

Impact of Urbanization on Food Security in Lafia Local Government Area, Nasarawa State, Nigeria

Hudu Hamza Musa, Adamu Tanko Ogah PhD, Salamatu Abraham Ekpo PhD, Sunday Yusuf Kpalo

Center for Disaster Risk Management and Development Studies, Nasarawa State University, Keffi, Nigeria

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ABSTRACT

Urbanization is rapidly transforming landscapes across Sub-Saharan Africa, with significant implications for food security. This study examines the impact of urbanization on food security in Lafia Local Government Area, Nasarawa State, Nigeria, over a 40-year period (1984–2024). Using a mixed-methods approach integrating GIS/remote sensing analysis with household survey data ($n=400$), the research identifies spatial patterns of land use/land cover change, determines the extent of agricultural land conversion, and estimates the socioeconomic determinants of household food security. Findings reveal substantial urban expansion, with built-up areas increasing from 193,240 hectares in 1984 to 1,043,553 hectares in 2024, while farmland declined from 5,822,596 to 2,370,561 hectares over the same period. Logistic regression analysis identified annual income ($p<0.01$) and cooperative membership ($p<0.01$) as significant positive determinants of food security, with the model explaining 49% of variation in food security status. The study concludes that rapid urbanization has profoundly undermined local food production capacity and recommends integrated land-use planning, strengthening of cooperative societies, and food-sensitive urban policies to balance urban growth with agricultural sustainability.

Keywords: Urbanization, Food Security, Land Use/Land Cover Change, GIS, Nigeria, Lafia, Household Food Security

INTRODUCTION

Background to the Study

Urbanization constitutes one of the most significant challenges to food security globally, with its impact becoming increasingly worrisome and alarming. As Africa's largest economy and most populous country, Nigeria faces the world's fifth highest burden of people experiencing food crisis or worse, exceeded only by Yemen, Ethiopia, Afghanistan, and the Democratic Republic of the Congo (World Food Programme, 2023). Nigeria's human development potential remains unfulfilled, with its most vulnerable populations continuing to suffer critical levels of food insecurity and malnutrition driven by persistent conflict, organized violence, recurrent climate shocks, and the broad exposure to urbanization impacts.

Urbanization, defined as the process of increase in the number of people dwelling in urban centers (Streiffolar, 2001) or the movement of people from rural settlements to cities and densely populated areas (Yue, 2008), has continued to adversely affect agricultural production and food security across Nigeria. The rapid increase in population must be accompanied by expansion of building, construction of roads, industries, and provision of other socio-economic services—these constitute the main causes of recent phenomena in the country's land use patterns. Food security, defined as a situation where all people, at all times, have physical and economic access to sufficient, safe, and nutritious food to meet their dietary needs and food preferences for an active and healthy life (Abur, 2014), remains elusive for millions of Nigerians.

The problem of urbanization is particularly evident in most urban centers in Nigeria, especially Lafia Local Government Area in Nasarawa State. The creation of Nasarawa State in 1996 from Plateau State stimulated

drastic migration into the new state capital, bringing with it developmental challenges caused by urbanization. Lafia's accessibility to the Federal Capital City, presence of various educational institutions (including a polytechnic, college of agriculture, school of nursing, Federal University), industrial estates, Federal Teaching Hospital, international market, and a cargo airport are factors responsible for the continuous rate of urbanization in Lafia. These factors have resulted in negative effects on land use and consequently on the populace and food security.

Statement of the Problem

Food security remains a complex issue to address. Over the years, various governments have implemented measures to resolve food insecurity, yet these issues persist (Stringer, 2017). Food insecurity is often rooted in poverty, which decreases the ability of countries to develop their agricultural markets and economies. Secure access to food can produce wide-ranging positive impacts, including economic growth, improved health facilities, job creation, higher earnings, and a more productive workforce.

Urbanization affects land that could be used for agriculture and food production, resulting in rising prices of food commodities. The changes in demand for domestic food production and availability can significantly affect food security. In Nigeria, food inflation for November 2023 surged to 32.84% on a year-on-year basis, 8.72 percentage points higher than the rate recorded in November 2022 (Edeh, 2023). The National Bureau of Statistics (2023) further indicated that food inflation soared to 31.5%, with approximately nine million children at risk of suffering from acute malnutrition, including an alarming 2.6 million children facing severe acute malnutrition requiring critical nutrition treatment.

Urban expansion in Nigerian societies typically competes for land with agricultural sectors. It is expected that the urbanization trend in Lafia will impact negatively on the agricultural sector and food security. However, the nature and extent of such effects have remained unknown due to inadequate research studies. This study aims to fill this gap by providing a comprehensive analysis of how urbanization trends intersect with food security challenges in Lafia Local Government Area, contributing to academic discourse and informing policy decisions related to sustainable development.

Objectives of the Study

The specific objectives of this study are to:

1. Identify the spatial patterns of land use/land cover changes in Lafia from 1984 to 2024;
2. Determine the extent of land use/land cover in the study area between 1984 and 2014; and
3. Estimate the determinants of food security in the study area.

Significance of the Study

This research provides valuable insights into the complex relationships between urbanization and food security within the study area. By examining how urban expansion affects agricultural land use and household food access, the study contributes to a deeper understanding of the mechanisms through which urban growth influences local food systems. The integration of land use/land cover analysis with household-level food security assessment represents a methodological contribution that bridges physical geography and socio-economic research, potentially informing similar studies in other urbanizing contexts.

