



Factors Associated with Food Security and Factors Responsible for Food Insecurity among Farming Households in Tarka Local Government Area, Benue State, Nigeria

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Abstract

Food insecurity remains a major socioeconomic and agricultural challenge in Nigeria, particularly among rural farming households whose livelihoods depend heavily on smallholder agriculture. This study examined the socioeconomic characteristics of farming households, livelihood activities, household food expenditure, perceived changes in food conditions, factors responsible for food insecurity, and strategies for achieving sustainable food security in Tarka Local Government Area of Benue State, Nigeria. Data were obtained through a structured questionnaire administered to 700 farming households across ten political wards, with 500 completed questionnaires retrieved and analyzed using frequency counts, percentages, and chi-square statistics. The results indicate that males constituted 62.0% of respondents, while females accounted for 38.0%. Regarding educational attainment, 18.0% had no formal education, 40.0% had primary education, 20.0% had secondary education, and 22.0% possessed tertiary qualifications. Farming was the dominant primary occupation (52.0%), while 72.0% cultivated 0.30 ha or less. A substantial 76.0% of respondents had no access to credit, while 70.0% of those reporting credit sources relied on local informal arrangements. Crop production constituted the most common livelihood activity (40.0%). Furthermore, 53.0% of respondents spent ₦10,000–₦20,000 monthly on food, while 80.0% perceived their food situation as worse than previously. Lack of education and skills (86.7%), poverty (85.3%), high food prices (77.4%), lack of consistent food supply (68.6%), poor health services (66.7%), poor rural infrastructure (66.6%), inadequate post-harvest technologies (66.0%), and weak support services (65.3%) were identified as major contributors to food insecurity. All respondents supported farmer cooperation, infrastructure development, crop diversification, mechanization, and agricultural biotechnology as strategies for improving food security. The chi-square result ($\chi^2 = 108.01$; $df = 9$; $p < 0.05$) indicates a statistically significant departure from the expected distribution, suggesting associations between the examined factors and food security outcomes. The study concludes that food insecurity in Tarka LGA is multidimensional and requires integrated interventions involving agricultural education, affordable finance, rural infrastructure, post-harvest management, livelihood diversification, appropriate mechanization, and improved food-market access.

Keywords: Food security; food insecurity; farming households; smallholders; food prices; agricultural credit; Tarka LGA; Benue State; Nigeria

1. Introduction

Food security remains one of the most important development challenges confronting developing countries. The Food and Agriculture Organization (FAO) and its United Nations partners conceptualize food security in terms of people's consistent physical and economic access to sufficient, safe, and nutritious food. Contemporary food-security thinking extends beyond food availability to include access, utilization, and stability, with household resilience increasingly important in the face of economic, climatic, and social shocks (FAO et al., 2025). Nigeria illustrates this challenge particularly clearly. Despite its substantial agricultural resources and large rural farming population, the country continues to experience widespread food insecurity. The November 2025 Cadre Harmonisé assessment estimated that approximately 27.2 million Nigerians were already facing hunger and projected that the number could rise to 34.7 million during the June–August 2026 lean season without adequate intervention (FAO, 2025a). The World Food Programme likewise reports that nearly 35 million Nigerians are projected to experience acute or severe food insecurity during the 2026 lean season, with conflict, climate shocks, displacement, and disruption of local food systems identified among the principal drivers (WFP, 2026a). These assessments are consistent with findings that climate-related shocks and policy-induced price distortions have contributed to substantial losses in productive capital among Nigerian farmers (PeacePro, 2026).

The problem is especially important for farming households because agricultural production is simultaneously a source of food, employment, and income. Where farmers have inadequate access to credit, productive inputs, extension services, markets, infrastructure, and improved technologies, agricultural production may be insufficient to meet household food requirements or generate adequate income. Recent empirical evidence supports the importance of agricultural finance. A 2024 study of smallholder farming households in Nigeria found that only 16.7% of sampled households were marginally food secure, while 83.3% experienced low or very low food security. The study further found that microcredit access significantly improved household food security and that cooperative membership increased access to credit (Adesiyani & Kehinde, 2024). This is reinforced by a 2025 IFPRI analysis which confirmed that access to credit is critical for improving smallholder performance, yet formal credit access remains severely limited in rural Nigeria, forcing farmers to depend on informal sources (Ambler et al., 2025). Similarly, a 2025 study on rice farmers in northwestern Nigeria found that participation in agricultural trade credit significantly increased credit access, yield, and income (Muhammad Bichi et al., 2025).

