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Food security analysis among farming households in northeast Nigeria: A binary logistic regression approach

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Abstract - Food security is fundamental human right and a cornerstone of national stability, yet millions of people in developing countries especially Nigeria still face daily uncertainty about their next meal. This study analysed food security among respondents in the Northeast Nigeria where poverty and insurgency continue to prevail. Specifically, it identified the food security status and its key determinants among farming households in Northeast Nigeria. This study utilised secondary data obtained from the General Household Survey (Wave 5) conducted by the National Bureau of Statistics. Descriptive statistics and binary logistic regression were employed to analyse the data. Results from the study revealed that only 34.64% of the respondents were food secure. The state-level analysis showed that Taraba state ranked as the most food secure state in the study area whereas Borno state remained the least food secure state in the region. Moreover, household size, marital status and drought shocks significantly and negatively influenced food security while the number of children and price increase shocks were positively correlated to food security. This study therefore recommends that government and relevant stakeholders should promote family planning and awareness programs to help manage large household size, implement climate-smart agricultural strategies to mitigate weather shock and address insurgency realistically beyond political rhetoric.

Keywords: Food security, Northeast households, Binary logistic regression.

INTRODUCTION

Household food security exists when all the members of a family have consistent access to enough food for an active life (FAO, 2008). Food security is fundamental human right and a cornerstone of national stability, yet millions of people around the world especially in developing countries like Nigeria still face daily uncertainty about their next meal (World Bank, 2025). This uncertainty exposes individuals to health risks, economic hardship and social suffering (Smith and Doe, 2023). The World Food Programme (2024) reported that Northeast Nigeria faces a multi-dimensional food security crisis due to ongoing conflict, climate shocks, and economic instability leaving an estimated 3.8 million people projected to face acute food insecurity.

Agriculture serves as the primary source of livelihood for smallholder households, contributing approximately 25% to Nigeria's Gross Domestic Product (GDP) and employing 70% of the active workforce (Oxford Business Group, 2024), thereby making it a critical foundation for both livelihoods and national food supply. According to Nano (2023), 1% improvement in technical efficiency achieved through enhanced input use, improved seed varieties, and better agronomic practices can reduce moderate food insecurity by 0.40% and severe food insecurity by 0.45% at the provincial level. Furthermore, the adoption of Climate-Smart and Precision Farming Technologies is crucial to maintaining production in the face of climate change. Despite the sector's potential to significantly improve food availability, boost incomes and enhance food access, several constraints continue to hinder its impact on food security. Key challenges include climate variability, insecurity in farming areas, and chronic under-investment in storage facilities, agro-processing, and rural infrastructure to mention a few.

The Nigerian government, in collaboration with agricultural stakeholders and non-governmental organizations has implemented several programs and policies aimed at improving food security nationwide with specific attention to the Northeast region. Key initiatives include the Nigeria Resilience Strategy (2021–2023) which focused on strengthening agriculture-based livelihoods in the face of conflict and climate shocks; the USAID Feed the Future – Rural Resilience Activity (2019–2024) (Feed the Future Nigeria Rural Resilience Activity, 2022), designed to transform agriculture through inputs, finance, technology, climate adaptation, and market systems; Mercy Corps' BRICC and ALMRI interventions which emphasized livelihood rehabilitation through training, input support, and cash transfers. Other notable efforts include Agricultural Insurance Innovations to mitigate risk through digitization and youth involvement, Social Safety Nets and Home-Grown School Feeding (HGSF) programs targeting income support and nutrition and the Nigeria–Brazil $1 billion (Reuters, 2025) agriculture deal promoting mechanization and scalable impact. Despite these well-intentioned interventions, challenges such as persistent insurgency, corruption, abrupt funding cuts, weak monitoring, bureaucratic bottlenecks, and politically biased implementation

have limited their effectiveness in addressing food security in the region.

Despite the growing concern of improving food security, the measurement and determinants of food security among rural households in Northeast Nigeria is not well-documented. As a result, there is a need to measure and examine the determinants of food security among households in northeast Nigeria. This is what this study aims to address and also help in providing information for the formulation of appropriate policies that can mitigate food insecurity, especially amongst rural households in the study area.