Scope of the Study

The study is geographically delimited to Lafia Local Government Area of Nasarawa State, Nigeria. The research covers a 40-year period from 1984 to 2024, strategically divided to capture critical phases of urban expansion: baseline conditions in 1984, intermediary changes in 2004 and 2014, and the current state in 2024. Conceptually,

the study is anchored on the intersection of urbanization dynamics and food security, framed within the Environmental Security Theory.

LITERATURE REVIEW

Conceptual Framework

Concept of Food Security

Food security has expanded in meaning and scope, now covering supply (assuring availability at stable prices), demand (access and affordability), nutritional aspects, and individual food preferences. The World Bank (1986) introduced the distinction between chronic food insecurity associated with structural poverty and low incomes, and transitory food insecurity. FAO (2015) identified four components of food security that must be simultaneously satisfied: availability, access, utilization, and stability.

Factors contributing to food insecurity in Nigeria include poverty, climate change, conflict and insecurity, increasing population, poor policy implementation, inefficient agricultural practices, post-harvest losses, and low budgetary allocation to agriculture (Mojeed, 2023; NESG, 2023). Climate change poses a particular threat, with extreme temperature and precipitation preventing crops from growing, and extreme events such as floods and droughts hindering crops and reducing yields.

Urbanization and Food Availability

Urbanization constitutes a challenge to food availability through evolving consumption patterns and food production and supply processes. Rapid urban growth and increasing numbers of megacities imply that more food must be available to people living in environments traditionally perceived as inappropriate for agriculture. Rural–urban migration trends, key contributors to urbanization (van Veenhuizen, 2006), result in changing lifestyles including evolving nutritional habits and food supply strategies. Continuing urban sprawl often makes it difficult to set clear boundaries between urban and rural areas, while land—including in urban peripheries—becomes more expensive, leading farmers to sell land for non-agricultural uses.

Urbanization and Food Access

When it comes to physical access to food, better infrastructure means urbanization is likely to have a positive impact on food security. In developing countries, however, access to food due to inadequate infrastructure can be a major problem. Financial access plays an equally important role; urban and peri-urban residents tend to be more disadvantaged than rural counterparts because they must purchase most of their food, making them dependent on food markets and vulnerable to price spikes. Research has shown that urban dwellers buy more than 90% of their food (Ruel et al., 2003).

Land Use and Land Cover Dynamics in Urbanizing Contexts

Land Use and Land Cover (LULC) change is a critical dimension of urbanization, with profound implications for food security, environmental sustainability, and socio-economic development. LULC refers to the human modification of the Earth's terrestrial surface and the physical and biological cover over the surface (Turner et al., 1995). In rapidly urbanizing regions such as Sub-Saharan Africa, LULC transformations are predominantly driven by urban expansion, agricultural intensification, and infrastructure development, often at the expense of natural ecosystems and arable land (Lambin et al., 2001).

Remote sensing and Geographic Information Systems (GIS) have become indispensable tools for monitoring LULC changes over time. Multi-temporal satellite imagery enables researchers to quantify the rate, pattern, and drivers of land cover transitions (Jensen, 2005). In the context of Lafia, similar methodologies have been applied to reveal the encroachment of settlements into agrarian landscapes, underscoring the tension between urban development and agricultural sustainability (Chunwate et al., 2019; Christopher et al., 2017).

THEORETICAL FRAMEWORK

This study adopts Environmental Security Theory as its framework. The theory emerged within the broader concept of human security introduced by the United Nations Development Programme (UNDP, 1994). Environmental Security is defined as a state in which an ecosystem is able to support the healthy pursuit of livelihoods by the people living in that system (OECD, 1996). The theory explores the linkages between environmental conditions and food security, particularly how environmental events such as climate change, land degradation, and water scarcity affect food security (Whyte, 2001). Agricultural production and food security are influenced by environmental and climate conditions, making this framework particularly relevant for interrogating the urbanization–food security nexus.

RESEARCH METHODOLOGY

Study Area

Lafia Local Government Area is located between 8° and 9° East of the Greenwich Meridian and latitude 8° and 9° North of the equator (figure 1). The LGA lies largely within the guinea savannah ecological zone, with a wet season from April/May to October. The area has an annual average rainfall of about 1,288 mm and an average temperature of about 32°C. According to the National Population Commission (2006), the local government was projected to have a total population of 348,095 people. By 2024, using a growth rate of 2.5%, the population had reached an estimated 509,300 inhabitants (Lafia Local Government Information Unit, 2024). The major occupation of the people includes farming of upland crops such as millet, sorghum, groundnut, cowpea, cassava, and yam, as well as vegetable crops like tomatoes, hot pepper, and garden egg.

