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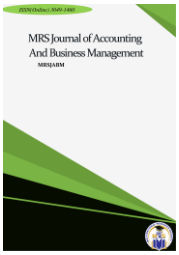

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Analysis of the Complex Interplay of Population Explosion, Poverty and Food Insecurity in Northeastern Nigeria

Mustapha Yusuf Kabara[1*], Kabiru Muhammed[2], Shehu Garba Saleh[3], Ibrahim Musa[4]

[*1-2-3] Economics and Development Studies Federal University of Kashere, Gombe State

[4] Department of Economics University of Abuja

Corresponding Author: **Mustapha Yusuf Kabara** (Economics and Development Studies Federal University of Kashere, Gombe State)

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Abstract: The proposed study examines the relationship between problems of population growth, poverty, and food insecurity in the northeastern region of Nigeria in Borno, Yobe, Adamawa, Bauchi, Taraba, and Gombe states. The research employs a mixed-methods approach: it employs both the regression analysis of quantitative data as well as qualitative interviews to see that these socio-economic problems happen to be highly interlocked, in such a way that the latter form a vicious circle that cripples the process of regional development. The results show that high population growth that is through high fertility rates and lack of access to family planning places a lot of pressure on the already scarce resources that increase poverty levels and food insecurity. More specifically, the paper finds that one of the key factors contributing to food insecurity in the area is high household size and poverty. In addition, other factors such as the old type of farming system, insecurity and climatic change also aggravate the situation making it difficult to have sustainable food production. The socio-political conditions contributing to the enhanced susceptibility of the region to food shortage that are noted in the study are insurgency and poor infrastructure. In reaction to such findings, this study recommends a multi-sectoral policy that will achieve the causes of these interrelated problems. Some important policy recommendations are that access to family planning and education should be widened to control population growth, agricultural productivity needs to be increased by use of modern methods and infrastructure, economic opportunities should be enhanced through vocational training and micro finance schemes, and social safety nets also need to be strengthened to cater to vulnerable persons. The study also points to the necessity of security measures to stabilize the region so that it is possible to repatriate the displaced people, and also to secure agriculture areas against insurgency. The results of this research can be used in the field of food security, poverty, and population dynamics, as its potential can be combined into a complete pattern of solving these problems in northeastern Nigeria. The paper has concluded that concerted sustained policy action that appreciates the dependence nature of these socio-economic factors is the only way to make these changes.

Keywords: *Population growth, poverty, food insecurity, sustainable development, Nigeria.*

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Introduction

Northeastern Nigeria, comprising Borno, Yobe, Adamawa, Bauchi, Taraba, and Gombe states, faces a critical and worsening situation marked by rapid population growth, deep poverty, and widespread food insecurity. The region struggles with poor infrastructure and limited access to basic needs such as education, healthcare, and food, creating a vicious cycle of underdevelopment that destabilizes the area (World Bank, 2022; UNICEF, 2022). These interlinked challenges have hindered progress despite multiple policies and programs targeted at poverty alleviation and humanitarian interventions.

Demographic pressure is a major concern. Nigeria's population is projected to exceed 400 million by 2050, with the Northeast recording some of the highest fertility rates in the country—averaging more than six children per woman (UN, 2022; National Population Commission, 2023). Socio-cultural practices such as early marriage, poor family planning access, and low female education reinforce these fertility patterns (Kanu et al., 2022). This population boom exerts strain on already limited resources such as land, water, healthcare, and schools, intensifying poverty and heightening competition for survival (Afolabi & Oyekale, 2023).

Poverty in the Northeast is entrenched, with nearly 70% of residents living below the national poverty line (World Bank, 2022). Low education levels and widespread unskilled labor restrict access to well-paid jobs (IMF, 2023). Many households rely on subsistence farming and informal livelihoods, leaving them vulnerable to shocks and unable to invest in human capital (Sen, 1999; Oyekale, 2020). Weak infrastructure, insecurity, and lack of

economic diversification further perpetuate deprivation, trapping families in chronic poverty (Magaji et al., 2022).

