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ANALYSIS OF INFLUENCE OF LIVELIHOOD ACTIVITIES ON FOOD SECURITY AMONG RURAL FARMING HOUSEHOLDS IN ADAMAWA STATE, NIGERIA

ABSTRACT

This study examined the influence of livelihood activities on the food security status of rural farming households in Adamawa State, Nigeria. Primary data was the main sources of data which was collected with the aid of structure schedule. Purposive and snowball sampling techniques was used to select 300 farming households from six Local Government Areas across the three senatorial zones of the state. Data collected were analyzed using descriptive and inferential statistics. The findings of the study revealed that crop production (92.9%), selling of forest products (72.5%), and livestock production/marketing (65.3%) were the most common livelihood activities among respondents. The HFIAS results showed that only 34.7% of households were food secure, while 65.3% experienced varying degrees of food insecurity. Specifically, 25.9% were mildly food insecure, 27.5% moderately food insecure, and 11.9% severely food insecure. The marginal effect estimates indicated that on-farm income ($dy/dx = 0.2145$), off-farm income ($dy/dx = 0.1738$), non-farm income ($dy/dx = 0.1964$), and educational level ($dy/dx = 0.0876$) had positive and significant effects on household food security. Conversely, age ($dy/dx = -0.0418$) and household size ($dy/dx = -0.0642$) negatively and significantly influenced food security status. The study concludes that livelihood diversification plays a vital role in improving food security among rural farming households. Therefore, policies and interventions that promote diversified income opportunities, education, and agricultural productivity are essential for enhancing household welfare and reducing food insecurity in Adamawa State.

Keywords: Food security, livelihood activities, livelihood diversification, rural households, HFIAS,

INTRODUCTION

Food security remains one of the most pressing development challenges globally, particularly in developing countries where rural households depend largely on agriculture and natural resources for their livelihoods. The concept of food security extends beyond food availability to include accessibility, utilization, and stability of food supplies over time. According to the Food and Agriculture Organization (FAO) (2023), a household is considered food secure when all members have physical, social, and economic access to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for an active and healthy life.

However, increasing population growth, climate variability, economic instability, conflicts, and environmental degradation have continued to threaten the food security status of millions of rural households across Sub-Saharan Africa. As a result, livelihood diversification has emerged as an important survival strategy adopted by rural households to enhance income generation, reduce vulnerability, and improve food security outcomes (Dia *et al.*, 2022; Tafida *et al.*, 2023).

Livelihood activities refer to the combination of capabilities, assets, resources, and income-generating strategies utilized by households to sustain their means of living. In rural communities, these activities often include crop production, livestock rearing, fishing, trading, wage employment, agro-processing, and other non-farm enterprises. The Sustainable Livelihood Framework posits that households combine available assets and opportunities to develop livelihood strategies that enhance their resilience and welfare. Increasing evidence suggests that households engaging in multiple livelihood activities are better positioned to cope with shocks, smooth consumption, and maintain food security than those relying solely on farming. Livelihood diversification contributes to household income stability and reduces exposure to agricultural risks associated with climate change, market fluctuations, and production failures (Adewumi *et al.*, 2022; Dia *et al.*, 2022).

In Nigeria, food insecurity remains widespread despite the country's vast agricultural potential. Agriculture employs a significant proportion of the rural population and contributes substantially to national food production. Nevertheless, many rural farming households continue to experience inadequate access to food due to low agricultural productivity, poor infrastructure, limited access to credit, inadequate extension services, and increasing production costs. Studies have shown that livelihood diversification through non-farm employment, livestock production, trading activities, and other income-generating ventures significantly influences household food security by enhancing income and reducing dependence on seasonal agricultural earnings (Adewumi *et al.*, 2022). Furthermore, access to financial resources has been identified as a critical factor in improving agricultural productivity and food security among smallholder farmers in Nigeria (Abolade *et al.*, 2025).