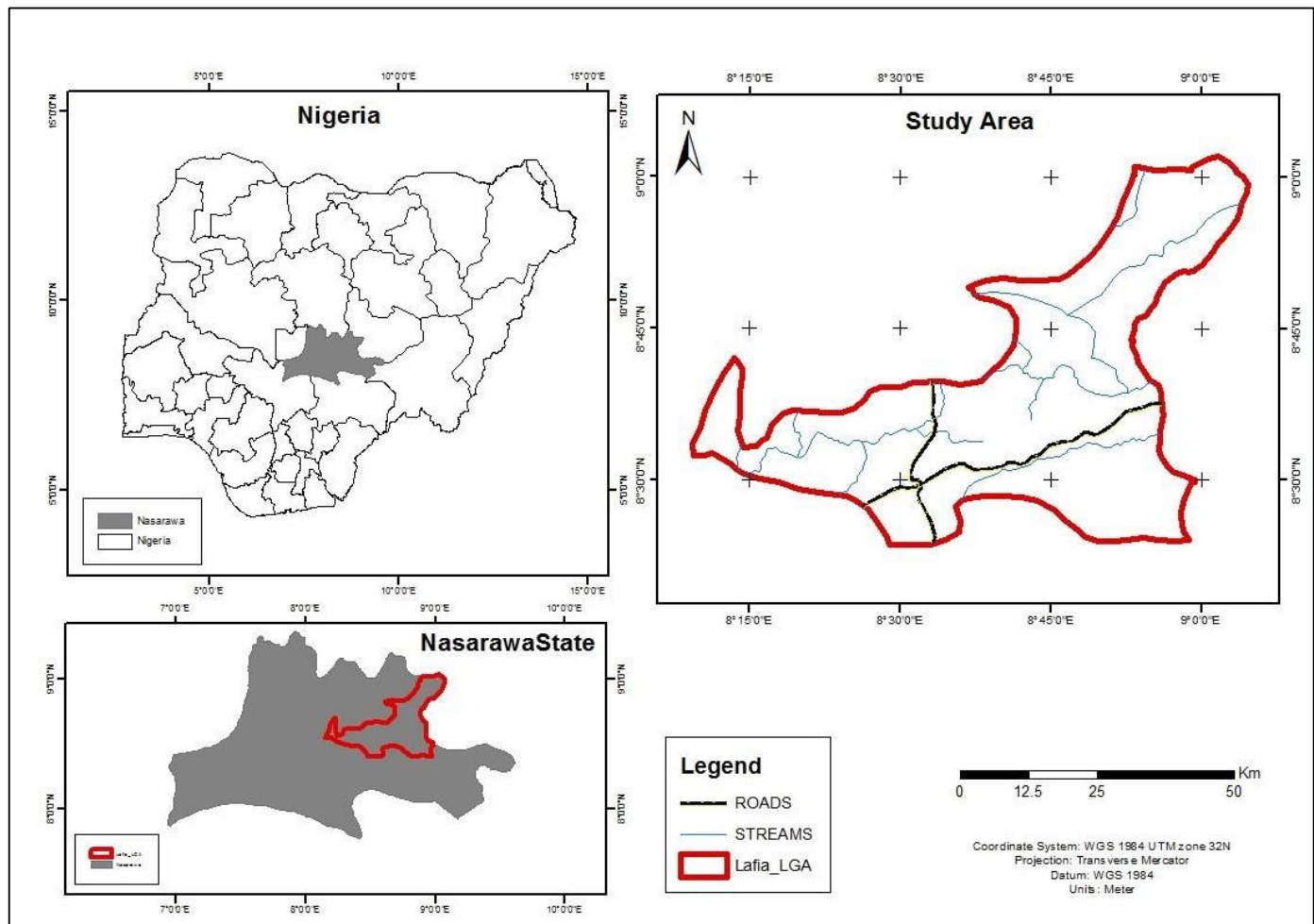


Figure 1: Map of Lafia Local Government Area. Source: NASRDA, 2025.

Research Design and Data Collection

This study employed a mixed-methods approach combining primary and secondary data sources:

Primary Data: Boundary coordinates of selected farms within the study area using a hand-held GPS system, organized in latitudes and longitudes; information collected through oral interviews; and questionnaire administration to 400 households.

Secondary Data: Topographic map of Lafia Local Government from Nasarawa Geographical Information System (NAGIS); population data from the State National Population Commission; and Landsat bands 2, 3, and 4 of TM, ETM, and OLI imageries for 1984, 2004, 2014, and 2024 obtained from the USGS website.

The sample size of 400 was determined using the Taro Yamane formula (1967). Simple random sampling was employed to administer questionnaires to households across the study area.

Methods of Data Analysis

Land Use/Land Cover (LULC) Analysis: The different Landsat bands were combined into bands 4, 3, 2 in ArcMap to form a false colour composite image. In Erdas Imagine, pixels representing vegetation, built-up area, rock outcrop, water body, and farmland were identified and selected as training samples. Supervised classification with maximum likelihood algorithm was applied for each year individually, classifying images into five classes: Built-up area, Vegetation, Farmland, Water Body, and Rock outcrop (figure 2).

