

POVERTY, FOOD SECURITY, AND COPING STRATEGIES AMONG FLUTED PUMPKIN FARMERS IN RESPONSE TO RISING PRODUCTION COSTS IN OGUN STATE, NIGERIA

Afodu, O. J.*, Akinboye, O. E., Oyekale, O. O., Shobo, B. A., Awoyinka, R. I., Omotayo, P. M., and Ogunseitan, O. H.

Department of Agriculture and Industrial Technology, Babcock University, PMB 4003, Ilishan Remo, Ogun State, Nigeria.

*Corresponding author: afoduo@babcock.edu.ng

ABSTRACT

*This study examined how poverty level and food security status influence coping strategies adopted by fluted pumpkin (*Telfairia occidentalis*) farmers in response to rising production costs in Ogun State, South-West Nigeria. A multistage random sampling procedure was used to select 240 vegetable farmers. Data were collected using a structured questionnaire and analysed with descriptive statistics, the Household Food Insecurity Access Scale (HFIAS), a relative poverty measure based on mean per capita household expenditure, and multinomial logistic regression. Results showed that 54.6% of respondents were female and 82.5% were classified as poor using the study poverty line of ₦26,500 per month. Food insecurity was widespread: 65.8% were mildly food insecure and 18.8% moderately food insecure. Mixed cropping was the most common coping strategy (50.5%), followed by use of credit (21.6%), no change in strategy (15.5%), and input reduction (12.4%). Poverty and food-security status were significant correlates of coping-strategy choice in the multinomial model. The findings indicate that economically vulnerable farmers have more limited capacity to adjust to rising production costs. Policies should improve access to affordable inputs, appropriate credit, farmer cooperatives, and extension support, prioritising poor and food-insecure vegetable farmers.*

Keywords: Coping strategies; Fluted pumpkin; Food security; Poverty; Production cost

INTRODUCTION

Fluted pumpkin (*Telfairia occidentalis* Hook. f.) is an important indigenous leafy vegetable widely cultivated and consumed in southern Nigeria. It contributes to household diets and provides income opportunities for smallholder producers (Akanni-John et al., 2020; Edokpolor, 2017). Its economic importance makes fluted pumpkin farmers' welfare and production decisions relevant to food-security and poverty-reduction efforts.

Food security exists when people have reliable physical, social, and economic access to sufficient, safe, and nutritious food for an active and healthy life (United Nations, 2015). For farming households, food access depends strongly on income, purchasing power, production performance, and exposure to shocks. Rising prices of seed, fertilizer, agrochemicals, labour, and irrigation can therefore affect both farm production and household welfare.

Agriculture remains important to Nigeria's economy, yet many rural and smallholder households face persistent monetary and multidimensional deprivation. National evidence shows that poverty is especially pronounced where households depend on unstable incomes and have limited access to credit and basic services (National Bureau of Statistics [NBS], 2022). These constraints can reduce farmers' capacity to respond to production-cost shocks. Previous studies have examined food insecurity, poverty, and farmers' coping or livelihood strategies in Nigeria and other African settings (Afodu et al., 2022, 2024; Danso-Abbeam et al., 2023). However, limited empirical attention has focused on how poverty level and household food-security status jointly relate to the choice among alternative coping strategies used by fluted pumpkin farmers when production costs rise in Ogun State. This study fills that gap by combining HFIAS-based food-security classification, a household-expenditure poverty measure, and a multinomial logit model of coping-strategy choice. Accordingly, the study (i) describes the socioeconomic characteristics of fluted pumpkin farmers, (ii) determines their poverty and food-security status, (iii) identifies coping strategies used in response to high production costs, and (iv) estimates the socioeconomic, poverty, and food-security factors associated with the choice of coping strategy. The evidence is intended to support better-targeted interventions for vulnerable vegetable-farming households.

MATERIALS AND METHODS

The study was conducted in Ogun State, South-West Nigeria. Ogun State comprises four Agricultural Development Programme (ADP) zones: Ilaro, Ikenne, Abeokuta, and Ijebu-Ode (Afodu et al., 2019). The state has 20 local government areas and supports the production of crops including cocoa, oil palm, rice, cassava, cotton, and vegetables.

A multistage sampling procedure was used. First, Ikenne and Ijebu-Ode ADP zones were purposively selected because of the concentration of vegetable production. Second, two local government areas were randomly selected from each zone. Third, six farming communities were randomly selected from each local government area, for a total of 24 communities. Finally, 10 vegetable farmers were randomly selected from each community, yielding a sample of 240 respondents.

The sample was drawn from a sampling frame of 6,225 registered vegetable farmers.