Objectives of the Study
1. describe socio economic characteristics of respondents in the study area
2. analyze food security status of respondents in the study area
3. examine food security status of respondents by states in the study area
4. examine food security determinants of respondents in the study area

METHODOLOGY

The study covered Northeast Nigeria, one of the six geopolitical zones of the country. It comprises six states which include Adamawa, Bauchi, Borno, Gombe, Taraba and Yobe. The region covers nearly one third (about 272, 395km^2) on Nigeria's total landmass making it the largest geopolitical zone in the country (Ibrahim and Sule, 2023). Moreover, the region lies within the Sudano-Sahelian agro-ecological zone characterized by semi-arid climate, erratic rainfall, frequent droughts, and high temperature, all of which negatively impact agricultural productivity (USAID, 2023). Futhermore Oruonye (2020) said the region experiences a dry and hot season known as the harmattan with high temperatures and little to no rainfall between November and March. The dominant livelihood includes subsistence and pastoralism with staple crops such as millet, sorghum, groundnut, rice, cowpea and maize. Northeast Nigeria is known for a wide range of ethnic groups each with its unique culture, language and traditions. The major ethnic groups in this region include Kanuri, Falani, Hausa, Tiv and Ngas. More importantly, Christianity and Islamic religion are the prevalent in that region with the majority of the population being Muslim.

The study used secondary data and was sourced from General Household Survey (GHS) wave 5 conducted by National Bureau of Statistic. Some of the required sourced for the study includes household head sex, marital status, states covered, sector, household size, children age and sex, price increase shocks, drought and household's food consumption data by item.

The socioeconomic characteristics were captured using percentage frequency distribution table while food security status of respondents was analysed using FAO proposed food security base line (2500kcal/adult equivalent/day): households were described into food secure and food insecure. Household food security status according to Mukaila *et al.* (2021) was compared to the based daily energy consumption recommendation of 2500kcal/AE/day. Households that consumed 2500kcal/AE/day and above were considered food secure whereas, households that consumed less than 2500kcal/AE/day were considered food insecure. This is also in line with Babatunde *et al.* (2013) findings. Therefore, this study used the same food security base line recommended by Mukaila *et al.* (2021) and Babatunde *et al.* (2013) respectively. Furthermore, household food consumption data covering 105 food items were used to derive calories supply or calories intake per respondent in this study. Food quantities consumed at household level were converted to calories using the locally available food consumption table for Western African (2012 and 2019). The calorie result value was divided by the number of Adult Equivalent (AE) in a household so as to obtain the per capita calorie intake and then divided by 7 days recall period to obtain per capita daily calorie intake of the respondents.

According to food security model specification by Ahungwa *et. al.* (2013), the food security index is expressed empirically as:

$$Z = \frac{\text{Household's daily per capita calorie available (A)}}{\text{Household's daily per capita calorie requirements (R)}}$$
.... (1)

However, determinants of food security were analysed using binary logistic regression model and the model specification is as follow:

$$\text{Logit}(P_i) = In\left(\frac{P_i}{1-P_i}\right) = \beta_o + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon_i \quad ....(2)$$

Where:
P_i = probability that household i is food secure
$X_1 - X_5$ = Household size, number of children, marital status, price increase shock, drought shock and non-food expenditure
β_o = intercept
β_1 to β_4 = coefficients of independent variables
ε_i = error term

RESULTS AND DISCUSSION
Socioeconomic characteristics

Table 1 revealed respondents' socio-economic characteristics across six states (Adamawa, Bauchi, Taraba, Gombe, Yobe and Borno) in Northeast Nigeria. The socio-economic variables included state distribution, sector (rural or urban), household head gender, marital status, exposure to price shocks, drought experiences, household size, number of adult or children per

household and non-food expenditure among others. The result from Table 1 suggested that Adamawa (28.75%) and Bauchi (27.64%) had highest number of respondents, while Borno (5.65%) and Yobe (8.48%) had the least representation respectively. The low representation in Borno and Yobe may indicate security challenges, accessibility issues peculiar to those states. The study also revealed that vast majority of respondents were male household head (86.69%) with 84.89% populace residing in rural areas while only 15.11% are from urban areas, suggesting that the study primarily focused on rural populations where food insecurity and economic hardship tend to be more pronounced. This is in line with Thomas and Turk (2023) findings that 52% of rural households experienced food insecurity compared to 18% in urban areas. Most respondents were married (83.23%) with 11.59% being widows/widowers. Very few of the respondents were single/unmarried (2.96%) or divorced/separated (2.22%). This indicated that majority of households were structured around