Crop diversification is also increasingly recognized as a potential mechanism for improving household food security. Adesiyani and Kehinde (2024), studying cocoa-producing households in Nigeria, found that crop diversification, formal education, access to credit, farm size, land use, and farming experience significantly influenced household food security. Their study concluded that access to credit, land use, and crop diversification were positively related to food security (Adesiyani & Kehinde, 2024). More recent research on maize-based farmers in Kwara State confirmed that crop diversification had a positive and significant influence on food security status at the 1% level, with the majority of respondents perceiving strong effects on access to sufficient, utilizable, and digestible food (Olatinwo et al., 2024). Research on climate-smart agricultural practices further supports this, showing that crop diversification and agroforestry significantly reduce the probability of food insecurity among rural farming households in Nigeria (Omotoso & Omotayo, 2024). Infrastructure constitutes another important component of food-system resilience. The World Bank's Rural Access Agricultural Marketing Project–Scale Up recognizes that rural roads connect agricultural production areas to markets and can improve agricultural trade, farm-gate prices, household incomes, and the movement of food while reducing harvest losses (World Bank, 2024). By May 2026, the project had completed approximately 1,500 kilometres of rural roads, benefiting over 11.5 million rural Nigerians, with efforts ongoing to deliver an additional 2,500 kilometres (NAN, 2026). The ILO has also recognized the project's integrated approach, combining infrastructure delivery with institutional strengthening and socio-economic inclusion to create decent jobs and more resilient rural communities (ILO, 2026). Tarka Local Government Area is situated within Benue State, an important agricultural region of Nigeria. Agriculture constitutes a major livelihood activity in the area, yet farming households face constraints associated with access to finance, rural infrastructure, agricultural technology, extension services, storage facilities, and changing food prices. The present study therefore examined the factors associated with food security and the factors responsible for food insecurity among farming households in Tarka LGA.

2. Objectives of the Study

The study specifically sought to:

1. Examine the socioeconomic characteristics of farming households in Tarka LGA;
2. Identify livelihood activities associated with household food security;
3. Assess household monthly food expenditure;
4. Examine respondents' perception of changes in their food situation;
5. Identify factors responsible for food insecurity; and

6. Identify strategies for improving sustainable food security in the study area.

3. Methodology

3.1 Study Area

The study was conducted in Tarka Local Government Area of Benue State, Nigeria. Tarka was created in 1996 and comprises ten political wards: Maki, Tse-Agberagba, Tse-Akena, Tse-Azege, Tse-Doo, Tse-Gaadi, Tse-Gbagir, Tse-Jato, Tse-Kpem, and Tse-Torkula. Agriculture constitutes an important livelihood activity, with households involved in crop production and livestock keeping under predominantly smallholder production systems. Major crops grown include yam, cassava, maize, rice, sorghum, and groundnuts.

3.2 Population and Sampling

The study targeted farming households across the ten political wards of Tarka Local Government Area, Benue State, Nigeria. The sampling frame comprised all farming households in the ten wards. A multi-stage sampling procedure was adopted:

Stage 1: All ten political wards were purposively selected to ensure comprehensive geographical coverage of the study area.

Stage 2: From each ward, 70 farming households were randomly selected using a stratified random sampling technique, giving a total of 700 households. The sample size was determined considering the population of farming households in the area and resource constraints.

Following questionnaire administration and retrieval, 500 completed questionnaires were successfully retrieved and found suitable for analysis, representing a response rate of approximately 71.4% of the questionnaires administered. These 500 validly retrieved questionnaires constituted the sample size for the study. The sample was considered adequate for examining the socioeconomic characteristics, livelihood activities, food expenditure patterns, perceived changes in household food conditions, factors contributing to food insecurity, and strategies for improving sustainable food security among farming households in the study area.

3.3 Data Collection

Primary data were collected using structured questionnaires, personal interviews, and field observations. The questionnaire covered socioeconomic characteristics, livelihood activities, food expenditure, food insecurity factors, and strategies for improving food security. Secondary information was obtained from agricultural offices, cooperative societies, journals, reports, and other relevant publications.

3.4 Data Analysis

Descriptive statistics comprising frequency counts and percentages were used to summarize the characteristics and responses of respondents. The chi-square test was used to test the hypothesis of no significant association between the examined factors and food security outcomes at the 5% level of significance. Limitations: The study relied on self-reported data, which may be subject to recall bias. Additionally, the cross-sectional design captures food security status at a single point in time rather than tracking changes over seasons.

4. Results and Discussion

4.1 Socioeconomic Characteristics of Respondents

The results presented in **Table 4.1** show that 62.0% of respondents were male and 38.0% were female. The predominance of male respondents suggests that agricultural production and related household economic activities remain substantially male-oriented in the study population. However, the 38.0% female representation demonstrates that women are also significant participants in the local food system. This finding is consistent with studies across rural Nigeria that report male dominance in agricultural household surveys, though the degree of female participation varies by region (Obi-Egbedi & Ifoga, 2024).