A structured questionnaire was used to collect information on respondents' age, sex, marital status, education, household size, farm size, farming experience, cooperative membership, access to credit, household expenditure, food-security experience, and coping strategies used in response to high production costs.

Method of Data Analysis

Descriptive statistics (frequencies, percentages, means, and standard deviations) were used to summarize respondents' characteristics, poverty status, food-security status, and coping strategies. HFIAS was used to classify household food-security status, while a relative poverty line based on mean per capita household expenditure was used to classify respondents as poor or non-poor. Multinomial logistic regression was then used to estimate factors associated with the choice among unordered coping-strategy alternatives.

Measuring Food Security Outcome

Household food insecurity was measured with the nine-item Household Food Insecurity Access Scale (HFIAS), Version 3 (Coates et al., 2007). Each occurrence-frequency item was scored from 0 (never) to 3 (often). For household i , the total score was computed as $HFIAS_i = \sum_{j=1}^9 s_{ij}$, where $s_{ij} \in \{0,1,2,3\}$; hence $0 \leq HFIAS_i \leq 27$. Higher scores indicate greater food-access insecurity.

For this study, HFIAS scores were grouped as follows: food secure = 0–1; mildly food insecure = 2–10; moderately food insecure = 11–20; and severely food insecure = 21–27. The observed distribution is reported in Table 4 and summarized again in Appendix A.

Poverty Measures

Monthly household expenditure was used as a proxy for living standard. Per capita household expenditure for household i was calculated as $PCHE_i = E_i/H_i$, where E_i is total monthly household expenditure on food, housing, health, and transportation, and H_i is household size. Mean per capita household expenditure was $MPCHHE = (1/n)\sum_{i=1}^n PCHE_i$. Following Obayelu and Awoyemi (2010), the relative poverty line was set at $Z = (2/3)MPCHHE$. Respondents with $PCHE_i < Z$ were classified as poor (1), while those with $PCHE_i \geq Z$ were classified as non-poor (0). The estimated poverty line for the sample was ₦26,500 per person per month.

Multinomial Logistic Regression Models

The dependent variable was coping-strategy choice, an unordered categorical outcome with four alternatives: no change in strategy (base category), input reduction, mixed cropping, and use of credit. For farmer i and coping alternative j , the multinomial logit model is $P(Y_i=j)=\exp(X_i\beta_j)/[1+\sum_{k=1}^3\exp(X_i\beta_k)]$ for $j=1,2,3$, while $P(Y_i=0)=1/[1+\sum_{k=1}^3\exp(X_i\beta_k)]$. The model therefore estimates each strategy relative to the no-change base outcome (Long & Freese, 2006).

The explanatory variables were age, sex, marital status, educational level, household size, farm size, farming experience, cooperative membership, food-security status, and poverty level. Food-security status entered the model using the four HFIAS categories (food secure, mildly food insecure, moderately food insecure, and severely food insecure), with the reference category defined in the estimation coding. Poverty level was binary (poor = 1; non-poor = 0). Coefficients and marginal effects were interpreted relative to the base coping outcome. The independence of irrelevant alternatives (IIA) assumption should be assessed as a robustness check for the multinomial logit specification (Long & Freese, 2006).

RESULTS AND DISCUSSION

Socio-Economic Characteristics of Vegetable Farmers in the Study Area.

Table 1 presents the socio-economic characteristics of the vegetable farmers in the study area. Women represented 54.6% of respondents and men 45.4%. Nearly half (48.3%) were 31–40 years old, indicating that vegetable production was concentrated among economically active adults. Most respondents were married (74.2%), and all reported some formal education: 17.5% primary, 46.4% secondary, and 36.1% tertiary education.

Table 1: Socioeconomic Characteristics of the Respondents

Variable	Frequency	Percent (mean + SD)
Sex		
Male	109	45.4
Female	131	54.6
Total	240	100.0 (1.5464 +.50043)
Age		
21-30	37	15.4
32-40	116	48.3
41-50	46	19.2
51-60	29	12.1
>60	12	5.0
Total	240	100.0 (41.2577+12.68142)
Marital status		
Single	62	25.8
Married	178	74.2
Total	240	100.0 (1.2577 +.43966)
Educational level		
Primary school education	42	17.5
Secondary school education	111	46.4
Tertiary education	87	36.1
Total	240	100.0 (3.1856 +.711195)
Family size		
1-3	67	27.9
4-6	158	66
7- above	15	6.2
Total	240	100.1 (4.2577 +1.76941)
Farm size		
1-3	191	79.4
4-6	32	13.4
7-9	15	6.2
12- above	2	1.0
Total	240	100.0 (2.9381 +2.17378)
Farming experience		
1-10	136	56.8
11-20	60	24.8
21-30	27	11.3
31-40	7	3.1
41- above	10	4.1
Total	240	100.0 (13.0309 +11.1537)
Do you belong to a cooperative association?		
Yes	77	32.0
No	163	68.0
Total	240	100.0 (1.6804 +.46874)
Do you have access to credit		
Yes	124	51.5
No	116	48.5
Total	240	100.0 (1.4585)