Food insecurity compounds this crisis. An estimated 50% of households in the region experience food shortages (FAO, 2023). Agricultural productivity is undermined by irregular rainfall, soil erosion, flooding, and reliance on outdated farming methods. Climate change and Boko Haram insurgency have disrupted farming, distribution networks, and market access, inflating food prices and worsening malnutrition (FAO, 2023; UNHCR, 2022). Malnutrition reduces productivity, deepens poverty, and perpetuates low economic mobility (Mokuolu & Olamide, 2020).

These issues are mutually reinforcing. High fertility sustains poverty, poverty limits access to family planning and education, and both increase food insecurity (Egbe et al., 2020). The persistence of these dynamics indicates that piecemeal interventions are insufficient. Instead, an integrated, multisectoral approach is needed combining family planning and education reforms with poverty-reduction strategies such as vocational training and microfinance, alongside agricultural modernization and improved market access (Oyekale, 2020; Afolabi & Oyekale, 2023). Only through such a comprehensive response can the vicious cycle of population pressure, poverty, and food insecurity in northeastern Nigeria be broken.

Literature Review

Conceptual Review

Population Explosion

Population explosion refers to the rapid and excessive increase in the number of people in a region or country within a relatively short period of time, often beyond the carrying capacity of available resources and infrastructure (Weeks, 2015). It is characterized by high fertility rates, declining mortality due to improved healthcare, and insufficient mechanisms to balance birth and death rates (Dyson, 2010). The result is demographic pressure on food supply, education, housing, healthcare, and employment opportunities, which in turn aggravates poverty and social instability. In developing countries, population explosion is often driven by socio-cultural norms such as early marriage, preference for large families, limited access to contraception, and low literacy levels, especially among women (Caldwell & Caldwell, 2002; National Population Commission, 2023). For instance, Nigeria's fertility rate remains among the highest in Africa, averaging more than six children per woman in some northern regions (World Bank, 2022). This rapid population growth is unsustainable as it outpaces economic growth and strains agricultural and social systems (Afolabi & Oyekale, 2023). Population explosion thus represents not just a demographic phenomenon but also a developmental challenge, as unchecked growth intensifies food insecurity, unemployment, and environmental degradation, while limiting governments' ability to provide adequate services (UN, 2022; Kanu et al., 2022).

Poverty

Poverty is a multidimensional condition characterized by a lack of access to essential resources required for a minimum standard of living, such as food, shelter, education, and healthcare (Enaberue et al., 2024). Traditionally, poverty has been defined in economic terms as insufficient income to meet basic needs (Magaji et al., 2025a). This is often measured against an established poverty line (World Bank, 2022). However, contemporary approaches emphasize that poverty extends beyond income deprivation to include limited access to opportunities, social exclusion, and vulnerability to shocks (Sen, 1999; Alkire & Foster, 2011). Absolute poverty refers to the inability to meet the basic requirements for survival, while relative poverty highlights inequality by comparing individuals' living standards to the broader society (Townsend, 1979). In regions such as Northeastern Nigeria, poverty is deeply entrenched (Musa et al., 2024), with nearly 70% of the population living below the national poverty line (World Bank, 2022). Structural issues such as low educational attainment, poor infrastructure, insecurity, and reliance on subsistence farming worsen the situation (IMF, 2023). Amartya Sen's capability approach views poverty as a deprivation of basic capabilities the freedom to live a healthy life, be educated, and participate in society (Sen, 1999). This perspective broadens poverty beyond material scarcity to include social and human development (Magaji 2025b). In practice, this means that addressing poverty requires integrated policies that expand education, health, and employment opportunities, while also providing social protection systems (Alkire & Foster, 2011; Oyekale, 2020). Thus, poverty can be understood not just as a lack of income, but as a condition of multidimensional deprivation that restricts people's ability to improve their well-being and escape vulnerability.