married couples with widowhood being a notable social concern. The average household size was 7 with a minimum of 1, indicating single-person households and a maximum of 24 representing the largest household size recorded. The mean household size of 7 suggested larger household size that exceeded 2020 Nigeria Living standards Survey household size average threshold of 5.

Moreover, 81.33% and 38.45% of respondents reported experiencing price increase shock and drought respectively, which might exacerbate food security challenges in the region under study. Study by Nakanwagi *et al.* (2021) found that high food price shocks adversely affect the food security of poor households leading to increased poverty and negative long-term effects on health, labour supply and education. In a similar manner, Gbadegesin *et al.* (2024) research work indicated that drought and floods drive up food prices and depressing agricultural wages, further exacerbating food insecurity.

Table 1: Socioeconomic characteristics

Variable		Frequency	Percentage	Cum.
	Adamawa	234	28.75	28.75
	Bauchi	225	27.64	56.39
States	Borno	46	5.65	63.04
	Gombe	133	16.34	78.38
	Taraba	107	13.14	91.53
	Yobe	67	8.48	100.00
Sector	Rural	691	84.89	84.89
	Urban	123	15.11	100.00
Household	Male	707	86.89	84.89
head Sex	Female	107	15.11	100.00
	Single/unmarried	24	2.96	2.96
Marital status	Married	675	83.23	86.19
	Widow /widower	94	11.59	97.78
	Divorce/separated	18	2.22	100.00
Price increase	No	152	18.67	18.67
shocks	Yes	662	81.33	100.00
Drought	No	501	61.55	61.55
	Yes	313	38.45	100.00
Variable	Observation	Mean	Min	Max
Household size	814	7.1511	1	24
Adult	814	3.4692	1	12
Children	814	3.6818	0	17
Non-food expenditure	814	115582.4	0	1313400

Source: Data Analysis, 2025

Table 2 revealed that 34.64% of sampled households from Northeast Nigeria were food secure while 65.36% experienced food insecurity. This suggests that majority of the respondents were food insecure, meaning they were unable to meet the recommended daily energy (kilocalorie) intake for proper nutrition. This study revealed a 14.36% increase in food insecurity compared to the 51%

reported by the United Nations Office for the Coordination of Humanitarian Affairs (UNOCHA) in 2023 for Northeast Nigeria. This suggests that by the 2024 harvesting season, more households experienced inadequate food consumption. In essence, food insecurity in the region has risen by 14.36%, highlighting a growing crisis. Similarly, Amaza (2008) reported that over 58% of sampled

households in Northeast Nigeria were food insecure, aligning with the findings of this study. Furthermore, some plausible reasons for higher food insecurity in the region may be attributed to factors such as the removal of fuel subsidies, widespread poverty, and ongoing insurgency driven by anti-Western education ideology (Boko Haram) among others.

Food security status of respondents

Food security status	Frequencies	Percent	Cum.
Food Secure	282	34.64	34.64
Food insecure	532	65.36	100.00
Total	814	100.00	

Source: Data Analysis, 2025

Food security status of Northeast households by state in Nigeria

Table 3 outlined the food security and insecurity percentages across six northeastern Nigerian states, ranked by their food security status. Taraba State exhibited the highest food security with 54.88% of its population being food secure. This suggests relatively better agricultural productivity and access to food resources compared to other states. This relatively higher percentage can be attributed to the state's substantial agricultural potential, including fertile soils and favorable climatic conditions (Umar, 2014). Additionally, the state produces cereals (maize, millet, sorghum and rice), root and tubers (yam, cassava and sweet potatoes) and cash crops (coffee, tea, groundnuts, and cotton) along with livestock rearing, particularly cattle, sheep, and goats, is also prevalent, especially on the Mambilla Plateau and along the Benue and Taraba valleys. These agricultural activities contributed significantly to the state's food security status.

