16	
Household size	
<10	38.36
10-15	31.04
>16	30.6
Levels of Education	
Non formal education	0.46
Primary	1.37
Secondary	36.99
Tertiary	61.18
Farm size (ha)	
<4	86.3
4-6	13.24
>6	0.46
>1500000	13.25
	22.38
	64.37
Occupation	
Farmer	17.81
Artisan	26.48
Civil servant	21.92
Business	25.11
Others	8.68

Source: Field Survey (2025).

4.2 Factors influencing food security status among small-holder yam farmers

According to Table 2, the income of yam farmers was identified as a determinant of food security, with a statistically significant and positive impact on the Food Consumption Score (FCS) ($p = 0.000$). This suggests that households with higher incomes are better positioned to access diverse and nutritious food, leading to improved food security. These finding agrees consistent with Akinyele (2020), who emphasized the role of income in mitigating food insecurity. Higher income levels enable households to buffer against price fluctuations and maintain consistent access to essential food supplies.

Farm size exhibited a significant positive effect on the FCS ($p = 0.001$). Larger land holdings allow farmers to diversify crops that not only increase food availability but also enhance dietary diversity. This corroborates findings by Asiedu and Sartie (2010), who highlighted the benefits of larger farms in improving productivity and food security.

Access to extension services positively influenced food security ($p = 0.062$), as these services equip farmers with knowledge on innovative farming techniques and climate adaptation strategies. Ahmed *et al*. (2021) also noted the pivotal role of extension services in improving agricultural productivity, thereby enhancing food security outcomes.

Age was found to have a small but negative effect on food access (HFIAS coefficient = - 0.027, $p = 0.202$). This could be attributed to reduced physical ability and reluctance of older farmers to adopt modern farming practices. Adebayo (2020) highlighted similar generational differences in adoption of agricultural innovations.

Larger household sizes negatively impacted food access (HFIAS coefficient = - 0.037). This is likely due to the increased demand for food resources in larger households, as also noted by Akinyele (2020). Households with more members face greater challenges in ensuring sufficient food for all, especially when reliant on limited income sources.

Contrary to expectations, access to credit showed a negative association with household food access (HFIAS coefficient = - 0.214). This might be explained by the diversion of credit resources for non-food-related purposes or repayment obligations, which could temporarily reduce food availability. This findings agrees by Bala *et al*. (2019), who reported that credit often supports long-term investments rather than immediate food needs.

Adopting early-maturing crop varieties negatively affected food access (HFIAS coefficient = - 0.872) but had a positive impact on the FCS. Initial adoption costs and the challenges of transitioning to new systems may explain the short-term negative effects. Over time, however, early-maturing varieties contribute to better yields and improved dietary diversity, as noted by Ayankanmi *et al*. (2021).

Mixed cropping and changing ridges showed mixed effects on food security. These strategies improved FCS but did not significantly affect household food access. The labor-intensive nature of these practices could can strain immediate food access, while contributing to long-term productivity (Altieri & Nicholls, 2017).

Although education did not show a direct significant effect on food security, it was positively correlated with adopting climate adaptation strategies. Educated farmers

are more likely to apply effective farming techniques, indirectly enhancing food security (Ajani, 2018). Similarly, access to weather information, while not statistically significant, helps farmers make informed decisions, reducing risks of crop failure (Aggarwal *et al*., 2018).

Table 2: Factors influencing small-holder yam farmers' food security status (n = 219)

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	Household Food Insecurity Access Scale (HFIAS)			Food Consumption Score (FCS)		
ıriables	Coefficient	Std. error	P-value	Coefficient	Std. error	P-value
ge	-0.027	0.021	0.202	0.023	0.060	0.702
ender	-0.603	0.505	0.233	-4.529	1.416	0.002
ears of farming experience	0.028	0.024	0.257	0.109	0.068	0.111
ousehold size	-0.037	0.075	0.267	0.200	0.211	0.343
ousehold labour size	0.167	0.097	0.086	-0.607	0.272	0.027
lucational Qualification	-0.134	0.095	0.160	0.625	0.267	0.020
rm size	-0.354	0.254	0.165	0.495	0.713	0.488
come per annum	0.000	0.000	0.306	0.000	0.000	0.193
cess to extension service	-0.259	0.505	0.609	3.036	1.417	0.033
cess to credit	0.214	0.474	0.652	-0.186	1.329	0.889
cess to weather	0.703	0.554	0.206	0.701	1.553	0.652
formation	-0.883	0.564	0.119	-1.858	1.581	0.241
cess to input subsidy	-0.529	0.436	0.227	2.100	1.225	0.088
embership in cooperative	-0.872	0.476	0.068	-0.205	1.336	0.878
dapt to early maturing	-0.777	0.462	0.094	1.574	1.297	0.226
dapt to drought	-1.835	0.583	0.002	3.957	1.635	0.016
dapt to change in ridges	1.058	0.564	0.062	1.332	1.581	0.401
dapt to mix cropping	0.753	0.453	0.098	-1.727	1.270	0.175
dapt to crop rotation	9.297	1.780	0.000	32.497	4.994	0.000
onstant	219			219		
umber of observations	0.000			0.000		
ob>F	0.441			0.385		
	0.391			0.3301		
djusted R^2						

Source: Field Survey (2025).

5.0 Conclusion and Recommendations

5.1 Conclusion

The research highlights the complex interplay of socio-economic, institutional and adaptive factors that influence food security among small-holder yam farmers in Zangon-Kataf Local Government Area, Kaduna State. Key findings indicate that income, farm size, access to extension services and adoption of adaptive strategies such as early-maturing yam varieties and mixed cropping are important factors shaping food security outcomes. Higher income levels and larger farm sizes were positively associated with improved food security, particularly in terms of food consumption. Conversely, household size and access to credit were found to negatively impact food security, stressing the challenges faced by larger households and the misalignment of credit use with immediate food needs.

Despite the significant role of adaptive practices like early-maturing varieties and mixed cropping in improving productivity, their short-term negative effects on food access suggest the need for more complete support for farmers transitioning to these strategies. The study also stresses the importance of education, with educated farmers showing a greater propensity to adopt climate adaptation strategies that indirectly contribute to food security. The research provides a clear indication of the need for more tailored interventions that address the socio-economic and institutional barriers faced by smallholder farmers in ZLGA, while also promoting the adoption of climate-resilient farming practices.

5.2 Recommendations

Based on the findings, the following recommendations were made:

1. **Extension agents should** improve accessibility and utilization of credit facilities for small-holder farmers, ensuring that loans are used effectively for farming inputs and not diverted for non-agricultural purposes. Additionally, expanding extension services to provide farmers with updated knowledge on adaptive farming techniques, climate resilience and market trends is crucial for improving food security.
2. **Social workers should a**ddress gender disparities in agriculture by facilitating women's access to land, credit and extension services. Gender-sensitive policies should be implemented to encourage greater female participation in yam farming that contributes to more balanced productivity and food security outcomes.
3. Early-maturing and drought-resistant yam varieties, as well as mixed cropping and other climate-smart practices, should be promoted through farmer training and subsidized input schemes. Support mechanisms to mitigate the initial challenges of adopting these strategies will be key to improving their long-term impact on food security.
4. While education alone did not show a direct significant effect on food security, it was positively correlated with the adoption of climate adaptation strategies. Continued educational outreach, especially for younger farmers, should be prioritized to foster greater innovation and resilience in the farming community.
5. Given the significant role of off-farm income in supporting household food security, efforts should be made to diversify income-generating activities for rural households, including promoting agribusiness, artisanal work and small-scale industries.

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