AGRICULTURAL SHOCK COPING STRATEGIES AND FOOD SECURITY AMONG FARMING HOUSEHOLDS IN NIGERIA

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ABSTRACT

Farmers are increasingly exposed to agricultural shocks such as pest invasion, flooding, poor rains, input price increase and fall in output price, which further worsen their food security state and well-being. Adopting strategies to cope with the shocks may enhance farmers' food security, although studies that link agricultural shocks to food security of households in Nigeria are not abundant. Therefore, this study examines the effects of agricultural shock coping strategies on food security among farming households in Nigeria. Data on 903 farming household heads were extracted from Nigeria's 2018/2019 general household survey, including; socioeconomic characteristics, agricultural shocks and the coping strategies adopted (assets-based, food adjustment-based, assistance-based, and borrowing-based). Data were analyzed using descriptive statistics, Foster-Greer-Thorbecke food security measure and logit regression. Results showed that most households were food insecure (51.8%) and did not adopt any coping strategy (62.50%). The most commonly adopted strategy (17.90%) was assets-based. The assistance-based coping strategies increased the probability of being food secure along with secondary and tertiary education, credit access and cooperative membership. Contrariwise, age and living in the rural sector, North-west and South-south zones decreased the probability of being food secure. Therefore, food security policy for farmers should focus on assistance through social security programmes, encouraging higher education level attainment, improved credit access, cooperative membership and rural living conditions.

Keywords: Coping strategies, Agricultural shocks, Food security.

JEF Classification: D1, Q180, Q18

1. INTRODUCTION

Food security is a basic human right and front-burner international concern. Its necessity to life makes it an issue that cannot be emphasized (Yusuf *et al*., 2022). An estimated population of over 720 million people globally were hungry in 2020, indicating an increase from 161 million in 2019 (FAO, 2021). The number of people who lacked appropriate food in 2020 were about 2.37 billion and increased by 320 million individuals within one year (FAO, 2021). The number of hungry people on the continent exceeds that of every other region in the world. One in every five Africans (21 percent of the population) remained hungry in 2020, whereas Latin America and the Caribbean recorded less than one in every 10 persons (FAO, 2021). Hunger is on the rise in all sub-regions of Africa (FAO, 2019). This further threatens ability of African countries to attain economic development since food security is a critical aspect of countries' economic growth and

development (Zhou *et al*, 2019). More pertinently, African countries' attainment of the Sustainable Development Goals (SDGs) appears bleak.

Nigeria is crucial to the continent's attainment of the SDGs, being the largest populated country in Africa where 20 percent of poor people in Africa live (World Bank, 2022). Furthermore, the country's macroeconomic and political instability coupled with prevailing climate variability has further worsened the living conditions of poor, who are mostly households engaged in agriculture (Bulus and Madueme, 2022). This has heightened poverty and food insecurity levels especially among farmers, resulting in 56.7% of farmers being poor (World Bank, 2022). This is a projected increase from the estimated 17 million people currently at risk of food insecurity (FAO 2023). Continued conflict, climate change inflation and rising food prices are key drivers of this alarming trend. Hence, several environmentally related disturbances which happen suddenly or were unanticipated can constitute shocks to farmers. These are referred to as agricultural shocks in this study.