Bauchi State followed with a 44.89% food security rate. Despite being second, over half of its population still faced food insecurity, indicating significant challenges in food availability or accessibility. This finding is consistent with Mailumo *et al*. (2015) and Sadiq *et al*. (2023) that revealed that 67% rural farming households and 61.4% households in Bauchi state faced food insecurity.

Gombe State had 38.35% of its population food secure, highlighting higher (61.65%) food insecurity issues. Yakubu (2021) highlighted that conflicts between farmers and herders significantly contributed to food insecurity in the region, with 59.3% of farmers and 31.3% of herders in Gombe State experiencing moderate hunger. Also, Mani et al. (2019) concluded that farmers' vulnerability to food insecurity in Gombe State was primarily influenced by access to credit, output levels and land ownership.

Yobe State result revealed 31.88% moderate food security rate. Notably, Yobe, along with Borno and Adamawa, has been significantly affected by conflict, leading to displacement and disruption of agricultural activities. Akpoghelie et al. (2024) reported that ongoing conflict in the North East has displaced 2.2 million people and left 4.4 million people food insecure across Borno, Adamawa, and Yobe states.

Table 3: Food security status of Northeast households by state in Nigeria

States	Food security	Food Insecurity	Total	Food security status ranked by states
	58	49	107	
Taraba	54.21	45.79	100.00	1
	101	124	225	
Bauchi	44.89	55.11	100.00	2
	51	82	133	
Gombe	38.35	61.65	100.00	3
	22	47	69	
Yobe	31.88	68.12	100.00	4
	44	190	234	
Adamawa	18.80	81.20	100.00	5
	6	40	46	
Borno	13.04	86.96	100.00	6
	282	532	814	
Total	34.64	65.36	100.00	

Source: Data Analysis, 2025

Adamawa State showed only 18.80% food security. The ongoing armed conflicts in northeastern Nigeria, as well as increased prices of food items and agricultural inputs, have continued to negatively affect food security and nutrition in the region. About 74.2% of farmers reported production difficulties, mainly due to limited access to fertilizers during the last rainy season. This led to reduced cultivated cropland area (43.1 percent) and crop harvests (53.4 percent) across five states, including in Adamawa, Borno and Yobe (FAO, 2022).

Borno State had the lowest food security at 13.04%, with highest (86.96%) of its population sampled experiencing food insecurity. Borno is the epicenter of insurgency, with three million people facing food insecurity, exacerbated by displacement and destruction of livelihoods (Ofuani-Sokolo and Okunrobo, 2023).

Determinants of food security in Northeast Nigeria

Table 4 showed that positive relationship exists between number of children, price increase shock and non-food expenditure with respect to food security in the study area while household size, marital status and drought shock tend to be negatively correlated with food security and all these variables were statistically significant. This suggests that an increase in size of households, number of married respondents and drought shock experienced by respondents reduce the likelihood of food security while non-food expenditure, price shock increase and number of children increase by a unit increase in food security status of respondents in the study area.

Household size from Table 4 revealed that an increase in household size by a unit will likely reduce food security by 11.60% and it is statistically significant at 1%. This result indicates that as household size increased, the likelihood of being food secure decreased. This aligns with the findings of Oyediran and Olajide (2023) that highlighted the strain larger families place on limited food resources and concluded that household size has a negative impact on food security status. Similarly, Wudil et al. (2023) investigated food security among rice farmers in Nigeria's Kano River Irrigation Project and found that larger household sizes significantly increase vulnerability to food insecurity. It is worthy to note that Nigeria Living Standards Survey (NLSS) 2020 reported an average household size of 5.06 persons nationwide while the Northeast region exceeded this threshold with an average of 2 persons. This implied that if factors such as early marriage, misconceptions about child education and family planning continue to drive large household sizes in the Northeast, they could worsen food insecurity, compounded by insurgency-related

challenges that have already severely disrupted agricultural production in the region.