The result should not be interpreted as implying that women have little importance in agricultural food production. Rather, gender differences in access to productive resources may influence who is identified as the principal farmer or household respondent. This is important because food-security interventions that focus only on male farmers may overlook women who contribute substantially to food production, processing, marketing, and household nutrition. Educational attainment was relatively low. Eighteen percent of respondents had no formal education, 40.0% had a First School Leaving Certificate, and 20.0% had O' Level education. Only 22.0% possessed NCE/OND or higher qualifications. This distribution is consistent with the national trend in rural Nigeria, where educational attainment remains lower than in urban areas.

This finding has important implications for food security because education can improve farmers' capacity to access, interpret, and apply agricultural information. It may also influence their ability to access formal finance, maintain records, evaluate technologies, and participate in agricultural markets. This interpretation is supported by Adesiyen and Kehinde (2024), who found that formal education significantly influenced food-security outcomes among Nigerian cocoa-producing households. The educational result is also consistent with the respondents' ranking of lack of education and skills as the most serious factor responsible for food insecurity, with 86.7% assigning it the highest level of effect (Table 4.5). The convergence between the two results strengthens the interpretation that human-capital limitations may constrain household food-security outcomes in the study area. Household size was also relatively large. Sixty-two percent of respondents belonged to households of 6–10 persons, and another 14.0% had more than ten persons. Thus, 76.0% belonged to households with six or more members. This is comparable to findings in other rural Nigerian agricultural communities where extended family structures remain common.

Large household size can increase food requirements and household expenditure. However, its effect on food security is not necessarily uniformly negative because larger households may also provide additional family labour for agricultural production. The relationship therefore depends on the balance between household consumption requirements and productive capacity. Recent Nigerian evidence demonstrates that household characteristics, education, farm size, and access to productive resources interact in determining food-security outcomes rather than operating independently (Obi-Egbedi & Ifoga, 2024). Farming was the dominant primary occupation, accounting for 52.0%, followed by trading (24.0%), civil/public employment (18.0%), and artisan activities (6.0%). The dominance of farming confirms the importance of agriculture as a livelihood strategy. Nevertheless, the presence of non-farm activities indicates that households diversify their economic activities to generate cash income. Farm sizes were generally small: 32.0% cultivated 0.00–0.10 ha, 24.0% cultivated 0.11–0.20 ha, and 16.0% cultivated 0.21–0.30 ha. Therefore, 72.0% cultivated not more than 0.30 ha. Such small holdings can restrict total output and make individual ownership of large agricultural machinery economically difficult. This finding is consistent with the national profile of Nigerian agriculture, where the majority of farmers are smallholders cultivating less than 2 hectares. The finding is particularly relevant to mechanization policy. Nigeria's recent agricultural initiatives increasingly emphasize mechanization, but mechanization programmes need to be adapted to smallholder conditions. A 2025 study by Olusola argues that sustainable agricultural machinery can improve productivity and reduce drudgery and post-harvest losses, but technologies need to be appropriate to smallholder production systems (Olusola, 2025).

The farming-experience distribution indicates considerable accumulated agricultural knowledge, with 37.0% reporting more than 20 years of farming experience. However, extensive experience does not automatically translate into food security. Experience can be constrained by inadequate access to improved technologies, finance, extension services, and markets. Income levels were low. Forty percent earned ₦100,000–₦150,000 annually and 30.0% earned ₦160,000–₦200,000, while only 6.0% earned more than ₦300,000. The low income profile is consistent with the high proportion of respondents identifying poverty as a major contributor to food insecurity. Only 24.0% of respondents had access to credit, compared with 76.0% who had no access. This finding represents an important structural vulnerability because farmers require finance to purchase improved seeds, fertilizer, agrochemicals, labour, and machinery. The finding is strongly supported by recent Nigerian empirical evidence. A 2026 study by Ayodeji (2026) showed that microcredit access significantly improves food security among smallholder farming households in Nigeria, while cooperative membership can improve farmers' access to credit. Adesiyen and Kehinde (2024) likewise found that access to credit was significantly associated with crop diversification and household food security among Nigerian cocoa-producing households. The present result therefore suggests that expanding affordable agricultural finance could improve both production capacity and household food access in Tarka LGA.

An important feature of the results is that no respondent reported a bank as a source of credit. Seventy percent identified local informal lenders (BAM), while cooperative societies, relatives, and friends accounted for 10.0% each. This dependence on informal financing may reflect difficulties associated with formal financial institutions,

including collateral requirements, transaction costs, and limited accessibility. The 2026 Nigerian microcredit study provides additional support for the importance of cooperatives as a mechanism for improving smallholder access to financial resources (Ayodeji, 2026). This aligns with the Central Bank of Nigeria's 2025 revamp of the Agricultural Credit Guarantee Scheme Fund, which aims to unlock affordable credit for smallholders who account for 90% of the nation's agricultural output but remain underserved due to limited collateral and poor credit history (CBN, 2025).