Agricultural households in Nigeria like most developing countries experience different shocks (Okonkwo *et al*., 2022) that can trigger decline in well-being, which can affect individuals (illness, death), a community, a region, or even a nation (like natural disaster, macro-economic crisis). In addition, there are periodic droughts and floods in the country, with attendant negative effect on agricultural productivity and food security, especially among rural households (WFP, 2022). The insurgency in the country especially in the northeast has added pressure to an already fragile resource environment. This has hindered development and worsened the food and nutrition insecurity of vulnerable women and children. Famine, food price increases and income shocks also increase hunger, poverty and food insecurity incidence (Bulus and Madueme, 2022). The literature asserted that households adopt coping techniques to combat agricultural shocks and food insecurity in varied situations (Onunka *et al.,* 2018 and Militao *et al.,* 2022). These studies did not explore the link between coping strategies and food security. Therefore, the following questions are raised in the study: what are the agricultural shocks experienced by the farming households in Nigeria? What are the agricultural shocks coping strategies adopted by the households? What are the factors influencing the choice of adopted coping strategies? What is the level of food security among the farming households and what are the effects of coping strategies to agricultural shocks on food security among the farming households in Nigeria? Thus, the broad objective of this study is to investigate the effects of agricultural shocks coping strategies on food security among farming households in Nigeria. A review of literature on food security and its link to agricultural shocks is presented before the description of data and analytical techniques employed in the data analyses for the study. Thereafter, the results are presented and discussed, conclusion drawn and recommendations proffered.

2. LITERATURE REVIEW

2.1 Conceptual and theoretical literature

Food security as a concept is multidimensional and has evolved since the global food inadequacy crisis which led to concerns about food security in the mid-1970s. The first and oldest approach to food security was the food availability approach popularized by Thomas Malthus in 1789, The approach underlined availability and price stability of foodstuffs at both local and international levels (Andohol *et al*. 2020), although environmental and economic factors including drought and famine were not considered. The basic needs approach emanated next, incorporating non-economic measurements of development (ILO 1976). The approach looked at development as the

process of satisfying peoples' basic needs, which in turn leads to living a "full-life", composed of measureable and immeasurable components (Stewart 1985). Having adequate food as a basic need was further extended to a basic right and became the basis for the average required daily caloric intake by the World Health Organisation (WHO). Recently, quality and diversity of diet have been emphasized over adequate quantity. Moreover, different genders consume different quantities of food, hence an assumption of a one-size fits all bundle is faulty. Further reconsideration and modification of the concept of food security gave rise to Sen's entitlement approach, which focuses on each person's entitlements to commodity bundles including food, and views starvation as resulting from "a failure to be entitled to any bundle with enough food". This study hinges on the entitlement theory since it considers that the ability of the farmer to access food is further limited in the case of a sharp fall in the output price of the commodity produced by the farmer, due to external causes. Such sudden disturbances to farmers' production and income are referred to as agricultural shocks and will affect their food security level. The shocks can also have severe impacts on food supply chains (Okonkwo et al., 2022).

2.2 Empirical literature

The understanding of agricultural shocks and food security at farming household level and how farming households cope with food insecurity through taking on different approaches could be very vital to solving the problem of food insecurity of farming households. Households commonly use several coping strategies in the event of food crisis and related shocks, as identified by Onunka *et al.* (2018) and Militao *et al.* (2022). Similarly, literature abounds with studies on the determinants of food security (Akukwe, 2020; Ogunniyi *et. al.*, 2021). Furthermore, Dagupta and Robinson (2021) assessed determinants of food insecurity and identified safety nets and coping mechanisms, though the effects of coping strategies on food security were not assessed. Similarly, Militao *et al.* (2022) attempted to link coping strategies to food security of agricultural households however, the analysis employed mainly descriptive statistics. The assessment of the influence of agricultural shocks' on food security requires inferential statistics to provide empirical evidence to help inform policy. Several empirical methods have been applied to assess the determinants of food security, including the tobit, probit and logit regression models although, coping strategies to agricultural shocks have not been considered as factors affecting food security. Thus, the aim of this study is to investigate the influence of coping strategies to agricultural shocks on food security of farming households in Nigeria.

3. MATERIALS AND METHODS

The study was carried out on Nigeria using secondary data obtained from the Nigeria General Household Survey wave 4 (NGHS) 2018/2019. Information for 903 farming households was extracted and used for the study. Data extracted covered socio-economic characteristics (such as age of respondents, gender of respondent, household size, level of education, marital status, credit access, farm size), agricultural shocks (pest invasions, flooding, poor rains, increase in price of inputs and fall in price of outputs), coping strategies adopted (assets-based, food adjustment-based, assistance-based, and borrowing-based) and food expenditure of farming households. Data were analyzed using descriptive statistics, Foster-Greer-Thorbeck (1984), FGT class of decomposable food insecurity measure and logistic regression model.