Table 1 presents the socio-economic characteristics of the vegetable farmers in the study area. Women represented 54.6% of respondents and men 45.4%. Nearly half (48.3%) were 31–40 years old, indicating that vegetable production was concentrated among economically active adults. Most respondents were married (74.2%), and all reported some formal education: 17.5% primary, 46.4% secondary, and 36.1% tertiary education. Household size was commonly 4–6 persons (66.0%), while 79.4% cultivated 1–3 plots. These characteristics describe a predominantly small-scale farming population. Farming experience was 1–10 years for 56.8% of respondents, 11–20 years for 24.8%, and more than 20 years for the remainder. Only 32.0% belonged to a cooperative association, while 51.5% reported access to credit. These institutional characteristics are relevant because cooperative participation and credit access can shape farmers' capacity to respond to production-cost pressures. Most (68.0%) of the vegetable farmers did not belong to any cooperative association, while 32.0% belonged to a cooperative association.

Poverty Levels among Vegetable Farmers

Table 2 shows that 198 respondents (82.5%) were classified as poor and 42 (17.5%) as non-poor using the study poverty line of ₦26,500 per person per month. The high poverty incidence indicates substantial economic vulnerability among the sampled vegetable farmers and may constrain their ability to finance inputs or adopt cost-management strategies. This result is consistent with the broader concern that production-cost pressures can be particularly difficult for smallholders with limited financial resources and weak access to formal support (Afodu et al., 2024).

Table 2: Poverty Level of Respondents

Level	Frequency	Percent
Poor	198	82.5
Non-Poor	42	17.5
Total	240	100.0

The Various Coping Strategies Adopted by the Vegetable Farmers in Response to High Cost of Production

Table 3 shows four coping responses to high production costs. Mixed cropping was the most common strategy (50.5%), followed by use of credit (21.6%), no change in strategy (15.5%), and input reduction (12.4%). The distribution indicates that farmers relied more on production diversification than on reducing inputs.

Table 3: Fluted Vegetable Farmers Coping Strategies to High Cost of Production

	Frequency	Percent
Input reduction	30	12.4
Mixed cropping	121	50.5
Use of credit	52	21.6
Did not adopt any strategy	37	15.5
Total	240	100.0

The Various Categories of Food Security of the Respondents

HFIAS results in Table 4 show that 15.4% of respondents were food secure, 65.8% were mildly food insecure, and 18.8% were moderately food insecure; no respondent was classified as severely food insecure. Thus, 84.6% of the sample experienced some degree of food insecurity. The predominance of mild and moderate food insecurity is consistent with evidence that smallholder households can remain vulnerable to food-access constraints despite participating directly in food production (Danso-Abbeam et al., 2023; Kapari et al., 2023).

Table 4: Categories of Food Security

Food Security Status	Frequency	Percent
Food secure	37	15.4
Mild food insecure	158	65.8
Moderately food insecure	45	18.8
Severely food insecure	0	0
Total	240	100.0

Determinants of fluted pumpkin farmers' coping strategies with high cost of production

Table 5 presents the multinomial logistic regression results for input reduction, mixed cropping, and use of credit, each compared with the no-change base outcome. The likelihood-ratio test was statistically significant ($LR \chi^2(33) = 82.01, p < .001$), and the reported pseudo- R^2 was 0.3455, indicating that the included predictors jointly improved model fit relative to an intercept-only specification. Interpretation below follows the significance stars reported in Table 5 (* $p < .10$, ** $p < .05$, *** $p < .01$). Only predictors marked significant in the relevant outcome column are discussed as statistically associated with that coping strategy.

For input reduction, statistically significant predictors were food-security status, poverty level, marital status, household size, and cooperative membership. These associations indicate that household welfare and institutional characteristics were related to the likelihood of reducing inputs relative to making no change. Food-security status was significant at $p < .05$ in the input-reduction equation. The positive coefficient indicates that food-secure farmers are more likely to adopt this strategy compared to those who do not have enough food to meet their needs. Studies have shown that food security significantly influences farmers' adoption of sustainable practices. Kassie et al. (2015) found that food-secure households in Ethiopia were more likely to adopt conservation agriculture practices, which often involve input reduction. Similarly, Pretty et al. (2011) reported that farmers with stable food supplies are more willing to implement practices that reduce input costs and enhance sustainability.