Table 4.1: Distribution of Respondents According to Socio-Economic Characteristics

Socio-Economic Characteristics	Frequency	Percentage (%)
Gender		
Male	310	62.0
Female	190	38.0
Total	500	100
Educational Background		
No education	90	18.0
First School Certificate	200	40.0
O' Level Certificate	100	20.0
NCE/OND	60	12.0
First Degree/HND	30	6.0
Postgraduate	20	4.0
Household Size		
1 – 5	120	24.0
6 – 10	310	62.0
Above 10	70	14.0
Primary Occupation		
Farming	260	52.0
Trading	120	24.0
Civil/Public service	90	18.0
Artisan	30	6.0
Farm Size (Hectares)		
0.00 – 0.10	160	32.0
0.11 – 0.20	120	24.0
0.21 – 0.30	80	16.0
0.31 – 0.40	70	14.0
0.41 – 0.50	50	10.0
Above 0.50	20	4.0
Farming Experience (Years)		
1 – 5	120	24.0
6 – 10	100	20.0
11 – 15	65	13.0
16 – 20	30	6.0
Above 20	185	37.0
Annual Income (Naira)		
100,000 – 150,000	200	40.0
160,000 – 200,000	150	30.0
210,000 – 250,000	60	12.0
260,000 – 300,000	60	12.0
Above 300,000	30	6.0

Socio-Economic Characteristics	Frequency	Percentage (%)
Access to Credit		
Yes	120	24.0
No	380	76.0
Sources of Credit		
Local BAM	350	70.0
Cooperative Society	50	10.0
Bank	—	—
Relatives	50	10.0
Friends	50	10.0
Annual Financial Support from Friends and Relatives (Naira)		
10,000 – 20,000	150	30.0
20,000 – 30,000	200	40.0
30,000 – 40,000	98	19.6
50,000 – 60,000	42	8.4
Above 60,000	10	2.0

Source: Field survey, 2026

4.2 Livelihood Activities

Table 4.2 presents the distribution of respondents according to livelihood activities. Crop production constituted the largest livelihood activity at 40.0%, followed by livestock keeping and labour provision at 18.0% each. Petty trading, firewood selling, and food vending each accounted for 8.0%. The result indicates that agriculture remains the principal livelihood foundation, but it also reveals considerable livelihood diversification. This is potentially important for resilience because households with multiple income sources may have alternative means of obtaining food when crop production is affected by climate shocks, market fluctuations, or insecurity. This result is consistent with Adesiyen and Kehinde (2024), who found that crop diversification and access to credit were associated with improved food-security outcomes among Nigerian farming households. However, diversification should not be interpreted as automatically guaranteeing food security. Some livelihood activities, such as selling firewood, may generate income while simultaneously contributing to environmental degradation if not sustainably managed. Therefore, livelihood diversification should be encouraged alongside environmentally sustainable practices.

Table 4.2: Distribution of Respondents According to Livelihood Activities

Livelihood Activities	Frequency	Percentage (%)
Crop production	200	40.0
Livestock keeping	90	18.0
Petty trading	40	8.0
Providing labour	90	18.0
Selling firewood	40	8.0
Food vendor	40	8.0

Source: Field survey, 2026

4.3 Monthly Food Expenditure

Table 4.3 shows that more than half of the respondents (53.0%) reported monthly food expenditure of ₦10,000–₦20,000. Only 11.0% spent ₦20,000–₦30,000, 6.0% spent ₦30,000–₦40,000, 15.0% spent ₦40,000–₦50,000, and 15.0% spent above ₦50,000. The low expenditure recorded by the majority should not automatically be interpreted as evidence of adequate food access. In low-income households, low food expenditure may instead reflect constrained purchasing power. This is particularly relevant in Nigeria because recent food-security

assessments continue to identify high food prices and economic hardship as major drivers of food insecurity. FAO's 2025 assessment reported that food-price inflation has weakened purchasing power and reduced the affordability of healthy diets, particularly among economically vulnerable populations (FAO, 2025b). Research by Mamboundou et al. (2025) further confirms that global price shocks have significant negative impacts on welfare and food security in Nigeria, emphasizing the importance of mitigation policies. The Nigerian food-security situation is consistent with this broader relationship between food prices and household food access.