Number of children result from Table 4 showed that a unit increase in number of children improves food security by 16.35% and it is statistically significant at 1%. This result may seem counterintuitive that increase in number of children do decrease food security status as opined by Owoo (2020), Alade et al. (2023) and Muhammad and Shaufique (2019). But possible explanations could be that older children engaged in farming or economic activities, contributing to household income that might in turn improve food security. In the Northeast region, prevalence of child labour (aged 5 to 17) stands at 49.4% indicating that nearly half of the children in the area engaged in labour activities (NBS and ILO, 2024). This inferably means the higher the number of children in that region, the likelihood of increased child labour that might also contribute to family income to improve food security. Moreover, in terms of socio support system, families with more children might tend to benefit more from Governmental and Non-Governmental Organisations' support programmes which might make them improve their food security than those families with fewer children. However, while increase in number of children may improve food security through increased labour, the long-term consequences of child labour which include limited educational attainment and reduced future earning potential, may perpetuate cycles of poverty and food insecurity which the region is currently experiencing.

Marital Status: The marital status of respondents affects food security status among respondents in the study area, and it is statistically significant at 1%. By implication, being married reduces the likelihood of food security. This finding is consistent with Adeoye et al. (2022) that found non-partnered households (Single, divorce, widowed) were more likely to be food secure compared to partnered (married) households. This could be due to higher financial burdens associated with supporting spouses and children because married respondents may have more dependents and face increased consumption needs most especially when income is low or being eroded by inflation rate. Moreover, conflict and dissatisfaction within marriage can also lead to negative consequences including potentially reduced attention to household food security. Being married does not automatically lead to reduced food security, but related factors like low or reduced household income, increased household expenses, marital discord among other factors can lead to food security reduction among married respondents in the study area.

Food price increase result from Table 4 revealed that an increase in food price by one unit will increase probability of food security in the study

area by 13.23% and it is statistically significant at 1 percent. This result is contrary to a priori expectation that increase in food price tends to reduce probability of food security as opined by National Bureau of Statistic (2024). However, increased in food price may benefit food producing households by raising their income, especially in Northeast Nigeria where agriculture is a main livelihood source. According to FAO (2022), higher agricultural products' prices can incentivize production and improve income for net producers, potentially enhancing their food security. Similarly, this study's findings align with Manda et al. (2020) who observed that farming households who are net sellers of food crops in rural Nigeria tend to have better food access during periods of favourable market prices. Thus, increased food prices might improve food security among food producers who are able to sell their products at higher margin and reinvest in nutrition and productivity. Moreover, it is important to note that the positive effects of increased food prices on food security are not universal. Poor households, especially those that are net buyers of food often suffer from reduced purchasing power when food prices rise leading to decreased food access and increased vulnerability to food insecurity.

Drought Shocks: The results from Table 4 showed that a unit increase in drought shocks-characterized by prolonged or sudden reductions in rainfall and water availability that negatively affect agriculture, the environment, and livelihoods-leads to a 5.16% decrease in the probability of food security. This implied that an increase in drought shocks significantly lowers the likelihood of achieving food security. According to Ayanlade et al. (2017), extended dry spells in Nigeria results in soil degradation, loss of fertile land and reduced water availability, all of which lower agricultural productivity. This decline in productivity directly impacts food insecurity (Orimoloye et al., 2020). Furthermore, Blueprint (2024) reported that maize and millet yield in northern Nigeria declined by 25–30% during severe drought years, worsening food insecurity in the region. This aligns with the findings of this study, indicating that drought shocks negatively affect food security.

Non-food Expenditure: An increase in non-food expenditure among households in the study area is positively associated with improved food security. In order words, increase in non-food expenditure by one unit increases probability of food security by $4.96e^{-04}$ % and it is statistically significant at 1 percent. This is consistent with finding from the study carried out by Oyediran and Olajide (2023) that emphasized that investment in non-food areas contribute to overall household well-being and resilience which in turn positively impacts food security. Furthermore, Kolawole (2024) concluded that non-food expenditure indicative of improved living standard and economic stability, are linked to better food security. Similarly, the findings of this study align with Amao *et al.* (2023) who reported that non-food expenditure has a positive and significant relationship with household dietary diversity. This implies that as households increase spending on non-food items, their food expenditure and dietary diversity also improve