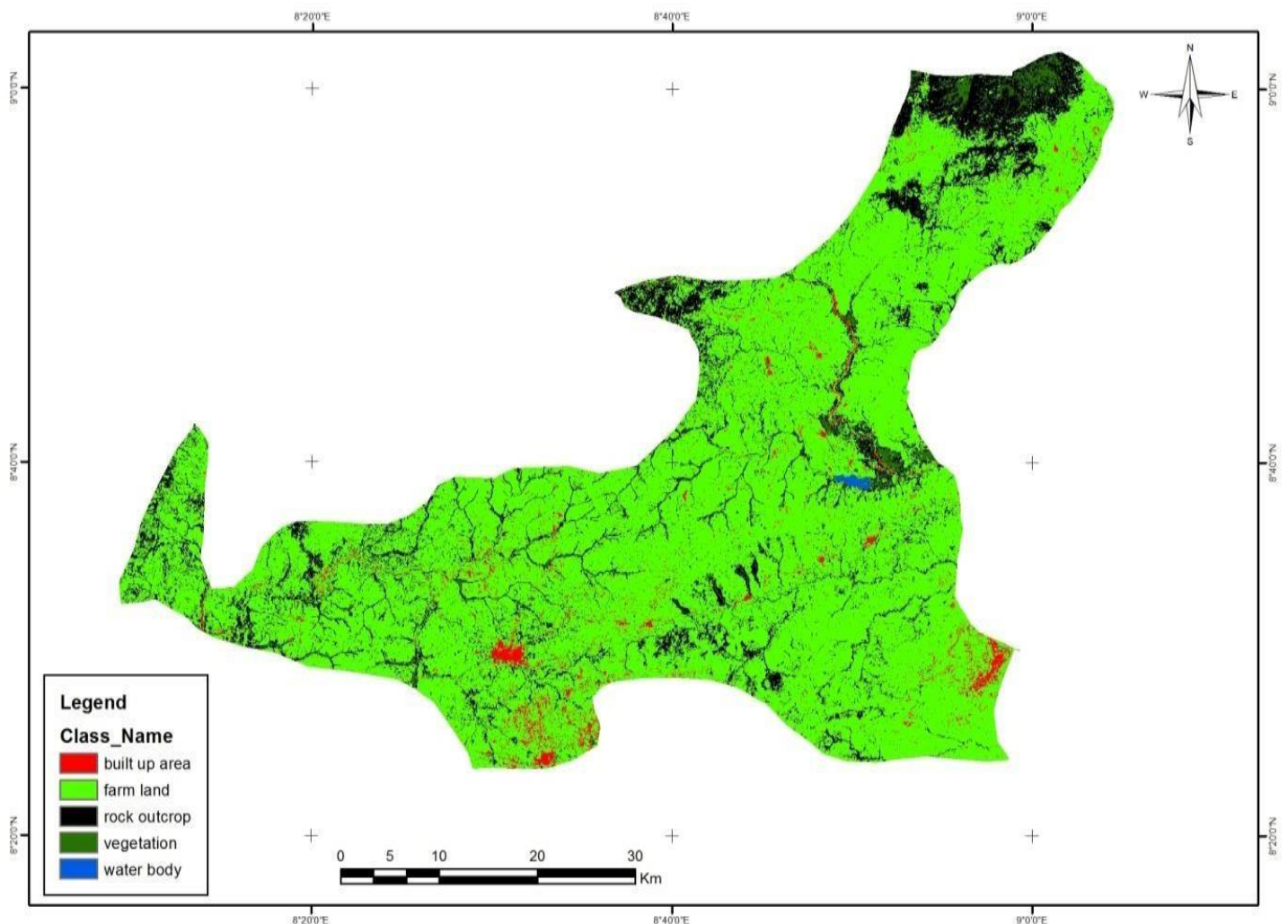


Figure 2: Land Use Land Cover Map of Lafia LGA (1984) (Source: GIS/RS Analysis, 2025)