Table 4.3: Distribution of Respondents According to Monthly Food Expenditure

Monthly Food Expenditure (Naira)	Frequency	Percentage (%)
10,000 – 20,000	265	53.0
20,000 – 30,000	55	11.0
30,000 – 40,000	30	6.0
40,000 – 50,000	75	15.0
Above 50,000	75	15.0
Total	500	100

Source: Field survey, 2026

4.4 Perceived Changes in Food Situation

Table 4.4 reveals a strikingly negative perception of food conditions. Thirty percent of respondents reported that the situation was "much worse," while 50.0% reported that it was "a little worse." Therefore, 80.0% perceived the food situation as worse. Only 10.0% considered it better. This finding is strongly supported by current national evidence. FAO's November 2025 Cadre Harmonisé assessment estimated that 27.2 million Nigerians were already facing hunger and projected 34.7 million to face acute food insecurity during the 2026 lean season without timely interventions (FAO, 2025a). WFP's current Nigeria assessment similarly places the number of Nigerians facing acute food insecurity at approximately 35 million for the 2026 lean season (WFP, 2026a). The respondents' perception therefore corresponds with the direction of national food-security evidence and suggests that deteriorating food access is also being experienced at the local household level.

Table 4.4: Distribution of Respondents According to Perception of Current Food Situation

Food Situation	Frequency	Percentage (%)
Much worse now	150	30.0
A little worse now	250	50.0
Same	50	10.0
A little better now	30	6.0
Much better now	20	4.0
Total	500	100

Source: Field survey, 2026

4.5 Factors Responsible for Food Insecurity

Table 4.5 presents respondents' ranking of factors responsible for food insecurity. Lack of education and skills was ranked highest, with 86.7% of respondents identifying it as having the highest effect. Poverty followed closely at 85.3%. High food prices were ranked highest by 77.4%, while lack of consistent food supply (68.6%), poor health services (66.7%), poor rural infrastructure (66.6%), poor post-harvest technologies (66.0%), and weak support services (65.3%) were also rated highly. The ranking of poverty is consistent with current Nigerian evidence. Widespread poverty reduces households' ability to absorb food-price increases and invest in agricultural inputs. The combination of low income and high food prices is particularly damaging because households simultaneously face reduced purchasing power and increasing food expenditure. The high rating assigned to food prices is also strongly supported by FAO and WFP assessments. The 2025 Cadre Harmonisé identified economic hardship and inflation among the principal drivers of food insecurity, while WFP's current assessment identifies conflict, climate shocks, and disruption of local food systems as major drivers (FAO, 2025a; WFP, 2026b).

Mamboundou et al. (2025) also demonstrated that global price shocks significantly affect welfare and food security in Nigeria, underscoring the vulnerability of Nigerian households to international market fluctuations.

Poor rural infrastructure was identified by 66.6% as having the highest effect. This result is supported by the World Bank's RAAMP-SU, which recognizes rural roads as critical for connecting farms with markets and improving agricultural trade, farm-gate prices, and household incomes while reducing harvest losses (World Bank, 2024). The expansion of RAAMP, with over 1,500 kilometres of rural roads completed by May 2026, demonstrates the government's recognition of infrastructure as central to food security (NAN, 2026; ILO, 2026). The finding concerning poor post-harvest technologies is similarly supported by Nigerian research. Obi-Egbedi and Ifoga (2024) found that post-harvest losses reduced the probability of food security among Nigerian yam farmers and concluded that reducing post-harvest losses should be a policy priority. Barau, Adelusi, Waiwada, and Sani (2023) also concluded that improved storage and post-harvest management technologies are important for reducing food losses and strengthening food-security sustainability in Nigeria. The Foundation for Peace Professionals (PeacePro, 2026) reported that Nigerian farmers suffered estimated losses of nearly N5 trillion in productive capital over the past two years due to a combination of factors including post-harvest failures, policy-induced price distortions, and weak market stabilization, further emphasizing the critical importance of addressing post-harvest challenges.

The result concerning weak extension, research, and financial support is also important. Farmers may possess considerable practical experience, but their capacity to respond to new climatic, market, and technological conditions depends partly on access to relevant information and services. Thus, the study's finding that weak support services constitute a major constraint is consistent with the broader evidence emphasizing access to extension, finance, and technology as determinants of agricultural productivity and food security. Akpabio et al. (2025) further argue that the failure to adopt e-agriculture represents a significant barrier to food security in Nigeria, highlighting the need for digital infrastructure and technical expertise to modernize the sector.

Table 4.5: Distribution of Respondents According to Ranking of Factors Responsible for Food Insecurity

Factors	Highest Effect (%)	Higher Effect (%)	High Effect (%)	Low Effect (%)	No Effect (%)
Lack of education and skills	86.7	10.0	3.3	-	-
Poverty	85.3	8.0	6.7	-	-
Weak support services (research, extension, and finance)	65.3	34.7	-	-	-
Poor rural infrastructure (roads)	66.6	6.7	6.7	20.0	-
Lack of consistent food supply	68.6	13.3	6.7	6.7	4.7
High food prices	77.4	13.3	9.3	-	-
Poor post-harvest processing and storage technologies	66.0	34.0	-	-	-
Poor health services	66.7	33.3	-	-	-

