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EFFECTS OF FARM HOUSEHOLD RESILIENCE ON FOOD SECURITY IN KWARA STATE, NIGERIA

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ABSTRACT
Food insecurity is a global problem, and recent evidence posits that resilience is critical in bolstering household food security. This study therefore examined the effects of farm household resilience on food security in Kwara State, Nigeria. A semi-structured questionnaire was employed to elicit information from 300 respondents obtained through a multistage random sampling technique. Farm household resilience was estimated via the Resilience Index Measurement and Analysis II (RIMA II), whereas food security was measured via the Food Insecurity Experience Scale (FIES). More than 80% of the households were male-headed, and most respondents had at least a primary education. More than half of the respondents had farming as their major occupation, while the mean household resilience was 0.31. The study revealed that more than 70% of the households were food insecure. Additionally, major occupation, access to credit and resilience positively affected food security, whereas sex and membership in farmer associations had a negative effect on food security. The study recommends that farm households engage in activities that increase their resilience, and the government should provide credit to farm households to improve their food security.

Keywords: Food security; Resilience; RIMA II

INTRODUCTION
Food security is a long-standing global health, nutrition, and productivity challenge. Food security is important for economic growth, development, and sustainability (Ayojimi et al 2023; Fanzo 2019). The number of individuals who suffered from hunger rose from 8.4% in 2019 to 9.9% in 2020 globally. In addition, 828 million people worldwide were hungry as of 2021, increasing by 150 million from 2019 and 46 million from 2020 (FAO 2022), which suggests that food insecurity is exacerbated around the globe. Africa currently houses approximately 256 million people who are suffering from food insecurity, comprising 239 million living in the sub-Saharan region and 17 million in North Africa (FAO 2019). Similarly, Nigeria is experiencing an upsurge in the prevalence of mild to severe food insecurity (World Bank 2020). Nigeria was declared food insecure based on a report by the FAO, as the overall number of malnourished persons increased by 25.6 million in 2018 (FAO 2022). Nigeria continues to be among the top food-insecure countries worldwide and is highly affected by changes in climate, recessions, and insurgency (Kralovec, 2020). Prolonged and periodical food insecurity has been rampant across the nation. The differential vulnerabilities of farm households to food insecurity may be based on sociodemographics (Adeyonu et al. 2022), which include but are not limited to age, education, employment, marital status, healthcare and water safety; disasters from natural causes; and fluctuations in the climate, political instability and terrorism, which may greatly affect a farm household's food security level.

Nigeria's food insecurity issues have continued to be a persistent and increasing

challenge, as the government continues to face difficulties in tackling it because the country has failed to meet its national dietary requirements (Ayeni and Adewumi 2023; Osabohien et al 2018). Poor diets significantly affect farm households in Nigeria, as there is increased susceptibility to diseases and illness, malnourishment because of a lack of required nutrients, reduced strength for labour-intensive tasks, a general loss of vigour, and reduced attentiveness and vitality, which leads to reduced productivity, resulting in poor food security. Furthermore, shocks may emanate from climatic changes and economic and political instability, which may affect households' food security levels and interfere with their regular operations and activities.

Resilience is measured by how well farm households adopt various mechanisms to handle shocks. Resilience is a novel concept that has emerged in the last ten years. In this context, resilience refers to a farm household's ability to handle risk and adapt to shocks and stress in consideration of the available resources and options. The ability to withstand the effects of shocks and adapt and change because of or in anticipation of these shocks is referred to as resilience (Doherty et al 2019). According to the FAO (2020), people who have resilient livelihoods are better able to prepare for and handle shocks, whether they are frequent, prolonged, or unexpected. A farm household's ability to plan for, adapt to, or recover from a food insecurity crisis in a prompt, successful, and sustainable manner is referred to as resilience to food insecurity. Resilient households may have a variety of livelihood strategies, access to essential services, social safety nets, and adaptive abilities.