The situation is particularly critical in Northern Nigeria, where rural households face additional challenges arising from climate variability, environmental degradation, insecurity, and poverty. These challenges have negatively affected agricultural production and household welfare, thereby increasing vulnerability to food insecurity. In recent years, the Boko Haram insurgency has significantly disrupted livelihood systems across the North-East region, leading to displacement, reduced access to farmlands, destruction of productive assets, and limited market participation. Consequently, many farming households have been compelled to adopt alternative livelihood activities to sustain their food needs and income levels. Research conducted in Northern Adamawa State revealed that conflict-related disruptions have adversely affected food security, access to finance, and livelihood sustainability among rural households (Tafida *et al.*, 2023).

Adamawa State occupies a strategic position in Nigeria's agricultural economy due to its favorable agroecological conditions and the predominance of farming as the primary occupation of rural residents. Major livelihood activities in the state include crop cultivation, livestock production, fishing, petty trading, agro-processing, and wage labor. Despite the abundance of agricultural resources, a substantial proportion of rural farming households continue to experience food insecurity. Empirical evidence from Ganye Local Government Area indicated that more than half of rural farm households were unable to adequately meet their daily food requirements despite engaging in various livelihood activities. The study

further established that livelihood diversification significantly influenced household food security status through increased income generation and improved access to food (Dia *et al.*, 2022).

Additionally, poverty remains a major determinant of food insecurity among rural households in Adamawa State. Limited income opportunities, poor access to productive resources, inadequate rural infrastructure, and low purchasing power constrain households' ability to obtain sufficient and nutritious food. Adewuyi and Yusuf (2023) observed that poverty significantly affects food security outcomes among rural households in Adamawa State, suggesting that interventions aimed at strengthening livelihood opportunities could improve household welfare and food access. Similarly, climate-related challenges such as drought, erratic rainfall patterns, and water scarcity have further undermined agricultural productivity and food availability in many parts of the state, thereby increasing the need for diversified livelihood strategies (Adewuyi & Yusuf, 2023; Associated Press, 2024).

Although several studies have examined food security and livelihood diversification in different parts of Nigeria, empirical evidence on the influence of livelihood activities on food security among rural farming households in Adamawa State remains limited and fragmented. Most existing studies have focused on livelihood diversification, poverty, or vulnerability independently, with limited attention given to the combined effects of various livelihood activities on household food security. Furthermore, changing socioeconomic conditions, climate-related shocks, and security challenges necessitate updated empirical investigations that reflect current realities in rural communities. Understanding how different livelihood activities influence food security outcomes is therefore essential for designing effective rural development policies and interventions aimed at enhancing household resilience and sustainable food security.

It is against this backdrop that this study seeks to examine the influence of livelihood activities on food security among rural farming households in Adamawa State, Nigeria to provide useful insights for policymakers, development agencies, agricultural practitioners, and researchers in formulating strategies that strengthen rural livelihoods and improve food security outcomes in the state and beyond.

METHODOLOGY

The study will be carried out in Adamawa State, a state located in the North-East geopolitical zone of Nigeria. Adamawa State lies approximately between latitude 9°20'N and longitude 12°30'E, with geographical coordinates around 9.33°N and 12.50°E. The state covers a total land area of about 36,917 km², making it one of the largest states in Nigeria. It was created on 27 August 1991 from the former Gongola State, with Yola serving as its capital city. Adamawa shares boundaries with Borno State to the northwest, Gombe State to the west, Taraba State to the southwest, and the Republic of Cameroon to the east. The climate of Adamawa State is characterized by distinct wet and dry seasons. The rainy season typically extends from April to October, while the dry season lasts from November to March. Economically, agriculture remains the dominant occupation of the population, with major crops including maize, rice, millet, sorghum, groundnut, cassava, yam, and cotton. Livestock rearing is also widely practiced due to the availability of extensive grazing lands. The state is inhabited by diverse ethnic groups, including Fulani, Bwatiye (Bachama), Higi, Margi, Kilba, Chamba, and several others, contributing to its rich socio-cultural diversity (Nigerian Investment Promotion Commission 2024).