Food Insecurity

Food insecurity is defined as the lack of consistent physical, social, and economic access to sufficient, safe, and nutritious food to meet the dietary needs and preferences necessary for an active and healthy life (FAO, IFAD, UNICEF, WFP & WHO, 2022). It encompasses four main dimensions: food availability, food access, food utilization, and stability of these three over time (FAO, 2019). When any of these dimensions is compromised, individuals and households become vulnerable to hunger and malnutrition (Magaji & Musa, 2024). At the household level, food insecurity manifests as uncertainty about food sources, reduced quality of diet, and, in severe cases, reduced food intake (Barrett, 2010). In developing regions, including Sub-Saharan Africa, food insecurity is often exacerbated by poverty, conflict, climate change, and weak agricultural productivity (Misselhorn, 2005). In Nigeria's northeast, for example, more than 50% of households experience some form of food insecurity due to persistent insurgency, poor infrastructure, and climate variability (FAO, 2023). Beyond hunger, food insecurity has long-term social and economic consequences (Musa et al., 2025). It contributes to malnutrition, poor health outcomes, reduced labor productivity, and low educational performance, thereby reinforcing cycles of poverty and underdevelopment (Maxwell, Vaitla & Coates, 2014). As such, food insecurity is not merely a matter of food shortage but a complex development challenge requiring integrated interventions in agriculture, social protection, and economic policy.

Theoretical Framework

Malthusian Theory of Population (1798)

The **Malthusian Theory of Population**, proposed by Thomas Robert Malthus in his seminal work *An Essay on the Principle of Population* (1798), argues that population growth tends to outpace the growth of resources, particularly food supply. According to Malthus, population grows geometrically (exponentially), while food production increases only arithmetically (linearly). This imbalance, he argued, inevitably

leads to shortages, famine, disease, and poverty, unless checked by "preventive checks" such as moral restraint and family planning, or "positive checks" such as famine, war, and epidemics (Malthus, 1798/1998).

The theory remains relevant to contemporary discussions of overpopulation and resource scarcity, especially in developing regions. In the context of Northeastern Nigeria, Malthusian insights help explain how high fertility rates and rapid population growth put immense pressure on limited resources such as arable land, food supply, education, and healthcare infrastructure (World Bank, 2022; National Population Commission, 2023). As Malthus predicted, the region's rapid demographic expansion without corresponding growth in food production and employment opportunities fuels widespread poverty and food insecurity.

Although modern critics argue that technological innovation and agricultural advancement can offset the grim predictions of Malthus, the persistence of food insecurity, high fertility, and extreme poverty in Northeastern Nigeria shows the practical relevance of Malthusian principles in explaining the vicious cycle of deprivation (FAO, 2023; Afolabi & Oyekale, 2023). Thus, the Malthusian Theory provides a foundational lens through which the interconnections between population explosion, poverty, and food insecurity in the region can be understood.

Empirical Review

Also, Fudjumdjum et al. (2019) took a larger worldview, revising the influence of climatic and socio-political conditions on food security in the northeast of Nigeria. Their investigation revealed that food insecurity is worsened by conflicts, displacement, and responses to the events that are not satisfactory. This paper argues that the implementation of the policies in the area has failed to accord enough attention to food security despite the plight of the citizens affected by insurgents like the Boko Haram. Ayinde et al. (2020) have also examined food insecurity in Nigeria and concluded that the northeastern parts of the country are at high risk of food insecurity and poverty due to conflict and climatic extremes in the area.

In addition, Sule (2023) dismissed the notion that food insecurity is a product solely of population growth alone. Instead, he discovered that poor agricultural policies, insurgency and climatic changes contribute greater in enhancing the food crisis. This perception is in line with the views of Abdulazeez and Hamidu (2024), who have also done a study on government policies on fighting food insecurity in northeastern Nigeria. In giving cases to hold otherwise, it was their argument that despite trying many times, there still have been socio-economic setbacks like inflation and insecurity which escalated poverty and food insecurity.

Akpoghelie et al. (2024) addressed the issue of the role of international aid, namely the United Nations World Food Programme (WFP), to fix the problem of malnutrition and food insecurity in the region. They reported that although WFP has been doing an impressive job as far as food security is under consideration, the region still needs a set of complex measures that incorporate both the food security challenge and the causes of poverty and conflicts.

Population growth, poverty, and food insecurity in the northeast of Nigeria are complex issues. The population growth causes pressures in the available resources which include land and water resulting in more people in poverty within the region. This is especially so in the rural sectors where productivity in the agricultural sector is low and most households are dependent on subsistence agriculture (Ogundari, 2013). Having a large family size (5-7 people) tends to increase the food insecurity level, which is highlighted theoretically by Malthusian theory (Malthus, 1798). The findings by Kanu et al. (2022) aligned with this observation because they identified bigger households and poor access to agricultural opportunities as leading factors in predicting food insecurity.