Poverty level was also significant at $p < .05$, with input reduction showing a negative coefficient. The finding that an increase in the poverty level of the vegetable farmers leads to a 2.72% decrease in the adoption of the input reduction strategy underscores the importance of addressing poverty as a key determinant of sustainable and efficient farming practices. These findings align with Glover et al. (2019), who found that poor farmers often lack the financial resources to invest in alternative, sustainable farming practices that may require initial capital, such as organic inputs or improved farming techniques.

Marital status and household size were significant at $p < .05$ in influencing the choice of input reduction among fluted pumpkin farmers. The results indicate that marital status is an important household characteristic associated with farmers' responses to rising production costs. Married farmers often operate within households where production and consumption decisions are jointly influenced by family responsibilities, labour availability, and the need to maintain household welfare. Consequently, marital status may affect the extent to which farmers are willing or able to reduce the quantity of purchased inputs used in production. This is consistent with evidence from Nigerian smallholder agriculture showing that marital status can significantly influence farmers' decisions to adopt different farm-management and sustainable land-management practices (Adebayo et al., 2022).

While cooperative membership was significant at $p < .10$. Cooperative membership was significant at $p < .10$ and had a positive coefficient ($\beta = 3.9791$), suggesting an association between participation in farmers' organisations and the choice of input reduction relative to maintaining an unchanged production strategy. Membership of agricultural cooperatives can expose farmers to information, collective experience, training, input-management knowledge and other institutional resources that may enable them to adjust production practices when costs increase. The result is consistent with recent evidence showing that cooperative participation can influence farmers' production and technology decisions. Eze et al. (2024) found that cooperative membership significantly increased the probability of adopting climate-smart agricultural practices among crop farmers in Nigeria.

Similarly, cooperative membership has been associated with improved production outcomes among Nigerian smallholders, including tomato farmers (Kehinde et al., 2023), while more recent evidence indicates that cooperative participation can improve the technical efficiency of smallholder farmers in Nigeria (Kehinde et al., 2025). These findings suggest that household structure and institutional participation were also associated with the input-reduction decision. Household size was also significant at $p < .05$ and had a positive coefficient ($\beta = 1.0456$), indicating that household composition plays an important role in farmers' input-management decisions.

Larger households may provide additional family labour that can substitute, at least partly, for purchased or hired inputs when production costs increase. At the same time, larger households have greater consumption requirements, which may place additional pressure on limited household resources and encourage farmers to economize on production expenditure. Recent evidence from Nigeria similarly identifies household size as an important determinant of farmers' adoption of agricultural practices. For example, Adebayo et al. (2022) reported that household size influenced smallholder maize farmers' choice of sustainable land-management practices, while Eze et al. (2024) found household size among the socioeconomic factors determining the adoption of climate-smart agricultural practices among crop farmers in South-East Nigeria. These findings support the present result that household structure can shape farmers' responses to production and resource constraints.

For mixed cropping, the significant predictors shown in Table 5 were food-security status, poverty level, marital status, educational level, household size, farm size, farming experience, and cooperative membership. Age was not statistically significant and is therefore not treated as a driver of mixed cropping. Food-security status had a positive and highly significant relationship with mixed cropping ($\beta = 1.0566, p < .01$). This indicates that the higher food-security category had a greater relative likelihood of adopting mixed cropping than maintaining an unchanged strategy, other factors being constant. The relationship between food security and diversification is particularly relevant because mixed or diversified cropping can spread production risk and provide households with multiple food and income sources. Recent Nigerian evidence supports this relationship. Adegbite et al. (2024) found that crop diversification was significantly associated with household food security, while farm size and other socioeconomic characteristics also influenced food-security outcomes.

Poverty level was significant at the 10% level ($\beta = 2.4640, p < .10$), indicating that farmers' economic position was associated with their choice of mixed cropping. However, because the coefficient is positive, it should not be described as showing that poverty reduces mixed cropping unless the coding of the poverty variable confirms that higher values represent lower poverty. Poverty may influence diversification through farmers' capacity to acquire seeds, labour and other resources needed to operate more than one crop enterprise. At the same time, resource-constrained households may diversify as a risk-management strategy.

This complex relationship is consistent with recent Nigerian evidence showing significant interrelationships among poverty, agricultural cooperative participation, education, household characteristics and productive resources (Kehinde et al., 2025).