Primary data was the main sources of data which was collected with the aid of structure schedule. Adamawa State was purposively selected as the study area due to its significant involvement in

agricultural production and diverse livelihood activities. Two Local Government Areas (LGAs) were purposively selected from each of the three senatorial zones of the state based on the prominence of livelihood-related activities in those areas. Two wards were selected from each of the chosen LGAs. Subsequently, three communities with a high concentration of farming and livelihood activities were purposively selected from each ward. The selection of these communities was guided by information obtained from local agricultural extension officers, community leaders, and relevant stakeholders familiar with the study locations. Respondents were selected using the snowball sampling technique. Initial respondents were identified within the selected communities and were subsequently asked to refer other farming households that met the study criteria. This process continued until the required sample size was achieved. A total of 300 farming households were successfully interviewed and constituted the sample size for the study.

The data collected were analyzed using both descriptive and inferential statistical techniques. Descriptive statistics such as frequencies, percentages, means, and tables were used to present the findings in a clear and understandable manner. Household food security status was assessed using the Household Food Insecurity Access Scale (HFIAS), a widely recognized tool for measuring household access to food and the severity of food insecurity. While inferential statistics such as Logit model was considered appropriate because the dependent variable was dichotomous, categorizing households as either food secure or food insecure.

The model is stated thus:

$$\text{Log}(Y_i) = \text{Ln} \left[\frac{P_1}{1 - P_1} \right] = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + e$$

$Y_i = 1$ if the i th household is food secure and 0 if the i th household is food insecure

X_1 = On farm income

X_2 = Off-farm income

X_3 = Non-farm income

X_4 = Age

X_5 = Household size (number of persons in a household)

X_6 = Educational status (Number of years spent in school)

β_1 to β_6 are parameters to be estimated

e = constant term

RESULTS AND DISCUSSION

Types of Livelihood Activities Engaged by Rural Farming Households

The findings in Table 1 reveal that rural households in the study area rely on a wide range of livelihood activities rather than a single source of income. This pattern reflects the common strategy of livelihood diversification used by rural households to manage risks, cope with income instability, and improve food security. Crop production was the most common activity, with 92.9% of respondents engaged in it. This shows that farming remains the backbone of rural livelihoods and household sustenance in the study area. The dominance of crop production suggests that most households still depend heavily on agriculture for food and income, despite increasing diversification into non-farm activities. This finding is consistent with the study by Mishra and El-Osta (2019), who reported that crop farming remains the principal livelihood source for rural households in many developing countries because of its direct contribution to household food availability and income generation. Similarly, Abdulai and Huffman (2020) found that

crop production continues to dominate rural economies in sub-Saharan Africa, especially where alternative employment opportunities are limited.

Livestock production and marketing was practiced by 65.3% of respondents, making it the second most common livelihood activity. Livestock serves multiple functions in rural households: it provides income, food (meat, milk, eggs), savings, and insurance against shocks such as crop failure. This result supports the findings of Gebremedhin *et al.* (2021), who showed that livestock ownership significantly enhances household resilience and food security in rural Ethiopia. It also agrees with Kassie *et al.* (2020), who reported that livestock marketing contributes substantially to rural household income diversification and poverty reduction. A notable 72.5% of respondents engaged in selling forest products, indicating that natural resources play a major role in household livelihoods. Forest products may include firewood, charcoal, fruits, medicinal plants, and other non-timber products that provide cash income and subsistence benefits. This finding is in line with Angelsen *et al.* (2020), who emphasized that forest products are critical safety nets for rural households, especially during periods of agricultural stress. Likewise, Njana *et al.* (2022) found that income from forest products contributes significantly to livelihood diversification and household welfare in rural Tanzania.

More than half of the respondents were involved in agro-processing (55.4%) and selling food crops (56.1%). These activities indicate that many households participate not only in production but also in value addition and market-oriented agriculture. Agro-processing can increase income by extending shelf life and improving product value. The finding agrees with Ochieng *et al.* (2019), who reported that agro-processing enhances rural incomes and employment opportunities, particularly for women and youth. It also supports World Bank (2021) evidence that participation in agricultural value chains improves household earnings and market integration.