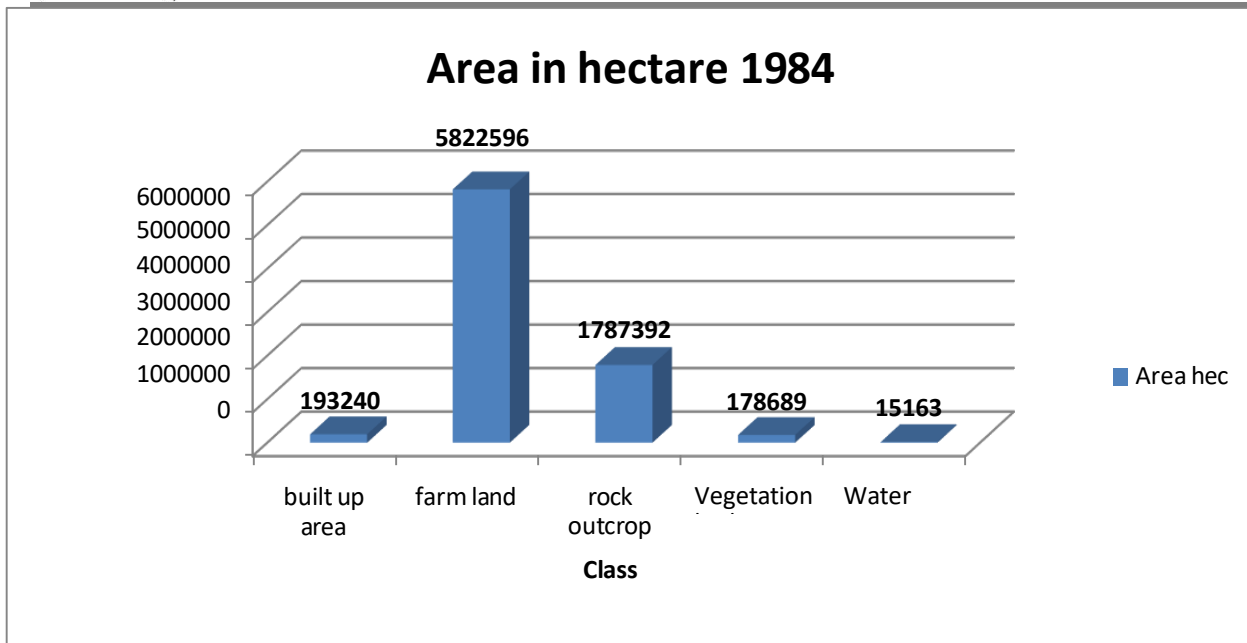


Figure: 3. 1984 Land Cover Classes and their Respective Area covered

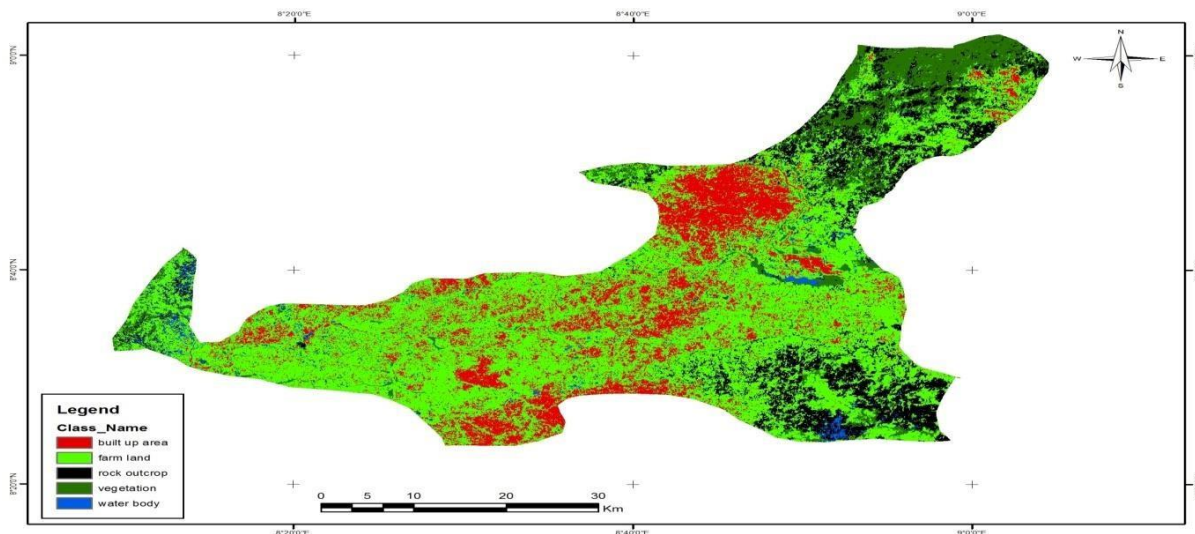


Figure: 4. Land Use Land Cover Map of Lafia LGA in 2004. Source: GIS/RS Analysis (2025)