Marital status was positively and significantly associated with mixed cropping ($\beta = 4.0302$, $p < .05$). This finding suggests that household social structure is associated with farmers' production decisions. Married farmers may have different household responsibilities, labour arrangements and livelihood objectives from unmarried farmers, which could influence their preference for diversified production. Mixed cropping may be particularly attractive where households seek to produce different food crops while simultaneously generating marketable output. Recent Nigerian studies have similarly incorporated marital status as an important socioeconomic characteristic influencing farmers' agricultural technology and management decisions (Abdulquadri et al., 2024). Nevertheless, the precise interpretation of the positive coefficient depends on how marital status was coded in the regression model.

Educational level also had a positive and statistically significant coefficient ($\beta = 5.4292$, $p < .05$), indicating that education was associated with a greater relative likelihood of choosing mixed cropping. Education can improve farmers' ability to obtain, understand, and apply information on crop combinations, input requirements, planting schedules, market opportunities, and risk-management practices. Educated farmers may therefore be better positioned to evaluate the benefits and management requirements associated with diversification. This interpretation agrees with Eze et al. (2024), who identified education as an important determinant of the adoption of climate-smart agricultural practices among Nigerian crop farmers.

Household size had a negative and statistically significant coefficient ($\beta = -2.2872$, $p < .05$). Thus, increasing household size was associated with a lower relative likelihood of adopting mixed cropping rather than maintaining an unchanged strategy, holding other factors constant. Although larger households can potentially provide family labour for labour-intensive agricultural activities, they also have greater consumption requirements and may face increased pressure on household income and available productive resources. These competing effects may explain why household size does not necessarily encourage diversification. Recent evidence from Nigerian farming households shows that household size can significantly shape both agricultural decisions and food-security outcomes. Eze et al. (2024), identified household size as an important determinant of climate-smart agricultural practice adoption, while Abdullah et al. (2023) found household size to be negatively associated with food security among some Nigerian farming households.

Farm size had a positive and highly significant coefficient ($\beta = 3.5113$, $p < .01$), showing that access to more farmland was strongly associated with adopting mixed cropping.

Farmers with larger farms have greater flexibility to allocate land among different crops and are consequently better positioned to diversify production without necessarily abandoning their principal crop enterprise. Adegbite et al. (2024) similarly found farm size to be an important factor associated with crop diversification and food security among farming households in Nigeria. Evidence from Nigerian rural farming households also indicates that farm size significantly influences food-security outcomes and the adoption of diversified climate-smart practices (Adepoju et al., 2024). This suggests that land availability remains an important productive resource for farmers seeking to spread production and market risks through mixed cropping.

Farming experience was positive and highly significant ($\beta = 0.6855$, $p < .01$). This implies that more experienced farmers had a greater relative likelihood of adopting mixed cropping compared with maintaining an unchanged strategy. Farming experience provides accumulated knowledge about crop compatibility, seasonal conditions, soil characteristics, pest and disease management, input requirements and market behaviour. Experienced farmers may therefore be better able to assess the potential benefits and risks of combining different crops. Adegbite et al. (2024) similarly reported that farming experience significantly influenced crop diversification among cocoa-producing households in Nigeria. Eze et al. (2024) also identified farming experience as an important determinant of climate-smart agricultural practice adoption.

Cooperative membership had a positive and statistically significant relationship with mixed cropping ($\beta = 4.5697$, $p < .05$). Such institutional networks can reduce information constraints and encourage farmers to consider diversified production strategies. Eze et al. (2024) found that cooperative membership significantly increased the probability of adopting climate-smart agricultural practices among crop farmers in South-East Nigeria.

Determinants of the Use of Credit as a Coping Strategy

The multinomial logistic regression results showed that food-security status, poverty level, marital status, educational level, household size, farm size, farming experience, and cooperative membership significantly influenced fluted pumpkin farmers' use of credit as a coping strategy relative to maintaining an unchanged production strategy. These findings indicate that credit use among the farmers was associated with household welfare conditions, socioeconomic characteristics, productive resources and institutional participation.

Food-security status had a positive and statistically significant coefficient ($\beta = 4.7708$, $p < .05$), with a marginal effect of 0.1537. This indicates that food-security status was significantly associated with farmers' choice of credit as a coping strategy. Subject to the coding of the food-security variable, the positive coefficient indicates that movement toward the category assigned the higher numerical value increased the relative likelihood of using credit rather than maintaining an unchanged strategy.

The relationship between food security and credit is important because access to financial resources can help farm households overcome liquidity constraints, purchase production inputs, and protect household consumption when financial pressure increases. Recent Nigerian evidence supports a strong relationship between agricultural credit and household food security. Adegbite et al. (2024) found that access to credit significantly influenced food security among cocoa-producing households in Nigeria. More recent evidence also indicates that microcredit access can significantly improve food security among Nigerian smallholder farming households (Kehinde et al., 2026). Therefore, the present finding reinforces the close association between farmers' financial decisions and their household food-security conditions.