The food insecurity line was obtained using the Foster-Greer-Thorbeck (FGT) class of decomposable food insecurity measure and was given as two-thirds of the mean per capita food expenditure.

It is presented as follows;

$$P\ \alpha = \frac{1}{N}\ \sum_{i=1}^{Hi}[\frac{(Z-yi)\hat{}\alpha}{Z}] \qquad \text{Equation 1}$$

$$P_0 = \frac{H0}{N} \qquad \text{Equation 2}$$

P_0 measures the proportion of persons whose consumption/expenditure level is below the food insecurity line, P = FGT parameter, α = non-negative parameter, which takes the value 0,1 and 2, N = Total number of households, H_1 = Head count of the food insecure (number of food insecure farm households), y_i = the average real spending/consumption of the households, Z = Food insecurity line which is 2/3 of mean consumption/expenditure of the farming households.

The food security status is a dependent variable (P_i) that is dichotomous; where the household is either food secure or insecure. The cumulative logistic probability function is as follows:

$$K_i = (Z_i) = F\ \mu + \sum(\beta_i X_i)] = \frac{1}{1+e\hat{}-[\mu+\sum(BiXi)]} \qquad \text{Equation 3}$$

Where:
e = Base of the natural logarithms
X_i = the *ith* explanatory variable
K_i = probability that a household is being food secure
Bi and μ = regression parameters to be estimated

Table 1: Variable description, measurement and expected sign

S/No	Category	Independent Variables	Measurement	A prior expectation
1.	Socio-economic variables	Age	Number of years	+/-
2.		Sex	Male = 1, Female = otherwise	+/-
3.		Primary education	Primary education = 1, otherwise = 0	+/-
4.		Secondary education	Secondary education = 1, otherwise = 0	+
5.		Tertiary education	Tertiary education = 1, otherwise = 0	+
6.		Household size	Number of persons	-
7.		Marital status	Married = 1, otherwise = 0	+
8.		Credit access	Access to credit = 1, otherwise = 0	+
9.		Cooperative membership	Cooperative membership = 1, otherwise = 0	+
10.		Sector	Rural = 1, otherwise = 0	-
11.	Coping strategies	Asset-Based	Asset-Based = 1, otherwise = 0	+
12.		Food Adjustment-Based	Food Adjustment-Based = 1, otherwise = 0	+
13.		Assistance-Based	Assistance-Based = 1, otherwise = 0	+
14.		Borrowed-Based	Assistance-Based = 1, otherwise = 0	+
15.		North East	North East = 1, otherwise = 0	-

16.	Geo-political zones	North West	North West = 1, otherwise = 0	+
17.		South East	South East = 1, otherwise = 0	+
18.		South South	South South = 1, otherwise = 0	+
19.		South West	South West = 1, otherwise = 0	+

4. RESULTS AND DISCUSSION OF FINDINGS

4.1. Characteristics of farming households in Nigeria

The description of farmers' characteristics are presented on Table 3. Most farmers were male (86.16%) with mean age of 49.2±14.2 years, suggesting that the farmers are still within their productive age. This result is similar to Bulus and Madueme (2022) who reported a higher percentage of males among farming households surveyed and mean age of 48.3 years. Moreover, majority (61.02%) of the respondents had at least primary education or higher. Similar to Faye and Obah-Akpowoghagha (2023), most respondents were married (80.73%), and the average household size was about 7 persons, indicating a large family size, in line with Anugwa *et. al.*, (2014). The farm size was 1.34 ha, indicating smallholdings, although 61.79% of the respondents cultivating less than a hectare of land. Furthermore, 83.39% had no access to credit thus, depended on own savings and other means to fund their farming activities. This corroborates the findings of Anugwa *et. al.,* (2014).