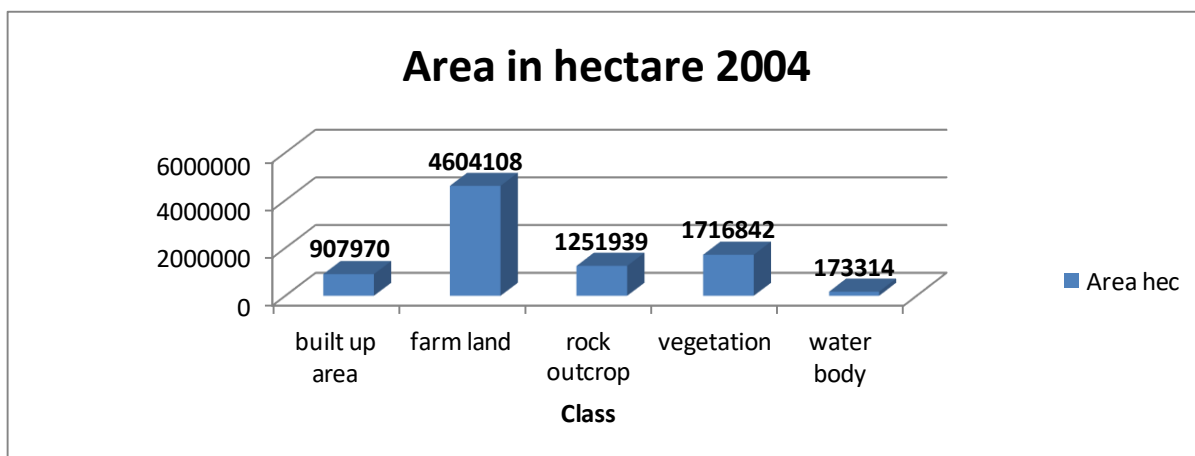


Figure: 5. 2004 Land Cover Classes and their Respective Area Covered

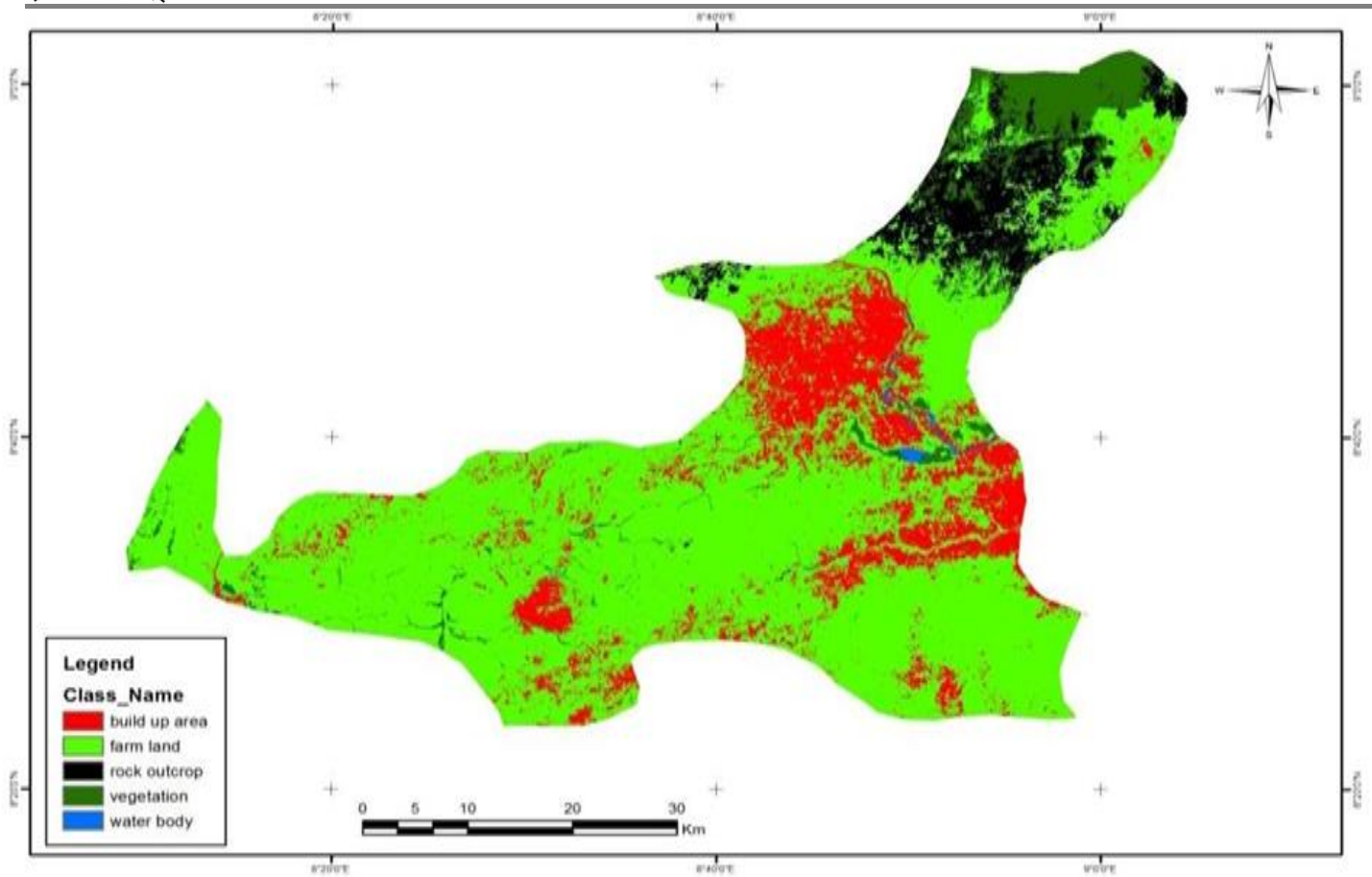


Figure: 6. Land Use Land Cover Map of Lafia LGA in 2014 Source: GIS/RS Analysis (2025)