Non-farm and market-related activities were also important such as petty trading (43.2%), vegetable marketing (39.1%), and food vending/restaurant businesses (32.7%). These activities provide supplementary income and reduce dependence on seasonal agriculture. This pattern is consistent with Davis *et al.* (2020), who found that non-farm enterprises are increasingly important sources of income for rural households across Africa. Similarly, Yeboah and Jayne (2018) reported that small-scale trading and food businesses help households' smooth consumption and cope with agricultural income fluctuations.

Farm input supply (14.0%) and transportation (23.5%) had the lowest participation rates. These activities may require higher capital, specialized skills, or better infrastructure, which could limit household involvement. This finding aligns with Barrett *et al.* (2019), who noted that capital-intensive rural enterprises are less accessible to poorer households. It also supports Alemu and Adesina (2021), who found that inadequate infrastructure and limited access to finance constrain participation in rural service-sector activities. This study indicates that households in the study area adopt a diversified livelihood portfolio combining agriculture, natural-resource-based activities, processing, and small-scale trading.

Such diversification is widely recognized as a strategy for reducing vulnerability and improving household welfare and food security.

Table 1: Distribution of Respondents According to Types of Livelihood Activities Engaged

Livelihood Activities	Frequency	Percentage
Crop production	273	92.9
Livestock production/marketing	192	65.3
Fisheries/fish marketing activities	138	46.9
Agro-processing	163	55.4
Selling of farm waste	95	32.3
Selling of forest product	213	72.5
Selling of food crops	165	56.1
Petty trading	127	43.2
Food vending/restaurant	96	32.7
Vegetable marketing	115	39.1
Artisanal work	78	26.4
farm input supply	41	14.0
Transportation	69	23.5
Total	1552*	

Source: field survey 2026

Note: * = Multiple responses

Rural Farming Households Food Security Status Based on HFIAS

The analysis of the study in Table 2 presents the household food security status of the respondents using the Household Food Insecurity Access Scale (HFIAS). The findings show that out of the 294 households surveyed, 102 households (34.7%) were food secure. The result indicates that slightly over one-third of the respondents were food secure. This suggests that these households had reliable access to sufficient, safe, and nutritious food throughout the reference period without experiencing significant food-access challenges. The relatively high proportion of food-secure households may be attributed to engagement in multiple livelihood activities such as crop production, livestock farming, agro-processing, and forest-product marketing, which provide income and food sources that enhance household resilience. This finding is consistent with the study of Mengistu and Kassie (2022), who reported that households with diversified livelihood sources and better economic resources were more likely to achieve food security in rural Ethiopia. Similarly, Muche and Tolossa (2022) found that households engaged in multiple agricultural and income-generating activities exhibited better food security outcomes than households relying on a single livelihood source.

The study shows that about one-quarter (25.9%) of the respondents were mildly food insecure. This category represents households that occasionally worried about food availability or experienced slight reductions in food quality but generally maintained adequate food consumption. Such households are

often vulnerable to shocks such as rising food prices, declining farm yields, or temporary income shortages. The finding agrees with Andarge (2022), who observed that households exposed to climate variability often experienced mild food insecurity before progressing to more severe stages if coping mechanisms failed. Likewise, Debela *et al.* (2023) reported that mild food insecurity is common among rural households that have some access to food but remain economically vulnerable to seasonal fluctuations.

81 households (27.5%) of respondents fell within the moderately food-insecure category (27.5%). These households likely experienced reductions in both food quantity and quality, skipped meals occasionally, or consumed less preferred foods due to resource constraints. This result indicates that a substantial number of households struggle to maintain adequate food access despite participating in livelihood activities. The finding corroborates the work of Dessie, Zewotir, and North (2022), who found moderate food insecurity to be highly prevalent among Ethiopian rural households facing economic and environmental challenges. Similarly, Tadesse *et al.* (2022) reported that climate-related shocks and inadequate household resources contributed significantly to moderate food insecurity among farming households.