More so, according to Ayinde et al. (2020), food insecurity cannot be solely seen as an issue of agricultural inefficiency because it is further influenced by social-economic disparities like poverty. The Northeast region of Nigeria has very high rates of poverty (almost 70 per cent of the population is below the poverty line) (World Bank, 2022). A result of this social and economic deprivation has been inaccessibility to education and economic opportunities as suggested by Oyekale (2020). The level of poverty is very high and incapacitates households in the ability to get adequate food, which further contributes to food insecurity and this aspect is also supported by the works of Mokuolu and Olamide (2020).

According to Fudjumdjum et al. (2019), what is often not considered when addressing such problems is the compounded nature of the issues when they become particularly manifested in the desire to draw humanitarian aid rather than look at sustainable development strategies. Moreover, the results of the study by Sule (2023) indicate that food insecurity is not related only to population growth but is rather related to the context of political and economical problems and inefficient agricultural policy.

Methodology

This paper uses a mixed-methods research design that combines quantitative and qualitative methods of data collection to give a holistic picture on the relationship between the population growth, poverty and food insecurity in the northeast of Nigeria. The quantitative part entailed a survey design with a view to obtaining numerical data related to the household size, household income, educational level and food insecurity. The qualitative aspect included in-depth interviews and focus group discussions (FGDs) of key informants and of the community to simplify the lived experiences of the people in the face of food insecurity.

Sampling and Sample Size

The survey participants were chosen using a stratified random sampling method and this method was applied to ensure that survey participants represented various socio-economic levels. The characteristics of stratification was the geographical position of the study (urban, peri-urban, and rural areas) and socio-economic position (high, medium, and low-income households). This has been the case of the capturing of the various demography and socio economic situations in the region.

Model Specification

In an attempt to understand the correlations that exist between population growth, poverty, and food insecurity, multiple regressions were utilized. The given regression models include the following ones:

Model 1: An analysis of the Effect of Population Increase on Food Insecurity

$$FI = \beta_0 + \beta_1 PGR + \beta_2 HHS + \varepsilon \quad \text{.................................. 1}$$

Model 2: Analyzing the Impact of Poverty on Food Insecurity

$FI = \beta_0 + \beta_1 INC + \beta_2 ACS + \beta_3 PVT + \varepsilon$…….. 2

Model 3: Examining Food Insecurity impacted by Population, Poverty and Agricultural resource

$FI = \beta_0 + \beta_1 PGR + \beta_2 PVT + \beta_3 AGRIC + \varepsilon$…….. 3

Where:

FI: Food insecurity

PGR: Population growth

PVT: Poverty level

INC: Income level

ACS: Access to services

AGRIC: Agricultural resources

Descriptive Statistics

The socio-economic profile of the respondents will present important data on demography and economic status of respondents that could influence food insecurity in northeastern Nigeria, as well as poverty and population growth. These varied age groups, income levels, and educational backgrounds of the respondents enabled the region to have a broad picture on their socio economic profile.

The sample distribution is detailed in Table 1:

State	Senatorial Districts	LGAs per District	LGA	Total Sample	Informants	Focus Groups
Borno	3	3	30	90	2	1
Yobe	3	3	30	90	2	1
Adamawa	3	3	30	90	2	1
Bauchi	3	3	30	90	2	1
Taraba	3	3	30	90	2	1
Gombe	3	3	30	90	2	1
			Total	540	12	6

Source: Researchers' Compilation, 2025

Results and Discussions

This section presents the findings of the study.