Despite increased interest in the concept of the resilience of households and how it affects the food security of farm households, empirical studies in this area are still limited in Nigeria, particularly in Kwara State. This study aims to gain a deeper understanding of the effect of farm household resilience on the food security of farm households in Kwara State. The results of this study provide useful information on the food security and resilience status of farm households. This will promote greater awareness of the role of farm household resilience in ensuring food security. Food insecurity in Nigeria has aggravated social vice, as members of farm households have abandoned farms and resorted to illegal means of acquiring food. Banditry, unemployment, low productivity, and malnutrition are the resulting effects of food insecurity; this scour can therefore be reduced if farm households can adapt and deal with production shocks. Understanding how farm household resilience and food security are linked is also important for designing effective strategies to address food insecurity in Nigeria. Hence, this study assessed the effects of farm household resilience on food security in Kwara State, Nigeria.

METHODOLOGY

Study Area: This study was carried out in Kwara State, which is one of the six states in northcentral Nigeria. Kwara State is surrounded by Kogi State, Niger State Ekiti, and Osun and Oyo states. Kwara state comprises 16 local government areas, and the state economy is mostly agriculture-based. Kwara State is in a tropical climate zone and experiences dry and wet seasons (Aderinoye-Abdulwahab, and Abdulbaki 2020). Kwara State experiences rainfall in the summer, with yearly rainfall ranging from 1000 mm to 1500 mm. The temperature of the state usually ranges between 25°C and 30°C in the rainy season and between 33°C and 34°C in the dry season. The climate of the state supports the cultivation of arable crops and tree crops.

Method of Data Collection: Data were collected using a semi-structured questionnaire. The questionnaire included information on the socioeconomics and assets of the farm households. Data on adaptive capacity and social safety nets were also collected. The questionnaire was administered to farm households in Kwara State with the help of trained enumerators.

Sampling Techniques and Sample Size

A three-stage sampling technique was adopted for this study. The first stage is the random selection of 5 local government areas (LGAs), Moro, Ifelodun, Isin, Ekiti, and Ilorin East, from the 16 LGAs in Kwara State. The second stage involves the random selection of 6 communities from each of the 5 LGAs, whereas the third stage is also a random selection of 10 households from each of the communities chosen. The sample size of this study was therefore 300 respondents.

Method of Data Analysis:

Farm Household Resilience Estimation: The resilience status of the farm household was estimated via the resilience index measurement analysis (RIMA) framework developed by the FAO in 2008 and modified in 2016. RIMA encompasses four pillars, namely, access to basic services, assets, social safety nets, and adaptive capacity. The resilience index of a farm household is expressed as:

R_i= f $(ABS_i, A_i, SSN_{i,} AC_i)$----------equation 1

Where R_i denotes resilience, ABS represent access to basic services, A reflects assets owned, SSN denotes social safety nets, and AC means adaptive capacity. Building on prior work (Olawuyi & Ijila, 2023; Atara et al., 2020; FAO, 2016; FAO, 2014; Alinovi et al., 2010), this study frames household resilience as a latent construct determined by these four dimensions. However, resilience is not directly observable, necessitating statistical methodologies capable of estimating latent variables. Factor Analysis (FA), and Principal Component Analysis (PCA), emerge as natural candidates for this purpose (Alinovi et al., 2008). In this study, FA was employed to estimate resilience. The estimation followed a two-step hierarchical approach, firstly each resilience dimension was first analysed separately, generating individual scores for access to basic services, assets, social safety nets, and adaptive capacity. Secondly, these scores were integrated to produce an overall resilience score for each household. To ensure comparability, the resilience scores were standardized to a range between 0 and 1 using the following transformation:

$R_i = \frac{R - R_{min}}{R_{max} - R_{min}}$ ----------equation 2

where R_i is the standardized resilience index for the ith household, R represents the resilience score obtained from FA for the ith household, R_{min} is the minimum observed resilience score, and R_{max} is the maximum observed resilience score. The variables that make up each of the pillars are presented in Table 1.