Table 4: Food Security determinants in Northeast Nigeria

Food security	dy / dx		P>|Z|
Household size	-0.1160***		0.000
Number of Children	0.1635***		0.000
Marital Status	-0.1963**		0.016
Price increase shock	0.1323***		0.001
Drought Shock	-0.0516*		0.095
Non-food expenditure	$8.65e^{-07}$		0.000
Logistic regression	Number of obs =	814	
	LR chi2 (6) =	192.09	
	Prob > chi2 =	0.0000	
Log likelihood = -429.16029	Pseudo R2 =	0.1829	

Note that *, ** and *** indicate statistically significant at 10%, 5% and 1% level, respectively Source: Data Analysis, 2025

CONCLUSION AND RECOMMENDATIONS

The study concluded that most respondents in Northeast Nigeria were male, married, adult aged individuals with larger household sizes, many of whom experienced price increase shocks. A significant portion of these households were found to be food insecure. Among the states surveyed, Taraba recorded the highest level of food security while Borno had the lowest. Key determinants of food security included household size, marital status and drought shock, all of which had a negative and significant impact. Conversely, non-food expenditure, price increase shocks and number of children per household had positive and significant influence of food security outcome in Northeast Nigeria.

Based on the findings of this study, the following recommendations were made to improve food security in Northeast Nigeria.

- Government and public sector should encourage family planning and promote awareness programs that can help manage large household size.
- Farming households should adopt climate - smart agricultural practices and drought-resilience strategies to mitigate the impact of weather shocks
- Government should encourage and support non-food income generating activities to improve household purchasing power
- Government should prioritize implementation of policies and interventions that specifically address localized food insecurity and the challenges posed by insurgency in the study area.

REFERENCES

Adeoye, P. A., Afolaranmi, T. O., Ofili, A. and Chirdan, O. O. (2022). Socio-demographic predictors of food security among rural households in Langai district in Plateau-Nigeria: a cross-sectional study. *Pan African Medical Journal.* doi:10.11604/pamj.2022.43.36.32704. PMID:36505019; PMC9716969

Ahungwa, G.T., Umeh, J.C. and Muktar, B.G. (2013). Emperical Analysis of food security status of farming households in Benue state, *Nigeria Journal of Agriculture and Veterinary Science* 6(1):57-62

Akpoghelie E.O. Chiadika E.O Edo G.I., Al-Baitai A.Y. Zainulabdeen K. Keremah S.C. Ainyanbhor I.E. Akpoghelie P.O. Owheruo J. O. Onyibe P. N. Dinzei M.M. Ekokotu H. A. Ugbune U. Oghroro E.E.A. Ekpekpo L.D. (2024). Malnutrition and food insecurity in northern Nigeria: an insight into the United Nations World Food Program (WFP) in Nigeria. Discover food 4:165 | https://doi.org/10.1007/s44187-024-00249-7

Alade, S.P., Su'an, L I., Abu, C. (2023). Urban-rural disparities in food security: An analysis of household survey data in plateau state, Nigeria. *FUDMA Journal of Sciences (FJS)* 7 (5):18 – 23

Amao, I. O., Ogunniyi, A. I., Mavrotas, G., and Omotayo, A. O. (2023). Factors Affecting Food Security among Households in Nigeria: The Role of Crop Diversity. *Journal of sustainability, 15*(11), 8534. https://doi.org/10.3390/su15118534

Amaza P.S, Adejobi A.O. and Fregene T. (2008). Measurement and determinants of food insecurity in northeast Nigeria: Some empirical policy guidelines. *Journal of Food, Agriculture and Environment* Vol.6(2): 92-96

Ayanlade, A., Akinyemi, F. and Ogunjobi, K. (2017). Climate Change and its impacts on food security in Nigeria. Journal of Environmental Management Tourism 8:540-552. Doi:10.14505//jemt. v8. 3(19) 12

Babatunde, R.O., Adejobi, A.O. and Fakayode, S.B. (2013). Income and calories intake among farming households in Nigeria. Result of parametric and non parametric analysis accessed on 25 A ugust 2022 through https://unilorin.edu.ng /publications/Babatunde/no%2013%20inc ome%20and%20calorie%20intake.pdf