The study further revealed that 11.9% of the households were severely food insecure. These households likely experienced frequent hunger, skipped meals regularly, reduced meal sizes drastically, or spent entire days without eating. Although the proportion is lower than the moderate and mild categories, it remains a serious concern because severe food insecurity has significant implications for nutrition, health, and overall household welfare. This finding is lower than the 17.2% severe food insecurity reported by Tsegaye *et al.* (2022) among households in Ethiopia affected by climate variability, suggesting that livelihood diversification in the present study area may have provided some buffering effect against extreme food deprivation. However, the result aligns with broader evidence showing that a considerable proportion of rural households in developing countries continue to experience severe food insecurity despite agricultural engagement (Dessie *et al.*, 2022).

The results of this study indicate that food insecurity remains a major challenge, as approximately two-thirds (65.3%) of the households experienced some degree of food insecurity. The predominance of moderate food insecurity suggests that many households are trapped in a vulnerable position where food access is not guaranteed, particularly during periods of economic hardship or agricultural shocks. Nevertheless, the presence of a sizeable proportion of food-secure households suggests that livelihood diversification may play an important role in enhancing household food security. This observation supports recent evidence that diversified livelihood portfolios contribute positively to food security by reducing dependence on a single income source and increasing household resilience to shocks (Furbush *et al.*, 2024).

Table 2: Rural Farming Household Food Security Status Based on HFIAS

HFIAS Category	Frequency	Percentages
Food secured	102	34.7
Mildly food insecure	76	25.9
Moderately food insecure	81	27.5
Severely food insecure	35	11.9
Total	294	100

Source: field survey 2026

Influence of Livelihood Activities on Food Security Status of Rural Farming Households

According to the analysis of Table 3 which presents the marginal effect estimates showing how different livelihood activities influence the probability of a household being food secure. The model is statistically significant (Likelihood Ratio Chi-square = 52.8463; $p < 0.01$), indicating that the explanatory variables jointly influence household food security status. The Pseudo R^2 value of 0.4875 suggests that approximately 48.75% of the variation in household food security is explained by the variables included in the model.

The result shows that on-farm income positively and significantly influenced household food security ($dy/dx = 0.2145$; $p < 0.05$). This implies that an increase in income generated from farming activities increases the likelihood of a household being food secure by approximately 21.45%. This finding suggests that agricultural production remains a critical source of food and income among rural households. Increased farm income enhances households' purchasing power and access to adequate and nutritious food. This finding is consistent with Bergau *et al.* (2021), who found that agricultural diversification and increased farm income significantly improved household food and nutrition security among smallholder farmers in Ethiopia. Their study emphasized that income generated directly from farming contributes substantially to household dietary diversity and food availability. Similarly, Kassegn and Endris (2021) reported that agricultural livelihood diversification positively contributes to food security through increased farm productivity, income generation, and improved household resilience to shocks.

The coefficient for off-farm income is positive and significant ($dy/dx = 0.1738$; $p < 0.05$), indicating that participation in off-farm activities increases the probability of food security by 17.38%. This finding suggests that income earned from wage employment, agricultural labor, and other off-farm activities complements farm income and enhances household access to food. The result agrees with Ukwuaba *et al.* (2021), who found that off-farm income diversification serves as an important risk management strategy that improves household welfare and reduces vulnerability to food insecurity among farming households in Nigeria. Likewise, Bergau *et al.* (2021) observed that off-farm livelihood diversification contributes positively to food security by providing additional income streams that stabilize household consumption during periods of agricultural shocks.