Table 2. Socioeconomic characteristics of farming households in Nigeria

Variables	Frequency	Percent	Mean (Std. dev)
Sex			
Male	778	86.16	
Female	125	13.84	
Age			
<20	3	0.33	
21-30	85	9.41	
31-40	207	22.92	49.22 (14.42)
41-50	219	24.25	
51-60	197	21.82	
>60	192	21.26	
Marital status			
Single	35	3.88	
Married	729	80.73	
Divorced	26	2.88	
Widowed	113	12.51	
Education level			
No formal	352	38.98	
Primary	265	29.35	
Secondary	236	26.14	
Tertiary	50	5.54	
Household size			
1-5	368	40.75	
6-10	393	43.52	6.89 (3.84)
11-15	116	12.85	

>15	26	2.88	
Farm size (Ha)			
<1	558	61.79	
1.0001-5	310	34.33	1.34 (2.29)
>5	35	3.88	
Credit Access			
Yes	150	16.61	
No	753	83.39	
Total	**903**		

Source: Authors' computation from GHS 2018/19, 2021

4.2. Agricultural shocks experienced by farming households in Nigeria

Table 3 presents a profile of agricultural shocks experienced by farming households in Nigeria. All households experience the shocks, though the most important agricultural shock experienced by 30.56% of the farming households was increase in price of inputs, followed by flooding (20.62%). The least important agricultural shock experienced by 12.96% of the households was fall in price of outputs. The result is plausible since an input price increase will affect production cost and incomes, while flooding could destroy farmlands and other productive and household assets, leading to food insecurity. A fall in price of outputs will negatively impact incomes which in turn affects their food security. The macroeconomic study of Adebisi (2022) also found that increase in prices (inflation) was a significant shock experienced in Nigeria, while Bulus and Madueme (2022) also found that farming households encountered numerous environmental shocks.

Table 3: Agricultural shocks experienced by farming households

Agricultural shocks	Frequency	Percent
Increase in price of inputs	276	30.56
Flooding	235	26.02
Poor rains	148	16.39
Pest invasion	127	14.06
Fall in the price of output	117	12.96
Total	**903**	**100**

Source: Authors' computation from GHS 2018/19, 2021

4.3 Coping strategies to agricultural shocks adopted by farming households

The coping strategies to agricultural shocks adopted by farming households are profiled on Table 5. Most farming households did nothing to cope with the agricultural shocks experienced, suggesting that they may suffer more adverse effects on their food security levels. The non-use of any coping strategy may be due to lack of assets, knowledge of what to do or poverty. On the other hand, 37.54% applied several strategies to cope with the agricultural shocks. The most important coping strategies adopted was the asset-based type, by 17.94% of the farmers. Hence, to cope with the agricultural shocks, the households applied sale of livestock, land and other property, advance sale of harvest, engagement in additional income generation and reliance on savings. The type of coping strategies is likely to provide a minimal disturbance to the household food security. Secondly, the food adjustment-based used by 8.19% of the farmers included: reduced food and non-food consumption, withdrawal of children from school and sending children to live with

friends. This coping strategies may have negative implications for household food security. Thirdly, the borrowing-based coping strategies used by 6.64% of the household heads, comprised: borrowing from friends and family, credited purchases, delayed payment obligations, loans from financial institutions and advance payment from employers. The strategies may likely provide only a minimal disturbance to the household food security. Finally, the least important category of coping strategies used by 4.76% was the assistance-based, which included receiving assistance from NGOs, government, and friends and family. The category of coping strategies may provide a minimal disturbance to the household food security, although it is only enjoyed by a small percentage of farmers. Faye and Obah-Akpowoghagha (2023), also found that the least proportion of households received assistance from government and other related sources.