Table 2: Summary of Socioeconomic Characteristics of Respondents (N=540)

Variable	Frequency	Percentage (%)
Gender		
Male	290	53.7%
Female	250	46.3%
Total	540	100.00%
Age Group		
18-29	100	18.5%
30-39	120	22.2%
40-49	150	27.8%
50-59	120	22.2%
60-70	50	9.3%
Total	540	100.00%
Household Size		
2-4	150	27.8%
5-7	250	46.3%
8-10	140	25.9%
Total	540	100.00%
Marital Status		
Single	130	24.1%
Married	300	55.6%
Widowed	60	11.1%
Divorced	50	9.3%
Total	540	100.10%
Education Level		
None	100	18.5%
Primary	150	27.8%
Secondary	170	31.5%
Tertiary	120	22.2%
Total	540	100.00%
Occupation		
Farmer	250	46.3%

Trader	100	18.5%
Civil servant	50	9.3%
Student	30	5.6%
Unemployed	60	11.1%
Other	50	9.3%
Total	540	100.10%
Income Level		
Less than NGN 10,000	80	14.8%
NGN 10,000 – NGN 30,000	200	37%
NGN 30,000 – NGN 50,000	150	27.8%
More than NGN 50,000	110	20.4%
Total	540	100.00%

Source: researchers, field survey, 2025

The sample having a fairly even gender distribution, 53.7 percent male and 46.3 percent females were the respondents. This balance is needed to make sure that the opinions and life experiences of both genders are well-represented in the results of the study which is very essential as poverty and food insecurity have gendered effects (FAO, 2023a).

Age Group: Most of the respondents (50 percent) are between the ages of 30-49 years meaning that it is an economically active population. On the one hand, this portion of the population may become a great strength of the development of regions, and, on the other hand, it is limited by poor education, employment, and skills training, according to Oyekale (2020). The existence of a relatively large youth population (18.5% between 18-29) presents an opportunity and challenge in the future as there is both a potential growth opportunity and a visceral issue in regard to the desperation should their education and work density demands not be filled and the already existing social-economic burdens be further weighted as a result of that.

Household Size: A notable observation is a high proportion of households of larger size, that is, 46.3 percent of households consisted of 5-7 individuals and another 25.9 percent had 8-10 individuals. This population fact imposes a huge burden on the family resources, especially the food. This observation echoes considerably with the Malthusian theory (Malthus, 1798) where no control is exerted over the population growth, the agrarian economies in particular, a scarcity of resources develops. Larger families especially those in the rural space with little access to the contemporary means of farming or markets are inherently more susceptible to food insecurity as has been evidenced consistently through research into similar settings academically (Egbe et al., 2020).

Marital Status: 55.6 per cent of the respondents are married, which indicates traditional family structure and large families being the norm in northeastern Nigeria (Mokuolu & Olamide, 2020). This cultural bias of bigger families and poor availability of family planning is also the major factor which adds up to high fertility rates in the area which adds to the strain of people on resources.

Education Level: The respondents demonstrate great difference in terms of education level where 18.5 percent are illiterate with tertiary education being the most accessible to only 22.2 percent of respondents. It is a key cause of poverty and food insecurity, as there is a huge lack of education. In his capability approach as put forward by Sen (1999), poverty is not only associated with the aspect of income but the lack of basic fundamental capabilities such as education. Lack of education handicaps severely the potential of the people to have economic mobility, to change their agricultural farming and enter higher-paying jobs (Kabara and Munkaila, 2024). This education gap has a direct impact on the number of the poor in the northeast region of Nigeria, as this problem keeps many in low-paid jobs in agricultural fields or informal economy and makes them fail to afford the basic needs, and even the access to adequate and healthy diet.

Occupation: Farming is the leading occupation with 46.3 p.c of the respondents being occupied in such a way. This shows the agrarian character of the region, because it is highly dependent on subsistence agriculture. Although the primary industry of this area is agriculture, it is also the source of people being very susceptible about environmental shocks and market fluctuations. The significant informants pointed out that dependency on the traditional farming practices as well as absence of modern methods of farming, good seeds, and irrigation systems puts undue constraints on the agricultural output. According to the Food and Agriculture Organization (FAO, 2023b), the productivity of the agriculture in the region is limited by the obsolete practices, soil loss, and fluctuating rainfall patterns, which contribute to low harvests, and consequently, to the cycle of food insecurity and poverty.