Poverty level was positive and significant ($\beta = 4.7428$, $p < .05$), although its reported marginal effect was negative (-0.095). The significance of poverty level suggests that farmers' economic circumstances were important in determining their choice of credit. Poorer farmers may face greater liquidity constraints because rising production expenditure competes with household consumption and other essential needs. Credit may therefore become an important mechanism for financing inputs and maintaining production when farmers lack sufficient internally generated funds. However, poverty can also restrict access to formal credit because poor farmers often have fewer assets and limited capacity to meet collateral or repayment requirements. Kehinde et al. (2025) demonstrated a significant relationship between poverty status and institutional characteristics among Nigerian smallholder farmers and further identified access to credit as an important factor associated with poverty outcomes.

Marital status had a positive and statistically significant coefficient ($\beta = 4.5579$, $p < .05$), with a marginal effect of 0.1025. This finding indicates that household social structure was associated with the decision to use credit. Married farmers may have greater household responsibilities, including spending on food, education, healthcare, and other family needs, while also financing agricultural production. Such responsibilities can increase demand for external financing when farm income is insufficient to cover both production and household expenditure. Recent Nigerian evidence confirms that marital status can affect agricultural credit constraints. A recent study of farming households found that marital status significantly influenced farmers' quantity-credit-constraint status and suggested that the greater financial demands associated with married households can affect their credit position (Kehinde et al., 2025). Nevertheless, the exact interpretation of the positive coefficient in the present study depends on how marital status was coded.

Educational level was positively associated with credit use ($\beta = 3.9136$, $p < .10$), with a marginal effect of 0.0749. Although significant only at the 10% level, the result suggests that education may enhance farmers' ability to identify available credit sources, understand lending requirements, complete application procedures and evaluate the costs and benefits of borrowing.

Better-educated farmers may also possess greater financial literacy and record-keeping ability, thereby increasing their capacity to interact with formal or semi-formal financial institutions. Recent Nigerian evidence supports this interpretation. Kehinde et al. (2026) found educational attainment to be an important determinant of smallholder farmers' access to microcredit. Similarly, Kehinde et al. (2025) identified years of education as a factor significantly associated with farmers' cooperative participation and poverty status. Thus, education may improve farmers' ability to navigate agricultural financial services, although the relatively weaker significance level observed in the present study warrants cautious interpretation.

Household size was highly significant but had a negative coefficient ($\beta = -2.6116$, $p < .01$) and a marginal effect of -0.0536 . This indicates that larger household size was associated with a lower relative likelihood of using credit rather than maintaining an unchanged strategy, holding other variables constant. Larger households generally face higher consumption expenditure, which can reduce the income available for farm investment and potentially weaken repayment capacity. Although large households may supply family labour, their greater dependency and consumption burden can make additional debt less attractive or more difficult to obtain. Recent evidence from Nigerian smallholder households similarly shows that household size can negatively affect both access to microcredit and the amount received (Kehinde et al., 2026). Another recent Nigerian study found household size among the socioeconomic factors significantly influencing the credit-constraint status of farming households (Kehinde et al., 2025). The negative relationship found in the present study therefore suggests that household financial obligations may constrain farmers' capacity or willingness to rely on borrowing.

Farm size had a positive and highly significant coefficient ($\beta = 2.5673$, $p < .01$), with a marginal effect of 0.0162 . This indicates that farmers operating larger farms had a greater relative likelihood of using credit. Larger farms normally require greater expenditure on seed, fertilizer, agrochemicals, hired labour and other production inputs, potentially creating greater demand for external financing. At the same time, farm size may signal productive capacity and expected income to lenders, thereby improving creditworthiness. Adegbite et al. (2024) found significant relationships among farm size, credit access and food security among Nigerian farming households. More recent evidence from Nigeria also identifies farm size as a positive and significant determinant of both the probability of accessing microcredit and the amount of credit obtained (Kehinde et al., 2026). The present result therefore suggests that the scale of agricultural operation is an important consideration in farmers' credit decisions.

Farming experience had a positive and highly significant coefficient ($\beta = 0.4275$, $p < .01$), although its reported marginal effect was -0.0051 . The significance of farming experience demonstrates that accumulated agricultural knowledge was associated with farmers' credit decisions.

Experienced farmers may possess better knowledge of seasonal production requirements, expected returns, agricultural risks and appropriate periods for obtaining and repaying production loans. They may also have longer-standing relationships with cooperatives, input suppliers, and informal lenders. Adegbite et al. (2024) found farming experience to be significantly associated with crop diversification and household food-security outcomes among Nigerian cocoa farmers. Kehinde et al. (2025) likewise identified farming experience as an important factor associated with cooperative participation among smallholder farmers.