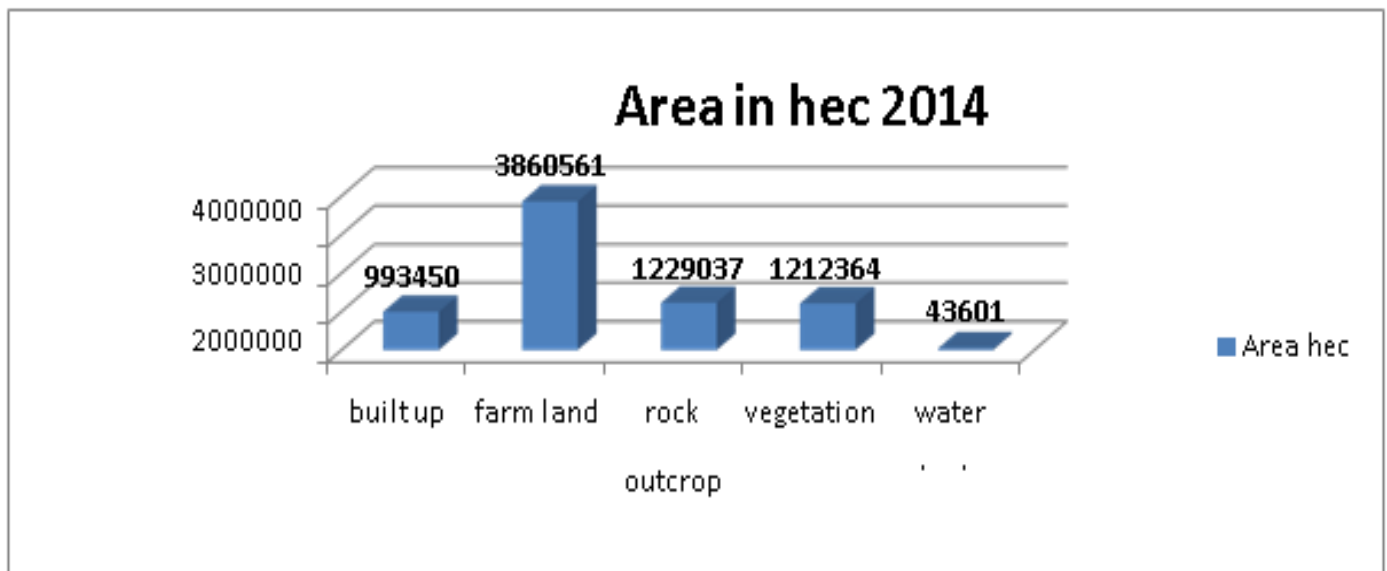


Figure: 7. 2014 Land cover Classes and their respective area covered

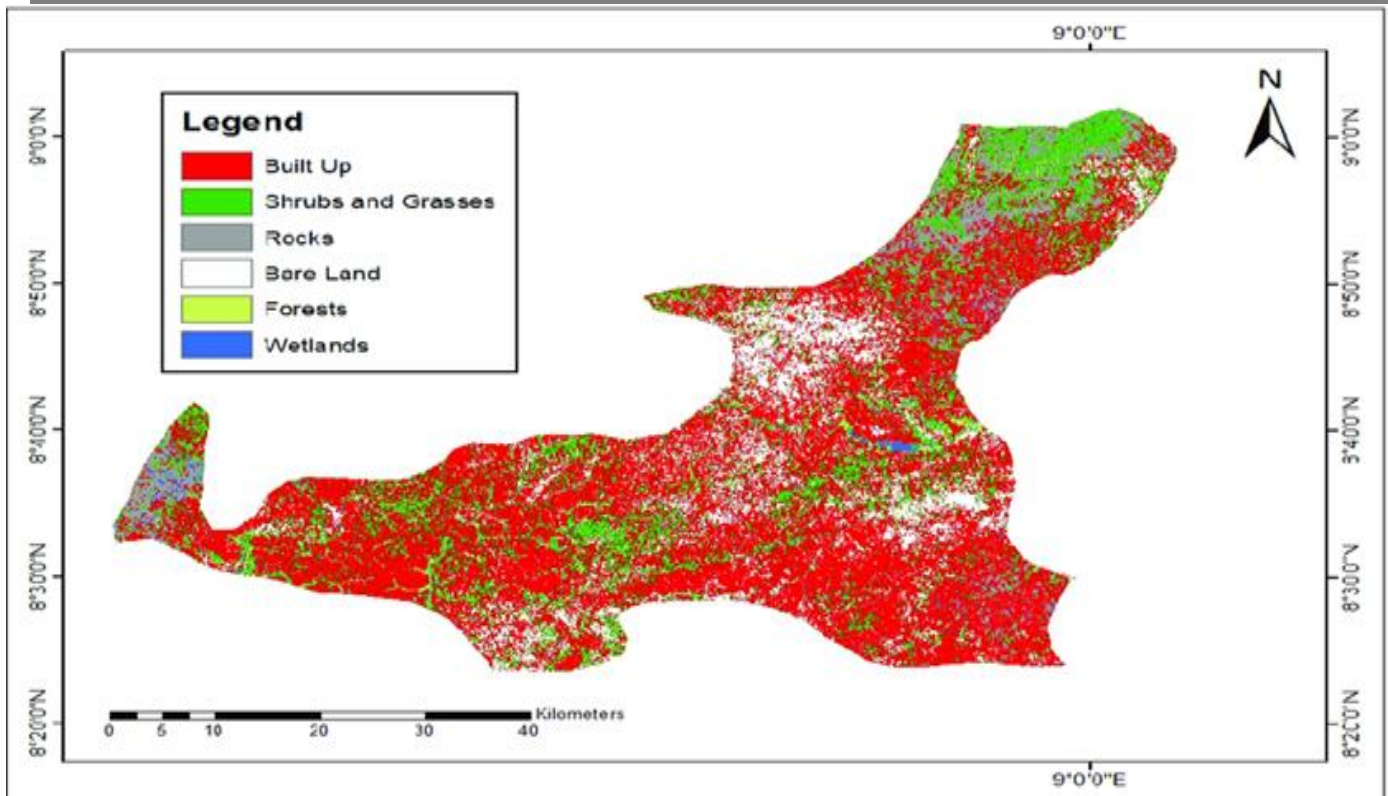


Figure: 8. Land Use Land Cover Map of Lafia LGA in 2024

Determinants of Food Security: A binary logit regression model was used to examine the determinants of household food security, as applied by Omotesho et al. (2006) and Oyebanjo et al. (2013). The logistic model is specified as:

$$F_i = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + b_8X_8 + b_9X_9 + b_{10}X_{10} + b_{11}X_{11} + b_{12}X_{12}$$

Where:

- F_i = Food security status (Dummy: 1 = food secure; 0 = food insecure)
- X_1 = Age of household head (years)
- X_2 = Level of education (years spent in schooling)
- X_3 = Farm size (hectares)
- X_4 = Farming experience (years)
- X_5 = Household size (number of persons)
- X_6 = Credit access (dummy: 1 = credit access; 0 = otherwise)
- X_7 = Gender (Male = 1, Female = 2)
- X_8 = Monthly income (₦)

Food security status was determined using the expenditure-based food security index (Omonona and Agoi, 2007; Zubairu and Maurice, 2014):

$$F_i = 2/3 \text{ per capita food expenditure for the household} / \text{mean per capita food expenditure of all households}$$

Where $F_i \geq 1$ = food secure household; $F_i < 1$ = food insecure household.