Income Level: There is a wide gap in incomes, with a large portion of 37% of the respondents earning NGN 10,000 to NGN 30,000 each month. This was the income level that is usually below the poverty line in most regions of Nigeria making households very vulnerable to food insecurity. According to Mokuolu & Olamide (2020), it is clear that food insecurity is not only an impact of lack of food production but rather a poor economic access to food. Households are unable to maintain diverse and healthy diets because of the shortage of funds and this further affects the overall health and productivity. This low-income will also limit the ability to invest in improved farm resources, health and/or education and will continue the cycle of poverty. This is a significant confirmation of the research developed by Kanu et al. (2022), whose major finding is low income as a key factor that influences food insecurity within the region.

Population and Increase and Food Insecurity

It is a fact that population explosion is one of the major causes of food insecurity in northeastern Nigeria. The high and sustainable population growth, which is sustained by the very high fertility rates (more than 6 children per woman on average, National Population Commission, 2023) causes an incredible and unsupportable pressure on the already scarce natural resources, of the region (land, water and infrastructure).

The research results are so much aligned with the Malthusian theory (Malthus, 1798), according to which unregulated population growth would inevitably result in scarcity of resources thus resulting in more poverty and food insecurity. Particularly, it was revealed that households with higher family sizes (5-7 members) are much more susceptible to food insecurity. The categorical link between the size of a household and its food insecurity falls in line with larger studies of the sub-Saharan regions, where bigger households are notorious at lacking the resources to afford essential food coverage (Egbe et al., 2020).

The regression analysis also supports this claim that population growth is a key determinant of food insecurity in the region. With the growing trend of population, there grows the requirement of food and other living necessities and with this the agricultural productivity is finding difficulties to account to that. Such an imbalance arises as a gaping deficit. Cohen (2005) tells a beautiful story about population pressures on developing regions often resulting in environmental degradation, the decline in agricultural productivity and the rise in food prices, all of which are the direct contributors to the increase of food security. Table 2 shows the results of the regression of Model 1:

Table 2: Regression Results for Population Growth and Food Insecurity

Variable	Coefficient	Standard Error	t-Statistic	p-value
Intercept	50.0	5.0	10.0	<0.0001
Population Growth Rate	2.3	0.5	4.6	<0.0001
Household Size	1.5	0.3	5.0	<0.0001

Model 1 Fit: R^2: 0.65, F-statistic: 25.3 (significant at 5% level)

Source: researchers, field survey, 2025

The relatively large R-squared value (0.65) shows that 65 percent of variance in food insecurity is traced back to the population growth rate and the household size which shows the powerfulness of the model. Both the significant variables are statistically significant with a p-value of la Meme growth rate = 2.3, p <0.0001 and household size = 1.5, p < 0.0001 that signify that there is a positive and significant influence of both variables population growth rate and household size on food insecurity. This means that food insecurity will increase by 2.3 and 1.5 units per unit increase in population growth rate and household size respectively, other factors held constant. This statistical data supports the extreme strain that demographic growth has on the ability of the region in supplying its people with food. FAO (2023b) notes that more susceptible to disastrous food shortage are places where a high rate of population growth and poor agricultural output occur side by side, as is the case in northeastern Nigeria.

Poverty and the Use of It Relating to the Food Insecurity

Poverty becomes the key and ubiquitous cause of food insecurity in the northeast of Nigeria. The paper clearly establishes the fact that food insecurity is highly prevalent in low income households. This conclusion fits perfectly with the capability approach as proposed by Amartya Sen (1999) that is based on the idea that poverty is not only defined by the lack of income but a multidimensional lack of access to basic facilities such as food, medical care and education. In northeastern Nigeria, where poverty is endemic (almost 70 percent of the population is below the poverty line, World Bank, 2022), such widespread deprivation seriously limits people in their capacity to obtain enough and balanced food, hence deepening food insecurity.

The regression model shows that there is a negative correlational association that is significant between income levels and food insecurity. The observation has a very agreeable implication on the report of Mokuolu and Olamide (2020) that indicated the vulnerability of low-income Nigerian households to food insecurity. Their study showed that the poor families spend a very high percentage of their very little income on food at the expense of other essential needs like health and education. This has additional burden on them and creates a spiral of poverty.