Finally, cooperative membership had a positive and statistically significant coefficient ($\beta = 4.0283, p < .05$), although the reported marginal effect was negative (-0.0977). Cooperative organizations can facilitate farmers' access to credit by reducing information barriers, connecting members with financial institutions, supporting group lending arrangements and sometimes providing loans directly to members. Cooperatives can also improve members' financial credibility through collective guarantees and established repayment mechanisms. Recent evidence strongly supports this institutional role. Kehinde et al. (2026) found that cooperative membership significantly increased smallholder farmers' access to microcredit in Nigeria. Similarly, Kehinde et al. (2025) established significant relationships among cooperative membership, access to credit and the poverty status of Nigerian smallholder farming households. The result therefore confirms the relevance of farmers' organizations to agricultural financing decisions.

Table 5: Results of Multinomial Logistics Regression of Ugwu Farmers' Response

Predictors	Input Reduction			Mixed Cropping			Access to Credit		
	Marginal Effect	Coeff.	Std. Error	Marginal Effect	Coeff.	Std. Error	Marginal Effect	Coeff.	Std. Error
Food security	0.0162	-1.200**	0.5140	0.1365	1.0566***	0.1099	0.1537	4.7708**	1.2480
Poverty level	-0.0272	3.6718**	1.4752	0.1220	2.4640*	1.290	-0.095	4.7428**	1.4363
Sex	-1.6315	-1.6314	2.6487	0.2906	2.5448	2.1719	-0.1017	1.6331	2.2495
Age	0.00104	-0.1181	0.0891	-0.0071	-0.1483	0.0792	0.0060	-0.1077	0.0884
Marital status	0.1057	1.9031**	0.5441	0.0033	4.0302**	1.9469	0.1025	4.5579**	2.2048
Educational level	-0.02124	0.8759	1.31891	0.0962	5.4292**	1.1776	0.0749	3.9136**	1.2837
Household size	0.01886	1.0456**	0.4967	0.0348	-2.287**	0.4654	-0.0536	-2.61***	0.50281
Farm size	-0.0375	0.2690	0.5809	0.0213	3.5113***	0.4425	0.0162	2.5673***	0.4521
Farming experience	-0.0024	0.0106	0.1105	0.0075	0.6866***	0.1035	-0.0051	0.4275***	0.117
Cooperative membership	0.07188	3.9791*	2.0054	0.259	4.5697**	1.8193	-0.0977	4.0283**	1.9033
Pseudo R2= 0.3455; Pros >chi2= 0.000; LR chi2(33)= 82.01									

NOTE: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

CONCLUSION

The study shows that fluted pumpkin farmers in Ogun State faced substantial welfare constraints: 82.5% were classified as poor and 84.6% experienced mild or moderate food insecurity. Farmers responded to high production costs mainly through mixed cropping, followed by credit use, no change in strategy, and input reduction. The multinomial logit results further show that poverty and food-security status, together with selected household, farm, education, experience, and cooperative variables, were significantly associated with coping-strategy choice. The findings should not be interpreted as evidence that rising input prices caused food insecurity, because input prices were not included as an explanatory variable in the multinomial model. Rather, the analysis establishes associations between farmers' existing welfare characteristics and the coping strategies they selected amid high production costs.

Based on these findings, the following recommendations and suggestions for further studies are made:

1. Agricultural support programmes should target poor and food-insecure vegetable farmers by providing affordable, timely access to essential inputs.
2. Extension services should provide practical guidance on mixed cropping and other cost-management practices that protect productivity rather than encouraging indiscriminate input reduction.
3. Credit interventions should be designed around the characteristics associated with credit use in the model, while cooperatives should be strengthened as channels for input purchase, information, savings, and appropriately structured finance.
4. Farmer training should also account for differences in education, farm size, household size, and farming experience so that recommendations are feasible for different categories of producers.
5. Future research should use panel or repeated-cost data to identify the causal effects of input-price changes on farm income, food security, and coping behaviour.
6. Robustness testing of the multinomial logit specification, including the IIA assumption, should also be reported alongside the final model estimates.