Blueprint Newspaper. (2024). The impact of drought on food security in Nigeria. https://blueprint.ng/the-impact-of-drought-on-food-security-in-nigeria/

FAO. 2022. Northeastern Nigeria: Adamawa, Borno and Yobe states. Response overview (April 2022). Rome. https://doi.org/10.4060/cc0228en

Feed the Future Nigeria Rural Resilience Activity (2022). Factsheet: USAID Feed the Future Nigeria Rural Resilience Activity (2019-2024). Mercy Corps. https://www.mercycorps.org/sites/default/f iles/2023-02/Rural-Resilience-Activity-Factsheet-June-2022.pdf

Food and Agriculture Organization of the United Nations (FAO). (2008). An introduction to the basic concepts of food security. FAO, Rome. Retrieved from http://www.fao.org/3/al936e.pdf" \t"_new

Gbadegesin, Tosin and Andree, Bo and Braimoh, Ademola. (2024). Climate Shocks and Their Effects on Food Security, Prices, and Agricultural Wages in Afghanistan. World Bank Working Paper. 10999. 1-36. 10.1596/1813-9450-10999.

Ibrahim, M. and Sule, M. (2023). Nexus between households' income and child labour in Northeast Nigeria. *African Journal of Social Science and Humanities Research* 6(3), 57-70. Doi: 10.52589/AJSSHR-YLWQGNJ2

Kolawole, C.O. (2024). Consuption Expenditure Pattern and Food Security Dynamic in Nigeria. *International Journal of Advance Multidisciplinary Research and Study* 4(3):1358-1366

Mailumo, S.S., Folorunsho, S.T., Amaza, P.S. and Muhammad S. (2015). Analysis of food

security and poverty status of rural farming households in Bauchi state, Nigeria. *Journal of Agricultural Research and Development.* Vol 15 No. 1

Manda, J., Alene, A.D., Tufa, A.H., Feleke, S., Abdoulaye, T., Omoigui, L.O. and Manyong V. (2020). Market participation, household food security and income: The case of cowpea producers in Northern Nigeria. Food and Energy Security, 9(3), e211. https://doi.org/10.1002/fes3.211

Mani J.R., Issa F.O., Abdullahi A.Y., Yusuf M. and Bidoli T.D. (2019). Resilience and Vulnerability to Food Insecurity among Farming Households in Ashaka Cement Host Communities, Gombe State, Nigeria. *Nigeria Journal of Agricultural Extension* vol. 20 number 4 pg 38-44

Muhammad, N. and Sidique, S. (2019). Determinants of Food Security Among Households in Nigeria. Pakistan Journal of Nutrition. 18. 1042-1052. 10.3923/pjn.2019.1042.1052.

Mukaila, R., Fasola, A. and Omotesho, O.A. (2021). Food Security Status: its drivers and coping strategies among vegetable farming households. *Certetari Agronomice in Moldova* vol. LIII, No. 4(184):414-425

Nakanwagi, Teddy and Ntuli, Herbert and Muchapondwa, Edwin. (2021). Food price shock, food security and potential mitigation strategies in Malawi. *SSRN Electronic Journal.* 10.2139/ssrn.3860635.

Nano, E. (2023). The agricultural technical efficiency and food security nexus: Evidence from Nigeria (FAO Agricultural Development Economic Working Paper No. 23-07). Food and Agriculture Organization of the United Nations (FAO). https://www.fao.org/agrifood-economics/puplication/detail/en/c/1672405/?

National Bureau of Statistics (2024). Nigeria General Household Survey-Panel (Wave 5) 2023/2024. Abuja, Nigeria: National Bureau of statistics. Retrieved from https://www. nigerianstat.gov.ng/pdfuploads/GHS-Panel%20wave%20-%20Survey%20Report.pdf

National Bureau of Statistics (NBS) and International Labour Organization (ILO) (2024). Child Labour Survey 2022, Geneva: International labour office, Nigeria National Bureau of statistics.

Ofuani-Sokolo, A.I. and Okunrobo, H.O. (2023). An examination of the Child's Right to survival and development in Nigeria—The Boko Haram Insurgency in context.

Hungarian J Leg Stud. 64(1):88–114. https://doi.org/10.1556/2052.2023.00445.