Table 4: Coping strategies to agricultural shocks adopted by farming households in Nigeria

S/No.	Agricultural shocks coping strategies adopted	Category of coping strategy	Frequency	Percentage
1.	None	Did nothing	564	62.46
2.	Sale of livestock, sale of land, sale of other property, sold harvest in advance, engaged in additional income generation, relied on savings	Asset-based	162	17.94
3.	Reduced food consumption, reduced non-food consumption, withdrew children from school, sent children to live with friends	Food adjustment-based	74	8.19
4.	Borrowed from friends and family, credited purchases, delayed payment obligations, took a loan from a financial institution, took advanced payment from employer	Borrowing-based	60	6.64
5.	Received assistance from NGO, received assistance from government, received assistance from friends and family	Assistance-based	43	4.76

Source: Authors' computation from GHS 2018/19, 2021

4.4. Estimation of food security level among farming households in Nigeria

The farming households' food security level is shown on Table 5. The food security line was ₦793.13k per week. Over half (51.8 %) of the households were food insecure, indicating that food insecurity was predominant among farming households in Nigeria. Moreover, the food insecurity depth was 26.0%, indicating that households need to spend an additional ₦206.21k to become food secure. The severity of food insecurity among the respondents is 16.7%, implying that food insecurity is severe among food insecure farming households. The result is corroborated by the findings of Johnson *et al.* (2020) that food insecurity is high among farming households in Nigeria.

Table 5. Farming households' food security level

Food security status	Frequency	Percent

Food insecure	468	51.83
Food secure	435	48.17
Food insecurity incidence		0.5183
Food insecurity depth		0.2602
Food insecurity severity		0.1674
Mean per capital household food expenditure	₦1189.67k	
2/3 mean per capita households' food expenditure	₦793.13k	

Source: Authors' computation from GHS 2018/19, 2021

4.5. Effects of agricultural shock coping strategies on food security status of farming households in Nigeria

The logit estimates for the effects of agricultural shocks coping strategies on the food security status of farming households in Nigeria are shown on Table 6. The LR chi-square value of 97.41 was significant at 1 percent, showing that the model is good fit for the data. The assistance-based coping strategy increased the likelihood of household food security, significant at 10% level. Hence, applying the assistance based strategy will increase the probability of food security by 10.3%. This implies that cash and non-cash assistance from NGOs' and government social security programmes improve food security of farming households. This is plausible because of the effect on income and consumption smoothening. Faye and Obah-Akpowoghagha (2023), also found that safety nets are important for food insecure households. Age decreased the likelihood of a household being food secure, and was statistically significant at 1%, indicating that an increase in age of household head will reduce the probability of households being food secure by 2.3%. Hence, as the household heads grow older, they are likely to become food insecure. Aging farmers are associated with conservative and traditional methods leading to low productivity. The result is in line with the findings of Ume *et. al*. (2018) though, contrary to Aboaba *et. al*., (2020). Similarly, having secondary and tertiary education increased the likelihood of being food secure, at 10% and 1% levels, respectively. Thus, having secondary and tertiary education increased the likelihood of food security by 7.8% and 22.2%, respectively. This implies that higher levels of education than the primary level, improve farmers' food security. The finding is in line with Ogunniyi *et al*., (2021) that occupational and geographical mobility of labour increases with higher levels of education which in turn increases their ability to earn better incomes and become food secure.

Moreover, being married revealed a positive relationship with food security, significant at 10%, indicating that married households heads have 16.2% likelihood of being food secure. This may be due to the pooling together of resources from both spouses to generate more income and become food secure. This corroborates the findings with Djangmah (2016) and it is contrary with that of Akukwe (2020). Similarly, having access to credit showed a positive relationship with food security at 5% level of significance. Access to credit increased likelihood of food security by 8.2%. This is expected since access to credit enables investments that can increase the probability of being food secure. The result is in line with Yusuf et al., (2022), though contrary to Nkomoki *et. al.* (2019). Moreover, cooperative membership increased the probability of being food secure and was significant at 5%. A household head with cooperative membership has an increased likelihood of being food secure by 11.4%. Being a member of cooperatives builds social capital and provides access to information and opportunities which could improve farmers' food security. The result is in line with Nkomoki et al., (2019). Furthermore, living in the rural sector showed a reduced the likelihood of food security by 20.9%, having a negative influence on food security and significant at 1%. This implies that rural household heads have a higher probability of being food insecure