The standardized resilience index was used to categorize the households into poor, moderate, and high resilience groups via the approach described below:

a) Poor resilience, with average scores of 0-0.33
b) Moderate resilience, with average scores of 0.34-0.66
c) High resilience with average scores of 0.67-1.00

Food Security Measurement: The food security status of the farm household was estimated via the Food Insecurity Experience Scale (FIES) established in 2014. Through a 12-month recall timeframe, the FIES gathers personal experience and behaviours linked to access to food because of a shortage of resources. The FIES consists of 8 questions to which respondents must respond yes/no. It is the first tool employed on an international scale to quantify food insecurity at the individual level (Smith et al 2017). The FIES classified food insecurity into three groups: mild food insecurity, with scores ranging from 1-3; moderate food insecurity, with scores ranging from 4-6; and severe food insecurity, with scores ranging from 7-8. The FIES questions are depicted in Table 2.

The focus of this study is to assess whether farm households in Kwara State are food secure. Therefore, the FIES was regrouped into a dichotomous variable. Households that have scores ranging from 1--8, that is, those that have mild to severe food insecurity, are grouped as food insecure.

Those who have a score of 0, that is, do not experience any form of food insecurity, are classified as food secure. The effect of resilience on food security was assessed via probit models. The probit model assumes that Y^* can be specified as follows:

$Y_i^* = \beta_0 + \beta_1 x_{1i} + \beta_2 x_{2i} + \ldots + \beta_k x_{ki} + v_i$ ----------equation 3

$$Y_i = \begin{bmatrix} 0 \text{ if } Y^* \leq 0 \\ 1 \text{ if } Y^* > 0 \end{bmatrix}$$ ---equation 4

where: Y_i = food security status

x_i = explanatory variables, which are as follows:

x_1= age of the household head (years) resilience level

x_2= sex of the household head (1 if male, 0 otherwise)

x_3 = marital status (1 if married, 0 otherwise)

x_4 = household size

x_5 =farming experience (years)
x_6 = major occupation (1 if farming, 0 otherwise)
x_7 = education (years)
x_8 = number of contacts with extension agents
x_9 = Member of farmer association (1 if member of farmer association, 0 otherwise)
x_{10} = access to credit (1 if access, 0 otherwise)
x_{11} = resilience index
v = error term

RESULTS AND DISCUSSION

Socioeconomic Characteristics of the Farm Household: The results in Table 3 show that approximately 15% of the respondents were female, whereas 85% of the respondents were male. This implies that farming as an occupation is dominated by men in the study area, which is likely connected to the reality that agricultural production is rigorous and requires considerable energy. This finding is supported by previous research from other Nigerian agricultural zones, such as Egbodion et al. (2024); Ogunnowo and Olajide (2024); Apeh et al. (2023); Gbughemobi (2023); Anugwa et al. (2023) and Kehinde et al. (2021), who reported that men are more involved in agriculture in their studies. The mean age of 56 years showed that farm households are still within their active age; however, they are leaning towards the retirement age of the economically inactive group, which has an impact on their level of productivity and, in turn, their food security status. This finding corroborates Kehinde et al. (2021), who reported that the average farmer in their study was over 50 years old. The mean household size is 7, which indicates that the majority of the respondents have a large household. This means that members of the household could be used as a source of labour on their farm, which would increase the productivity of the household, leading to increased income and better food consumption. However, a large household size may also have a negative effect on the food security status of the farm household. This result conforms with Oyetunde-Usman et al. (2021) and Alhassan (2020), who reported that smallholder farmer family sizes are typically large in Nigeria and Ghana, respectively.

Majority (58%) of the respondents' main occupation is farming, in contrast to other occupations, which are trading, civil service, and artisan. This suggests that individuals with farming as a main venture are likely to be more efficient in their farming operations, which leads to better outputs, income, and increased food security. The average number of years of farming experience is 23, which indicates that the majority of the farm households have vast experience in their farming operations. This suggests that the farmers in the study area can be characterized as experienced, seasoned, or knowledgeable. This finding is in line with the results of Mukaila et al. (2021), whose study revealed an average farming experience of 21 years among vegetable farming households in Kwara State, Nigeria.