Source: Field survey, 2026

4.6 Strategies for Sustainable Food Security

Table 4.6 shows that the study found 100% support for all five proposed strategies: farmer cooperation, infrastructure provision, crop rotation and diversification, mechanized farming, and agricultural biotechnology. The unanimous support for farmer cooperation is particularly relevant given the low level of formal credit access. Cooperatives can facilitate savings, collective procurement, group marketing, access to extension, and collective negotiation with financial institutions. Recent Nigerian evidence demonstrates that cooperative membership can improve access to agricultural credit (Ayodeji, 2026). The CBN's 2025 revamp of the Agricultural Credit Guarantee Scheme explicitly aims to leverage cooperatives to deliver innovative lending models to underserved groups (CBN, 2025). The unanimous support for infrastructure is also understandable because poor roads were among the factors most strongly associated with food insecurity in the respondents' ranking. World Bank evidence supports the potential of rural-road investments to improve market access, agricultural trade, farm-gate prices, and household incomes (World Bank, 2024). The ongoing expansion of RAAMP to additional states, supported by the Islamic Development Bank and the European Investment Bank, further validates this approach (ILO, 2026).

Crop rotation and diversification received unanimous support. This is consistent with Adesiyun and Kehinde (2024), who found that crop diversification significantly influenced food security among Nigerian cocoa-producing households. Diversification can reduce dependence on one crop, spread production risk, and increase the range of foods available to households. Olatinwo et al. (2024) provided further evidence that crop diversification practices contributed to food security by increasing access to preferred sufficient, utilizable, and digestible food among maize-based farmers in Kwara State. Omotoso and Omotayo (2024) also found that crop diversification, as a climate-smart agricultural practice, significantly reduced the probability of food insecurity among rural farming households in Nigeria. The respondents' support for mechanization is also understandable given the smallholder nature of farming. Mechanization can reduce labour constraints, improve timeliness, and increase productivity. However, because 72.0% of respondents cultivate 0.30 ha or less (Table 4.1), mechanization should preferably be promoted through cooperative ownership, machinery-hiring centres, and service providers, rather than requiring each farmer to own expensive machinery. This approach is more compatible with fragmented smallholder production and aligns with state-level agricultural transformation plans that emphasize mechanization through service delivery models (Voice of Nigeria, 2026).

Table 4.6: Distribution of Respondents According to Strategies for Ensuring Food Security and Sustainability

Strategies	Frequency	Percentage (%)
Organizing farmer cooperation	500	100
Provision of infrastructure	500	100
Crop rotation and diversification	500	100
Promotion of mechanized farming	500	100
Agricultural biotechnology	500	100

Source: Field survey, 2026

4.7 Chi-Square Test

Table 4.7 presents the results of the chi-square test examining the association between the categorized factors and food security outcomes. The study reports a calculated chi-square value of 108.01 with 9 degrees of freedom ($df = 9$), compared to the critical value of 16.92 at the 5% significance level. The study therefore rejects the null hypothesis of no significant association because $108.01 > 16.92$ ($p < 0.05$). The result indicates that the observed distribution differs significantly from the expected distribution. The largest contributions to the statistic include Category 9 HA (25.00), Category 5 HO (18.78), and Category 10 HO (18.78). This finding suggests that the examined factors are significantly associated with food security outcomes in the study area.

Table 4.7: Calculated Values of X^2

S/N	Category	E	O	(O - E)	(O - E) ²	(O - E) ² /E
1	HA	25.00	33.33	8.33	69.39	2.78
	HO	25.00	16.67	-8.33	69.39	2.78
2	HA	25.00	16.67	-8.33	69.39	2.78
	HO	25.00	26.67	1.67	2.79	0.11
3	HA	25.00	40.00	15.00	225.00	9.00
	HO	25.00	16.67	-8.33	69.39	2.78
4	HA	25.00	13.33	-11.67	136.19	5.45
	HO	25.00	30.00	5.00	25.00	1.00
5	HA	25.00	20.00	-5.00	25.00	1.00
	HO	25.00	3.33	-21.67	469.59	18.78
6	HA	25.00	36.67	11.67	136.19	5.45
	HO	25.00	20.00	-5.00	25.00	1.00
7	HA	25.00	20.00	-5.00	25.00	1.00
	HO	25.00	36.67	11.67	136.19	5.45

S/N	Category	E	O	(O - E)	(O - E) ²	(O - E) ² /E
8	HA	25.00	23.33	-1.67	2.79	0.11
	HO	25.00	30.00	5.00	25.00	1.00
9	HA	25.00	50.00	25.00	625.00	25.00
	HO	25.00	30.00	5.00	25.00	1.00
10	HA	25.00	33.33	8.33	69.39	2.78
	HO	25.00	3.33	-21.67	469.59	18.78
Total		150	500.00			X² = 108.01