REFERENCES

- Adebayo, O. A., Olagunju, K. O., & Ogundipe, A. A. (2022). Adoption of multiple sustainable land management practices and its effects on productivity of smallholder maize farmers in Nigeria. *Smart Agricultural Technology*, 2, 100048.
- Afodu, O. J., Afolami, C. A., Akinboye, O. E., Ndubuisi-Ogbonna, L. C., Ayodeji, A. T., Shobo, B. A., & Ogunnnowo, M. D. (2019). Livelihood diversification and its determinants on rice farming households in Ogun State, Nigeria. *African Journal of Agricultural Research*, 14(35), 2104–2111.
- Afodu, O. J., Balogun, O. L., Afolami, C. A., Akinboye, O. E., Akintunde, A. O., Shobo, B. A., Ayo-Bello, T. A., Ndubuisi-Ogbonna, L. C., & Adefelu, A. O. (2022). Influence of poultry farmers' coping strategies of high cost of feed on food security status in South-West Nigeria. *Badeggi Journal of Agricultural Research and Environment*, 4(3), 43–51.
- Afodu, O. J., Balogun, O. L., Afolami, C. A., Akinboye, O. E., Akintunde, A. O., Shobo, B. A., Adewumi, A. G., Ayo-Bello, T. A., Ndubuisi-Ogbonna, L. C., Oyewumi, S. O., & Adefelu, A. O. (2024). Effect of poverty level and food insecurity status on poultry farmers' response to high feed costs in South-West Nigeria. *African Journal of Food, Agriculture, Nutrition and Development*, 24(4), 26182–26200. <https://doi.org/10.18697/ajfand.128.23695>
- Akanni-John, R., Shaib-Rahim, H., Eniola, O., & Elesho, R. (2020). Economic analysis of fluted pumpkin (*Telfairia occidentalis*) production in Ibadan Metropolis, Oyo State, Nigeria. *International Journal of Environmental & Agriculture Research*, 6, 9–14.
- Akinola, A., Kehinde, A., Tijani, A., Ayanwale, A., Adesiyan, O., Tanimonure, V., ... & Ojo, T. (2023). Impact of membership in agricultural cooperatives on yield of smallholder tomato farmers in Nigeria. *Environmental and Sustainability Indicators*, 20, 100313.
- Coates, J., Swindale, A., & Bilinsky, P. (2007). Household Food Insecurity Access Scale (HFIAS) for measurement of food access: Indicator guide (Version 3). Food and Nutrition Technical Assistance Project, Academy for Educational Development.
- Danso-Abbeam, G., Asale, M. A., & Ogundeji, A. A. (2023). Determinants of household food insecurity and coping strategies in Northern Ghana. *GeoJournal*, 88, 2307–2324. <https://doi.org/10.1007/s10708-022-10742-0>
- Edokpolor, J. E. (2017). Nutritional and economic potentials of fluted pumpkin (*Telfairia occidentalis*) in Nigeria. *Journal of Agricultural Science*, 9(3), 123–134.
- Eze, C. C., et al. (2024). Climate smart agriculture practices by crop farmers: Evidence from South East Nigeria. *Environmental and Sustainability Indicators*.
- Kapari, M., Hlophe-Ginindza, S., Nhamo, L., & Mpandeli, S. (2023). Contribution of smallholder farmers to food security and opportunities for resilient farming systems. *Frontiers in Sustainable Food Systems*, 7, 1149854. <https://doi.org/10.3389/fsufs.2023.1149854>
- Kehinde, A. D., Oyenpemi, L. O., & Oladimeji, O. O. (2025). Leveraging agricultural cooperative membership to improve the technical efficiency of smallholder cocoa farmers in Nigeria. *Social Sciences & Humanities Open*, 12, 102068.

- Kehinde, A. D. (2026). Unlocking food security through microcredit access among smallholder farming households in Nigeria. *Food and Humanity*, 101227.
- Long, J. S., & Freese, J. (2006). Regression models for categorical dependent variables using Stata (2nd ed.). Stata Press.
- National Bureau of Statistics. (2022). Nigeria multidimensional poverty index 2022.
- Obayelu, O. A., & Awoyemi, T. T. (2010). Spatial dimension of poverty in rural Nigeria. *Journal of Development and Agricultural Economics*, 2(6), 231–244.
- United Nations. (2015). Transforming our world: The 2030 agenda for sustainable development.

APPENDIX A: FOOD-SECURITY AND POVERTY CLASSIFICATION SUMMARY

The appendix reports the classification rules and aggregate distributions available from the manuscript. Respondent-level HFIAS item scores were not included in the submitted manuscript file and therefore cannot be reconstructed here.

HFIAS classification: Food secure (0–1): 37 respondents (15.4%); Mildly food insecure (2–10): 158 (65.8%); Moderately food insecure (11–20): 45 (18.8%); Severely food insecure (21–27): 0 (0.0%). Total = 240.

Poverty classification: Poor (PCHE < two-thirds of MPCHHE): 198 respondents (82.5%); Non-poor (PCHE ≥ two-thirds of MPCHHE): 42 (17.5%). Total = 240. The estimated sample poverty line was ₦26,500 per person per month.