The educational status of the household heads revealed that more than 60% of the respondents had attended at least primary school, which implies that a larger proportion of the respondents had basic education and could read or write. This may result in better adoption of new technologies in agriculture and proper application of fertilizers, which may result in increased income and better food security outcomes. This finding aligns with the findings of Oyetunde-Usman et al. (2021), who reported that the majority of farm households in Nigeria have basic education. The research further revealed that more than 65% of the respondents in the previous production year had no contact with extension agents, which could mean that many of the respondents did not have access to information on new technology, planting techniques, or improved varieties. This may affect their adoption of improved practices and production output, thereby reducing their resilience status and likelihood of being food secure. For example, Anang et al. (2020) reported that farmers in Ghana who had no contact with extension services had lower revenue from farming operations, which probably has a negative effect on food security status. Approximately 79% of the respondents do not have access to credit, which may limit their access to production inputs, thereby hampering their productivity. This result agrees with that of Alhassan (2020). who reported low access to credit among farm households in their research carried out in Ghana.

Resilience profile of farm households

The resilience profile of the farm households is presented in Table 4. Approximately 57%

of the farmers had a poor resilience level, 42% of them were moderately resilient, and approximately 1% of the respondents had a high resilience status. The mean resilience is 0.31, which also confirms that the majority of the households are not resilient to shocks, and what is probably responsible for this is limited access to resources, weak institutional support, poor basic infrastructures, and climate change among other factors. This result implies that farm households in the study area are not better prepared for shocks and therefore cannot withstand the outbreak of shocks. This can therefore affect their food security status, as the impact of shocks on their food production will leave them undernourished. This also implies that most households do not have access to basic infrastructure or receive significant subsidies or safety nets from the government or nongovernmental organizations to improve their production process. These results further imply that farm households in the study area do not own enough productive assets to increase their resilience against food system shocks. This means that in the event of any production shock, farm households' income will largely plummet, and their food security status will be hampered because of their low resilience and vulnerability to production shocks. These findings contrast with those of Maltou et al. (2019), Beyene et al. (2023), Popoola et al. (2023), and Olawuyi and Ijila (2023), whose outcomes of their studies in South Africa, Ethiopia, and Nigeria, respectively, indicated that most farm households are not resilient to production shocks.

Food Security Status of Farm Households:

The results of the food security status of the farm families are depicted in Table 5. The prevalence of food insecurity among the farm households is 73.67%, which implies that majority of the households in the study area are afflicted with food insecurity despite being involved in agricultural production. This means that a greater portion of the respondents do not have enough access to food, which is due to a lack of resources. For example, Samuel et al. (2021) reported that a majority (63.3%) of Nigerian households had worries about not feeding, as they should be due to insufficient money for food expenditure. The results of this study indicated that many farm households were worried that they would not have enough food to eat. This may also be a result of the large household size of the farm families in the study area. This result further implies that a large proportion of the households were unable to eat healthy and nutritious foods. This, of course, negatively impacts their productivity level and, in turn, reduces their output and food security state. This result is in line with those of Sani and Kemaw (2019), Cordero-Ahiman et al. (2020), and Mukaila et al. (2021), who reported that most households were food insecure.

Effect of Farm Household Resilience on Food Security

The effects of household resilience on food security are presented in Table 6. Sex has a negative effect on food security, which suggests that female-headed households are more likely to be food secure than their male counterparts. The results of the marginal effect analysis revealed that female-headed households are approximately 19% more likely to experience food security than male-headed households. This could be because women oversee the process of choosing, organizing, and preparing food, and they often devote the majority of family resources to buying food, which could explain why they are more food secure. Moreover, female-headed households tend to produce food crops that are primarily consumed by the household. This result concurs with Maltou and Bahta (2019) and Acheampong et al. (2023), who reported that female-headed households were more food secure than their male-headed households were; however, it negates the findings of Balana et al. (2023), who reported that families headed and controlled by male-headed households are better food secure than families headed by women.