Orimoloye, I.R., Belle, J.A., Ololade, O.O. and Mazinyo, S.P. (2020). Climate change, land surface temperature and the susceptibility of Nigeria's major food crops. *Sci Total Environ.* 742:140561. Doi:10.1016/j.scitotenv.2020.140561

Oruonye, E. (2020). Environmental challenges and Desertification in Northeast Nigeria *international Journal of environmental Research* 14(1), 45-56.

Owoo, N.S. (2020). Demographic consideration and food security in Nigeria. Journal of Social and Economic Development, 23(1), 128-167. doi:10.1007/s40847-020-00116-y

Oxford Business Group. (2024). Agriculture in Nigeria: Boosting productivity and value addition. Oxford Business Group https://oxfordbusinessgroup.com/reports/nigeria/2024-report/agriculture-chapter/?

Oyediran I.O. and Olajide O.A. (2023). Assessing food security status of rural households in North Eastern Nigeria: a comparison of methodologies. *African Journal of food, Agriculture, Nutrition and Development*, 23(2): 22513-22533

Reuters (2025). Nigeria and Brazil sign $1 billion agreement to boost agriculture. https://www.reuters.com/word/americas/nigeria-brazil-sign-1-billion-agreement-boost-agriculture-2025-06-24/?

Sadiq, M.S., Singh, I.P., Ahmad, M.M. and Bala M.U. (2023). Food Insecurity Resilience Capacity of Rural Households in the Face of Induced-Weather Extremities in Bauchi State of Nigeria. *Scientific Journal Warsaw University of Life Sciences – SGGW Problems of World Agriculture* volume 23(XXXVIII), number 3, 2023: 20-44 DOI: 10.22630/PRS.2023.23.3.10

Smith, J., and Doe, R. (2023). Pathways linking food insecurity to health, economic, and social outcomes: A conceptual review. *Global Public Health, 18*(4), 567–579. https://pmc.ncbi.nlm.nih.gov/articles/PMC9930357/

Thomas, A. and Turk (2023). Food insecurity in Nigeria: Food supply matters (selected issues paper No. 018). International Monetary Fund. http://www.imf.org/-/media/Files/Publications/selected-issues-Papers/2023/English/SIPEA2023018.ashx

Umar, M.H. (2014). Agricultural Management Strategy on Food Security in Taraba State. *Journal of Biology, Agriculture and Healthcare,* Vol.4, No.8 page 29-31

United Nations Office for the coordination of Humanitarian Affairs (UNOCHA). (2023,

July). Lean season food security and nutrition crisis multisector plan- 2023 update 1 United Nations. https://www.unocha.org/puplications/report/Nigeria/lean-season-foo-security-and-nutrition-crisis-multisector-plan-2023-update-1

USAID (2023). Climate Risk Profile: Nigeria. United States Agency for International Development. https://www.climatelinks.org

World Bank (2025). Food Security Update 112: Current state of food security. Retrieved on July 28,2025 from https://thedocs.worldbank.org/en/doc/40ebbf38f5a6b68bfc11e5273e1405d4-0090012022/related/Food-Security-Update-112-January-17-2025.pdf?utm

World Food Programme. (2024). Economic hardship, climate crisis and violence in the northeast projected to push 33.1 million Nigerians into hunger in 2025. https://www.wfp.org/news/economic-hardship-climate-crisis-and-violence-northeast-projected-push-331-million-nigerians

Wudil, A.H., Ali,A., Aderinoye-Abdulwahab, S., Raza, H.A., Mehmood, H.Z. and Sannoh, A.B. (2023). Determinant of food security in Nigeria: Empirical evidence from beneficiaries and non-beneficiaries rice farmers of the Kano River Irrigation Project. Frontier in Sustainable Food Systems,7, 9 99932. https://doi.org/10.3389/fsuf.2023.9 99932

Yakubu, S. M. (2021). Effects of Farmer-Herder Conflicts on Rural Households Food Security in Gombe State, Nigeria: Analysis of the Effects of Farmer-Herder Conflicts on Rural Households Food Security in Gombe State, Nigeria. *Journal of Agricultural Extension*, *25*(1), 11–20.