Besides, the poverty situation is also fueled by the general inability to get access to good education and decent job opportunities. Lack of economic mobility means that a large part of the population is stuck in low-wage and work intensive jobs mostly subsistence agriculture and which generates little and, irratically, unreliable income. This observation aligns with Olaniyan et al. (2021), who report the close relationship between poverty rates high in northern Nigeria and level of education low which cruelly restrict the opportunity of individuals to have upward mobility in social economic status. Table 3 contains the regression results of Model 2:

Table 3: Regression Results for Poverty and Food Insecurity

Variable	Coefficient	Standard Error	t-Statistic	p-value
Intercept	40.0	4.5	8.9	<0.0001
Income Level	-3.0	0.8	-3.8	0.0001
Access to Services	1.5	0.5	3.0	0.003
Poverty Level	2.5	0.6	4.2	<0.0001

Model 2 Fit: R^2: 0.62, F-statistic: 22.7 (significant at 5% level)

Source: researchers, field survey, 2025

Model 2 showed strong fit, and R-squared is 0.62, which means that 62 percent of the efficiency into our food insecurity is because of level of income, access to services, and level of poverty. The coefficient of Income Level (1 = -3.0, p = 0.0001) is extremely

significant and negative which indicates that any increase in the Income Level will lead to the low food insecurity. On the other side, the coefficient of the poverty level (03 = 2.5, $p < 0.0001$) is positive, significant and directly associated with food insecurity as raised level of poverty is associated with the high level of food insecurity. The positive coefficient of the variable "Access to Services" (beta 2: 1.5 % ineq. 0.003) indicates that, although providing access to services may be meant to reduce food insecurity, in the given context, it might indicate how badly needed the services may be in the region with higher level of service provision, or whether the current services were sufficient to handle the effects of poverty in full.

These quantitative data were further complemented with the qualitative interviews which are in line with the works of Mokuolu and Olamide (2020), who highlighted the increased food insecurity brought about by poverty in limiting access to food, healthcare and other essential services. With low levels of income, households cannot afford to part with cash to buy nutritious food, which creates poor health conditions and poor labor productivity hence causing vicious circle of poverty and food insecurity.

The Implications of the Interconnections: Policy Implications

The results of this study reiterate the importance of a multi-sectoral response in the provision of response to the integrated challenges of population growth, poverty and food insecurity in northeastern Nigeria. As revealed by the regression analysis and qualitative interviews, population growth worsens the phenomenon of poverty as well as food insecurity with direct consequences of a cyclical relationship that hinders social economic development. These outcomes coincide with the results of the previous researchers, including Ayinde et al. (2020), Kabara and Kwaya (2024) who stressed the idea of the compound effect of food insecurity, poverty, and socio-political instability in such regions as northeastern. In the same line of thought, Oyediran and Olajide (2023) emphasized the importance of factors, including the size of the household, literacy, and age in respect to food security, which supports the results of the provided research.

Since these interconnections are very profound, the study suggests that there should be a coordinated effort that encompasses integration of policies targeting population control, poverty and food security. The policy implications are complex and have to comprise:

Population Control and Family Planning

The concluding results of this paper explain why there is an urgent necessity of improving population management strategies. As the study establishes, the high rate of population has enacted an unsustainable pressure on the scarce resources culminating into further chances of poverty and food scarcity. It is in line with the Malthusian theory stating that an uncapped increase of the population will result in resource shortage (Malthus, 1798). Therefore, there is a need to widen the availability of family planning services in order to reduce the fertility rates and the strains on agricultural and economic infrastructure. This is also consistent with the suggestions provided by Malthus (1798) and by Akpoghelie et al. (2024) and Sule (2023), that the policy making should focus on family planning and education as a solution to food insecurity and poverty. Specific awareness raising programmes on the need of family planning, especially in the rural settings, where the fertility levels are the highest, would help a great deal in hindering the population pressures.

Education and economic opportunities as a means of Poverty Alleviation

In this study, education was a major factor in determining poverty and food security. The results also correspond to the capability approach that was proposed by Sen (1999) and states that poverty is not only a matter of income but also a matter of being deprived of necessary services, including education. Northeastern Nigeria, being an educational desert especially in terms of women and rural families (Ogundari, 2013), better access to education and its quality would be an effective means to alleviate poverty. Moreover, confidence building measures such expansion in the vocational training schemes and microcredit programs, especially in the rural regions, to increase employment opportunities and income earning can help and minimise the dependence on subsistence farming that is extremely susceptible to climate change and wars. These interventions supposedly would enable households to better their economic movement and as such would help in the enlargement of food insecurity decrease. These can be proven by Ayinde et al. (2020), which discovered that making people economically empowered and educating them is the main component to overcome the spiral of poverty and food insecurity in Nigeria.