Source: Field survey, 2026

Note: df = 9; Critical value at 5% = 16.92; HA = High Agreement, HO = High Opposition

5. Discussion

The results demonstrate that food insecurity among farming households in Tarka LGA is multidimensional. The combination of low educational attainment, large household sizes, small farm holdings, low income, limited credit access, and dependence on agriculture creates a high-risk livelihood environment. The findings are consistent with Nigeria's broader food-security trajectory. Current FAO evidence indicates that food insecurity remains severe nationally, with 34.7 million people projected to experience acute food insecurity during the 2026 lean season without effective intervention (FAO, 2025a). The WFP similarly estimates that nearly 35 million people will face acute or severe food insecurity during the 2026 lean season (WFP, 2026a). The study's finding that poverty and high food prices are major constraints is therefore supported by current national evidence, including research confirming the significant impacts of global price shocks on Nigerian welfare and food security (Mamboundou et al., 2025). The importance of agricultural finance is particularly clear from the findings. Seventy-six percent of respondents lacked credit, and none reported bank financing. This finding corresponds with recent Nigerian evidence showing that microcredit significantly improves household food security and that cooperative membership can improve credit access (Ayodeji, 2026). The dominance of informal credit sources (70.0% from local informal lenders) reflects the limited penetration of formal financial institutions in rural areas. This is consistent with broader financial inclusion challenges in rural Nigeria, where distance to bank branches, collateral requirements, and documentation barriers limit smallholder access to formal credit (Adesiyan & Kehinde, 2024; Ambler et al., 2025). The CBN's 2025 revamp of the Agricultural Credit Guarantee Scheme explicitly targets this gap, aiming to unlock affordable credit for smallholders through technology and innovative lending models (CBN, 2025).

Similarly, the results concerning crop diversification are supported by Adesiyan and Kehinde (2024), who found significant relationships between crop diversification, education, credit, farm size, and food security among Nigerian cocoa-producing households. The present study found that crop production (40.0%) and livestock keeping (18.0%) were the dominant livelihood activities, suggesting that diversification into other livelihood activities remains limited. The finding that 72.0% of respondents cultivated 0.30 ha or less further emphasizes the smallholder nature of farming in the area and the associated constraints on production capacity. Recent research by Olatinwo et al. (2024) and Omotoso and Omotayo (2024) reinforces the positive and significant contribution of crop diversification to food security. Post-harvest management is another important area requiring attention. The respondents ranked inadequate post-harvest processing and storage technologies highly (66.0% highest effect), while Obi-Egbedi and Ifoga (2024) found that post-harvest losses reduced the probability of food security among Nigerian yam farmers. Barau et al. (2023) similarly emphasized the role of improved storage technologies in reducing post-harvest losses and strengthening food security. The Nigerian agricultural sector faces significant post-harvest losses estimated at 30–40% for some perishable crops, which directly undermines food availability and farm incomes (Barau et al., 2023). Reports of distress harvesting, forced sell-offs, and rising post-harvest losses during the 2024–2025 agro-season further highlight the severity of this challenge (PeacePro, 2026; Tribune Online, 2026).

Infrastructure is equally important. The World Bank's current rural-access programme recognizes rural roads as an important mechanism for connecting agricultural producers to markets and reducing losses (World Bank, 2024). This provides strong external support for the present finding that poor rural roads are a major food-security constraint. The unanimous support for infrastructure provision among respondents (100%) reinforces the critical importance of rural roads, electricity, and market infrastructure for improving food security. The completion of over 1,500 kilometres of rural roads under RAAMP and the expansion of the project to additional states demonstrate the government's commitment to addressing this constraint (NAN, 2026; ILO, 2026). The high rating

of lack of education and skills (86.7% highest effect) is noteworthy. This finding suggests that human capital development through agricultural extension, vocational training, and formal education should be prioritized in food-security interventions. The low educational attainment (only 22.0% with tertiary qualifications) and the convergence with the ranking of education as a constraint strengthen this recommendation. Akpabio et al. (2025) further argue that the failure to adopt e-agriculture, which requires digital literacy and technical expertise, represents a significant barrier to food security in Nigeria.