Farming as a major occupation is statistically significant and has a positive relationship with food security. Households whose major occupation is farming are likely to have better food security status than households whose major occupation is not farming. The marginal effect shows that respondents whose major occupation was farming are 12% more likely to be food secure than households whose major occupation is not farming. This may be because households whose major occupation is farming devote more time to the production of food for members of their household. In addition, they are likely to be

more efficient and productive because of the time and resources devoted to farming as their main income-generating enterprise.

Moreover, the results show that farm households that are members of farmer associations are likely to be less food insecure than those that are not members of farmer associations; in fact, households that belong to farmer associations are 9% more likely to experience food insecurity. This is likely a result of the uneven distribution of association benefits among members of farmer associations. Both rich and poor farm households are members of farmer associations. Wealthy members of the group are likely to benefit more because of their influence and status in the group, and poorer members may not gain much from the association. Disadvantaged association members' food insecurity might be worsened by this intragroup disparity. This result aligns with those of Ugbabe et al. (2017) and Oyenpemi et al. (2023), who reported that membership in associations decreased farmer efficiency and, in turn, food security. However, Kehinde et al 2021) established a positive relationship between farmer associations and food security.

The results also show that access to credit has a positive effect on food security, with households that have access to credit having an approximately 17% greater likelihood of being food secure than their counterparts who do not have access to credit. Access to credit helps farm households access better farming inputs and technologies, which increases farm output and productivity. Additionally, credit helps households manage their expenditures during times when income is erratic, including during the off-harvest seasons or when there are unforeseen needs. The results corroborate the findings of Osabohien et al. (2018) and Kehinde and Kehinde (2020), who opined that credit has a positive effect on food security.

The results revealed that resilience was significantly related to food security. The coefficient shows that resilience was positively related to food security, and the marginal effect showed that a unit increase in resilience status improved food security by almost 42%. Since resilience is the capacity of households to deal with shocks, rebound swiftly, and continue to live well despite production risks or shocks, it follows that households that have higher resilience can adapt to production shocks; hence, they are more productive with good harvests to show this ability. This leads to increased outputs and income, which ultimately blossom the household's food security status. These findings corroborate those of Smith and Frankenberger (2018), who posited that resilience helps decrease hunger and lengthens the number of months with enough food. Other studies that had similar results include d'Errico, et al., (2018); Murendo et al. (2020); and Olawuyi and Ijila (2023).

CONCLUSION AND RECOMMENDATIONS

The study therefore concludes from the findings that most farm households in Kwara State are not resilient to shocks and are food insecure. In addition, there is a positive nexus between resilience and food security. Based on this research findings the following recommendations were made: the resilience capacity of these households should be improved through the provision of improved farming inputs, basic amenities, and facilities that will ease their agricultural production this help them accumulate assets and increase farmers' resilience status. Furthermore, having diverse sources of income will also boost their resilience status. Some form of external support from government and non-governmental organizations could also help to strengthen the resilience status. External support may come through input subsidies, cash transfers, relief food, etc. Farm households that have farming as their major occupation are more food secure, not disputing that diversification is good. However, Farmers that farming is not their main occupation should be trained on better resource management and balancing farming with other occupations to increase productivity. This will translate to better resilience and food security for farm households.