compared to urban households. This is plausible since rural households lack market access, basic infrastructure and opportunities which limit their productivity and food security, relative to urban households. Finally, living in the North West and South South zones showed a positive influence on food security and significant at 10%. Thus, farming households in the North-west and South-south have a higher probability of being food secure relative to North-central, which was the base. Crop and livestock farming abound in the North-west while high income generation due to availability of crude oil characterizes the South-south. This could improve incomes and food security in the zones. This is in line with Adepoju *et. al.* (2013).

Table 6. Logit estimates for effects of coping strategies to agricultural shocks on farming households' food security

Variables	Coefficient	Std. Err.	P>|z|	dy/dx
Asset-Based	-0.0246208	0.1182686	0.835	-0.0089887
Food Adjustment-Based	0.0559283	0.1668368	0.737	0.0204185
Assistance-Based	0.3101492*	0.1798765	0.093	0.1032306
Borrowed-Based	0.0494154	0.1770861	0.780	0.0180408
Age	-0.0781208***	0.0201878	0.000	-0.0285207
Sex	0.0085872	0.2161155	0.968	0.0031358
Education				
Primary	0.1197812	0.1097725	0.275	0.0442116
Secondary	0.2109385*	0.1186385	0.075	0.0780663
Tertiary	0.6116606***	0.2198937	0.005	0.2226506
Marital status	0.4666622*	0.2481795	0.060	0.1624752
Credit access	0.2247294**	0.1188684	0.059	-0.0823982
Membership of cooperatives	0.3137052**	0.1651255	0.057	0.1145288
Sector	-0.5660689***	0.1307428	0.000	-0.2092258
Zone				
North East	-0.1572893	0.1367861	0.250	-0.0569697
North West	0.2416121*	0.1350638	0.074	0.0896532
South East	0.2022738	0.1607384	0.208	0.0750308
South-South	0.2726844*	0.1542407	0.077	0.1011779
South West	0.247596	0.2053929	0.228	0.0918747
_cons	2.035725***	0.5504027	0.000	
Number of obs = 902				
LR chi2(21) = 97.41				
Prob > chi2 = 0.0000				
Pseudo R2 = 0.0780				
Log likelihood = -575.94817				

Source: Authors' computation from GHS 2018/19, 2021

Notes: * p < 0.10, ** p < 0.05, *** p < 0.01

5. CONCLUSION AND POLICY RECOMMENDATIONS

The study set out to investigate the effect of agricultural shock coping strategies on food security of farming households in Nigeria using the 2018/19 General Household Survey data for Nigeria. Based on the findings, all the farming household heads experienced agricultural shocks. The most

important shock experienced was input price increase. Less than one-third of the farming household heads used coping strategies to deal with the agricultural shocks, the most common being asset-based coping strategies. Most respondents did nothing to cope with agricultural shocks. Furthermore, most farming households in Nigeria were food insecure. The assistance-based coping strategies improved the food security status of the farming households, along with age, access to credit, living in the urban sector, having secondary and tertiary education, being married, being a member of cooperative and living in the North-west and South-south zones. Based on the findings of this study, policy options for food security improving coping strategies for farming households in Nigeria should be directed at assistance based strategies which are mostly social security programmes. In addition, cooperative membership should be encouraged among farming households, farmers' access to credit should be improved by financial institutions, while government's basic education policy should increase beyond the primary level to secondary and tertiary levels. Government should also improve the living and business conditions in rural areas to enhance food security of farming households.

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