The marginal effect result indicates that non-farm income positively and significantly influences food security ($dy/dx = 0.1964$; $p < 0.05$). This implies that households involved in non-agricultural businesses are approximately 19.64% more likely to be food secure than those relying solely on farming. The result corroborates the findings of Lawi *et al.* (2025), who reported that non-farm livelihood diversification significantly improved food security and nutritional outcomes among smallholder farmers in North-Eastern Nigeria. The authors argued that non-farm enterprises provide stable income that can be used to

purchase food throughout the year. Similarly, Mengistu (2022) found that engagement in non-agricultural businesses significantly reduced food insecurity among rural households in Ethiopia. Age negatively and significantly influenced food security ($dy/dx = -0.0418$; $p < 0.05$). This indicates that a one-unit increase in the age of the household head reduces the likelihood of being food secure by 4.18%. Older household heads may face declining physical strength and reduced capacity to engage in income-generating activities. This finding aligns with studies by Mengistu (2022), which reported that older household heads are generally more vulnerable to food insecurity because of reduced economic productivity and limited adaptive capacity.

Household size has a negative and significant influence on food security ($dy/dx = -0.0642$; $p < 0.05$). This suggests that an increase in household size reduces the probability of food security by 6.42%. Larger households often place greater pressure on available food resources and household income. This result supports the findings of Adeoye *et al.* (2022), who reported that larger household sizes significantly increased the risk of food insecurity among rural households in Plateau State, Nigeria. Likewise, Mnukwa *et al.* (2022) found that household size was a major determinant of food insecurity among farming households in South Africa because larger families require higher food expenditures.

Educational level positively and significantly affected food security ($dy/dx = 0.0876$; $p < 0.05$). This implies that higher educational attainment increases the likelihood of food security by 8.76%. Education enhances access to information, improves farm management skills, promotes adoption of innovations, and increases employment opportunities. This finding is consistent with Mengistu (2022), who reported that literacy significantly reduced food insecurity among rural households in Ethiopia. Educated household heads were better able to diversify livelihoods and adopt improved agricultural technologies. Similarly, Ashagidigbi *et al.* (2022) found that education significantly improved food security among Nigerian households through better resource utilization and income generation opportunities.

Table 3: Marginal Effect Result of Influence of Livelihood Activities on Food Security Status

Variables	dy/dx	Std. Error	z-value
On-farm income	0.2145	0.0621	3.4541**
Off-farm income	0.1738	0.0554	3.137Z**
Non-farm income	0.1964	0.0588	3.3401**
Age	-0.0418	0.0189	-2.2116**
Household size	-0.0642	0.0247	-2.5992**
Educational level	0.0876	0.0315	2.781**
Likelihood Ratio Chi-square	52.8463		
Prob > Chi-square	0.0000		
Pseudo R ²	0.4875		

Source: field survey 2026

Note: ** = Significant at 5% level of probability

CONCLUSION AND RECOMMENDATIONS

Based on the findings of the study it is concluded that livelihood diversification is a critical pathway for improving household food security in Adamawa State. Strengthening opportunities for income diversification, improving access to productive resources, and enhancing human capital development will

significantly contribute to reducing food insecurity and improving the welfare of rural farming households. Therefore, the following recommendations were made:

- i. Government and development agencies should promote livelihood diversification among rural households by supporting both agricultural and non-agricultural income-generating activities. This will reduce dependence on a single livelihood source and improve household resilience to economic and environmental shocks.
- ii. Access to agricultural credit and financial services should be expanded to enable farming households invest in productive activities, adopt improved technologies, and increase farm productivity, thereby enhancing food security.
- iii. Agricultural extension services should be strengthened to provide farmers with training on improved production techniques, value addition, climate-smart agriculture, and income diversification strategies.
- iv. Policies aimed at encouraging agro-processing, small-scale enterprises, and other non-farm businesses should be implemented to create alternative sources of income and employment in rural communities.
- v. Household nutrition and family planning awareness programmes should be intensified to help households manage family size and improve the allocation of available food and financial resources.
- vi. Special support programmes should be designed for vulnerable groups, particularly elderly household heads and households experiencing severe food insecurity, through targeted social protection and food assistance interventions.
- vii. Stakeholders should develop integrated rural development programmes that combine agricultural support, education, finance, and enterprise development to achieve sustainable improvements in household food security.

COMPLIANCE WITH ETHICAL STANDARDS

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There is no conflict of interest.

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