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Table 5: Resilience Pillars

Access to Basic Services (ABS)	
Variables	**How it was measured**
The major source of water for drinking for the members of the household	Household water distribution/borehole=5, public taps=4, wells=3, spring/river=2, rainwater collection=1
The main type of toilet facility used by members of the household.	Flush toilet=5, ventilated improved pit latrine=4, composting toilet =3, pit latrine slab=2, bush=1
The major source of electricity used in the household	Generator=4, electricity distribution company of Nigeria=3, battery-powered lamps=2, lanterns=1
Distance from household dwelling to the closest accessible/functioning service measures in kilometres,	School, health facility, and market
Assets (AST)	
Agricultural wealth index	Number of agriculture assets possessed (like ploughs, harrows, planters, sprinklers, etc.
Wealth index	Numbers of cars, computers Mobile phones television, etc.
Total land owned	Measures in hectares.
Tropical livestock unit	
Social Safety Nets (SSN)	
The total amount of formal and informal transfers received by the members of the household in the last 12 months	Measured in naira
Adaptive Capacity	
Formal education	Number of years of formal education of household head
Income generating activities	Participation in income-generating activities besides farming was measured as a dummy
Crop diversification index	Crop diversification was measured as the number of enterprise household members have

Source: FAO, 2016.

Table 6: Food Insecurity Experience Scale questions

FIES questions	Responses
You were worried you would not have enough food to eat	Yes (1), No (0)
You were unable to eat healthy and nutritious food	Yes (1), No (0)
You ate only a few kinds of foods	Yes (1), No (0)
You had to skip a meal	Yes (1), No (0)
You ate less than you thought you should	Yes (1), No (0)
You ran out of food	Yes (1), No (0)
You were hungry but did not eat	Yes (1), No (0)
You went without eating for a whole day	Yes (1), No (0)

Source: FAO 2014

Table 7: Socioeconomic characteristics of the farm households

Variables	**Frequency**	**Percentage (%)**
Sex		
Female	44	14.67
Male	256	85.33
Age (years)		
31-40	15	5
41-50	84	28

51-60	113	37.67
>60	88	29.33
Mean	56	
Household size		
1─3	1	0.33
4─6	189	63
>6	110	36.67
Mean	7	
Educational status		
No formal education	103	34.33
Primary school	109	36.33
Secondary school	64	21.33
Tertiary	24	8
Access to credit		
No	236	78.67
Yes	64	21.33
Major occupation		
Farming	174	58
Trading	90	30
Civil servant	24	8
Artisan	12	4
Contact with extension agents		
No	206	68.67
Yes	94	31.33
Farming experience		
≤10	7	2.33
11─20	150	50
21─30	102	34
31─40	34	11.33
>40	7	2.33
Mean	23	

Source: Field Survey, 2023

Table 8: Resilience index of farm households

Resilience index	Frequency	Percentage (%)
Poor (0--0.33)	170	56.67
Moderate (0.34 --0.66)	126	42
High (0.67--1.00)	4	1.33
Total	300	100
Mean Resilience	0.31	

Source: Field Survey, 2023

Table 9: Food security status of farm households

Food security status	Frequency	Percentage (%)
Food insecure	225	75
Food secure	75	100
Total	300	100

Source: Field Survey, 2023

Table 6: Effect of farm household resilience on food security

Food security	Coefficient	Robust Standard error	P>|z|	Marginal effect
Sex	-0.5486783	0.2181217	0.012*	-0.1874744
Age	0.0053215	0.0137716	0.699	0.0016212
Marital status	-0.6249802	0.6252244	0.317	-0.2245065
Household size	0.0647848	0.0888693	0.466	0.0197367
Farming experience	-0.0122524	0.0146336	0.402	-0.0037327
Major occupation	0.4086634	0.186905	0.029**	0.1211324
Education (years)	0.0244996	0.0175549	0.163	0.0074638
Number of extension agents	0.1067594	0.1938299	0.582	0.0329895
Member of farmer association	-0.3226064	0.1937519	0.096*	-0.096228
Access to credit	0.4998458	0.2116557	0.018 **	0.1663188
Resilience index	1.369813	0.6865587	0.046 **	0.4173131
Constant	-0.8761034	0.7510351	0.243	
Number of obs = 300 Wald chi2(11) = 35.19 Prob > chi2 = 0.0002				
Log pseudolikelihood = -153.30517Pseudo R2 = 0.0913				

Source: Authors' data analysis, 2023

Note: *** = significant at 1%, ** = significant at 5%.