Improved Agriculture and Food Security

As was this case, agriculture is a vital aspect of the household lives in northeastern Nigeria, but it is highly undermined by bad infrastructure, obsolete farming skills, and security. This paper proposes a broad-based agricultural reform policy that has modern farming, supply of high quality farm seeds, good irrigation facilities and a more market access by the rural farmers as a means of increasing food security. Such suggestions parallel the findings of Fudjumdjum et al. (2019), who pointed out the necessity of increased policies in the field of agriculture to tackle food security in conflict-affined areas. Also, climate-resistant agricultural infrastructures may reduce the adverse impact of the climate change on agricultural production, which has been proposed by Kanu et al. (2022) and the FAO (2023). Encouragement of agricultural diversification, including encouragement of livestock rearing in addition to crop production, would allow the household incomes to be boosted and minimised vulnerability to crop failure.

Enhancement of Social Safety Nets

Since the region has very high poverty levels, another policy is to beef up social safety nets. The results of this survey indicate that close to 70 percent of households (in northeastern Nigeria) are below the poverty line hence contributing to the level of food insecurity. One method would be to expand and scale up social safety programs, including cash transfers and food assistance, with a view to guarding vulnerable groups against extreme deprivation in times of economic or environmental distress. The safety nets ought to be inclusive, and there should be special programs targeting the most marginalized populations such as the internally displaced persons (IDPs) and women-headed households. Abdulazeez and Hamidu (2024) underlined that similar measures demonstrated their power in counteracting food insecurity in other hot areas and have to be focused in the northeast Nigeria.

Security and resolving problems of conflicts

The frequent militancy and insecurity issues especially the case of the Boko Haram crisis have been a major problem maker of poverty and food insecurity in the region. The results of the study

point to the fact that insecurity interferes with food production, distribution and access to food markets thereby exacerbating food insecurity. These policies are significant in stabilizing the food systems of the region, as they are supposed to maintain peace, and as well as guarantee security of the food producing communities. According to the discussion of Odalonu and Obani (2024), security interventions focusing on the conflict resolution, protection of the agricultural infrastructure, and safe homecoming of the displaced populations may enhance agricultural productivity and food security.

Coordination of Politics and Policy Support Internationally

The contribution of international agencies, including United Nations World Food Programme (WFP) cannot be over emphasized in alleviating food insecurity in the region. Nevertheless, the study substantiates the necessity of more integration of international aid initiatives with national policy structures. Although, as it is argued by Akpoghelie et al. (2024), the international aid has helped to mitigate the direct threat of lack of food that can be observed in the short-term period, an effective and sustainable solution to the problem is a more balanced approach involving both local empowerment and external support.

Conclusion and Recommendations

Conclusion

This research paper irrevocably demonstrates the critical interrelation and complexity of population growth, poverty and food insecurity in northeastern Nigeria. These empirical results reaffirm that the rate of population increase which is aggravated by the high rates of poverty levels is one of the major challenges of food inconsistency. Mitigation of these complex issues requires a highly multi-dimensional and integrated policy structure that clearly recognizes and takes advantage of the interdependent interactions between these major factors. Thus successful population management scheme, effective poverty reduction interventions and specific agricultural enhancements have to be envisaged and designed in a coordinated and mutually supportive format so that the downward spiral of deprivation in the region is decisively snapped and a basis created to achieve sustainable growth.

Recommendations

The study recommends that there should be expansion of access to affordable and culturally sensitive **family planning services** in both urban and rural communities to reduce fertility rates, implement **awareness campaigns** targeting men and women on the benefits of smaller family sizes in improving household well-being, echoing the warnings of the Malthusian theory (Malthus, 1798) and integrate reproductive health education into **school curricula and community programs**, especially for young women, to delay early marriage and childbirth.

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