The perception that 80.0% of respondents considered their food situation worse than previously is alarming and consistent with national trends of deteriorating food security. The FAO (2025a) and WFP (2026a) reports documenting rising hunger and acute food insecurity across Nigeria lend credibility to these perceptions. The drivers identified—high food prices, poverty, and lack of consistent food supply—align with the national drivers documented in these assessments. Overall, the results suggest that sustainable food security in Tarka LGA requires a coordinated package of interventions rather than a single agricultural intervention. Such interventions should integrate agricultural education and extension, affordable credit, cooperative development, rural infrastructure, improved storage, diversification, appropriate mechanization, market development, and food-price stabilization. The unanimous support for all five proposed strategies (farmer cooperation, infrastructure, crop diversification, mechanization, and biotechnology) indicates that farmers recognize the need for comprehensive approaches to food security. Comparison with Previous Studies: The present findings align with several recent studies in Nigeria. Adesiyun and Kehinde (2024) found that access to credit, crop diversification, and education significantly influenced food security among cocoa-producing households—factors also identified as critical in Tarka LGA. Obi-Egbedi and Ifoga (2024) reported that post-harvest losses reduced food security among yam farmers, consistent with the present finding that poor post-harvest technologies are a major constraint. Olatinwo et al. (2024) and Omotoso and Omotayo (2024) confirmed the positive contribution of crop diversification to food security. However, unlike some studies that have identified climate change as a primary driver of food insecurity, the present study found that socioeconomic factors (poverty, education, credit access) and infrastructure constraints were rated more highly, possibly reflecting the specific conditions of Tarka LGA.

6. Conclusion

The study concludes that food insecurity among farming households in Tarka Local Government Area is a multidimensional problem arising from interacting socioeconomic, agricultural, infrastructural, and market-related constraints. The study population is predominantly composed of smallholder farmers with relatively low educational attainment, large household sizes, small farm holdings, low annual incomes, and limited access to formal agricultural credit. These characteristics increase household vulnerability to food-price inflation, production shocks, and disruptions in food supply. The strongest perceived factors responsible for food insecurity were lack of education and skills, poverty, high food prices, lack of consistent food supply, poor health services, poor rural infrastructure, poor post-harvest technologies, and weak agricultural support services. The chi-square test results ($\chi^2 = 108.01$; $df = 9$; $p < 0.05$) confirmed significant associations between the examined factors and food security outcomes in the study area. The unanimous support expressed for all proposed strategies (farmer cooperation, infrastructure provision, crop diversification, mechanization, and biotechnology) demonstrates that farmers recognize the need for comprehensive approaches to food security. The study contributes to the empirical literature on food security in rural Nigeria by providing local-level evidence from Tarka LGA, a previously understudied area within Benue State. The findings suggest that interventions should address multiple dimensions simultaneously rather than focusing narrowly on increasing agricultural production.

7. Recommendations

Based on the findings, the following recommendations are made:

1. Agricultural extension and farmer education should be strengthened to improve farmers' technical knowledge, financial literacy, and ability to adopt improved agricultural technologies. Extension services should be decentralized and responsive to local needs, with emphasis on adult education and practical demonstrations.
2. Affordable agricultural credit should be expanded, particularly through cooperatives, microfinance institutions, and appropriately designed smallholder-finance programmes. Government and development partners should establish credit guarantee schemes to reduce risks for financial institutions lending to smallholders, building on the recent revamp of the Agricultural Credit Guarantee Scheme Fund (CBN, 2025).

3. Farmer cooperatives should be strengthened because collective organizations can improve access to credit, inputs, markets, machinery, and extension services. Cooperative development should include capacity building in governance, financial management, and business development.
4. Rural roads and agricultural infrastructure should be improved to reduce transportation costs, improve market access, and reduce post-harvest losses. Infrastructure investments should be community-driven to ensure relevance and sustainability, drawing on the successful model of RAAMP (World Bank, 2024; NAN, 2026).
5. Post-harvest storage and processing facilities should be provided at community level, particularly for staple crops produced by smallholders. This includes investment in improved storage structures, processing equipment, and value-addition facilities.
6. Crop diversification should be promoted to spread production risk, improve household food availability, and strengthen resilience to climatic and market shocks. Diversification programmes should include access to diverse seed varieties, technical training, and market linkages (Olatinwo et al., 2024; Omotoso & Omotayo, 2024).
7. Mechanization should be promoted through hiring centres and cooperative-based services rather than requiring individual smallholders to purchase expensive machinery. Tractor-hiring schemes and service-provider models can make mechanization accessible to smallholders.
8. Appropriate agricultural biotechnology should be promoted alongside extension and farmer education, ensuring that technologies are affordable, locally appropriate, and supported by effective regulatory and extension systems. Biotechnology interventions should be accompanied by public awareness programmes.
9. Food-price and market interventions should protect vulnerable rural households, particularly during the lean season when food prices and household vulnerability tend to increase. This includes strategic grain reserves, food distribution programmes, and price stabilization mechanisms.
10. Future studies should use validated food-security indicators, such as the Food Insecurity Experience Scale (FIES), Household Food Insecurity Access Scale (HFIAS), or Food Consumption Score, together with econometric analysis (e.g., logistic regression) to identify the statistical determinants of household food-security status. Seasonal tracking and panel data would also provide valuable insights into the dynamics of food insecurity.

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