Table: 1. Determinants of Food Security status of the Respondents

LULC Class	1984	2004	2014	2024
Built-up	193,240	907,970	993,450	1,043,553
Farmland	5,822,596	46,041,808	3,860,561	12,370,561
Rock outcrop	1,787,392	1,251,939	12,229,037	11,110,58
Vegetation	178,689	1,716,842	1,212,364	1,102,214
Water body	15,163	17,314	43,601	41,601
Total	265,595.85	265,595.85	265,595.85	265,595.85

RESULTS AND DISCUSSION

Spatial Patterns of Land Use/Land Cover Changes (1984–2024)

The analysis revealed significant and consistent transformation in land use and land cover in Lafia LGA over the 40-year period. Table 1 presents the LULC statistics across the four time periods.

The findings reveal a marked expansion of built-up areas from 193,240 hectares in 1984 to 1,043,553 hectares in 2024, accompanied by a substantial decline in farmland from 5,822,596 hectares to 2,370,561 hectares over the same period. This spatial pattern indicates that urbanization has been the dominant driver of land cover change, with agricultural and natural landscapes being converted into residential, commercial, and administrative uses.

The progression from 1984 to 2024 illustrates a clear trend of urban encroachment into peri-urban and rural agrarian zones, fundamentally altering the spatial structure of the region. This finding is consistent with broader patterns observed in rapidly urbanizing regions of Sub-Saharan Africa, where urban expansion often occurs at the expense of agricultural land, thereby threatening local food systems (Seto et al., 2012; Lambin et al., 2001). The loss of prime agricultural land to residential, commercial, and infrastructural developments reduces the local capacity for food production, increasing dependence on external food sources. This aligns with studies in similar contexts, such as Addis Ababa, where urban sprawl has exacerbated food price volatility and heightened urban food insecurity (Minale, 2018).

Extent of Land Use/Land Cover (1984–2014)

The quantitative analysis confirmed a dramatic reduction in farmland from 5,822,596 hectares in 1984 to 3,860,561 hectares in 2014, representing a loss of approximately 1,962,035 hectares of agricultural land over three decades. Concurrently, built-up areas expanded significantly from 193,240 hectares to 993,450 hectares.

This loss of agricultural land underscores the direct and extensive impact of urban expansion on the area's capacity for local food production. The data confirms that urbanization has not only changed the pattern of land use but has also substantially reduced the physical extent of land available for agriculture, threatening the local food production base. The decline in farmland and the apparent upward trend in built-up areas identify a case of population increase in the study area, which serves as the seat of government and center of administration of Nasarawa State.

Population growth in Lafia increased steadily from 1984 to 2024, rising from approximately 330,712 in 2006 to an estimated 509,300 by 2024. This demographic pressure has accelerated the conversion of peri-urban agricultural lands into built environments. Similar patterns have been observed in other state capitals across Nigeria, where population influx—driven by administrative, educational, and economic opportunities—has intensified competition for land (Chunwate et al., 2019).

Socio-Economic Characteristics of Rural Households

The socioeconomic analysis revealed that 86.7% of respondents were male and 13.3% were female, indicating that most households in the study area are headed by males, in line with traditional African cultural norms (Amaza et al., 2006). The marital status distribution showed 77.5% married, 18% single, 2.5% separated, and 1.7% widowed, suggesting that marriage remains a dominant social institution with implications for household food security through pooled labor resources and risk-sharing arrangements (Gordon & Craig, 2001).

Educational attainment showed that 70% of respondents had some level of formal education, with 24% having primary education, 23% tertiary, and 22.5% secondary education. This implies that literacy levels facilitated the adoption of improved farming practices, thereby enhancing food security (Tashikalma et al., 2015). The average household size was 6 persons, with 48.3% of households having 1-5 members and 40.8% having 6-10 members. The average farm size was 2.6 hectares, suggesting that most respondents were small-scale farmers primarily producing for household consumption (Oladele, 2001).

Land ownership was predominantly through inheritance (82.5%), with 27.5% purchasing land and 15.0% renting. Notably, 85.0% of respondents obtained food from their family farm, while 57.5% purchased food, indicating that most respondents relied on their farm produce, which helps reduce household expenses.

Food Security Status of Rural Households

Using the expenditure-based food security index, the 2/3 mean per capita monthly food expenditure was calculated as ₦40,712.50. Households with per capita food expenditure below this threshold were classified as food insecure, while those equal to or above were classified as food secure. The results revealed that 61.7% of households were food secure, while 38.3% were food insecure.

This prevalence rate is lower than the national average reported by the World Food Programme (2023), which estimated that 63% of Nigerians experience moderate to severe food insecurity. The relatively higher food security in Lafia may reflect the study area's status as a state capital, with better access to markets, infrastructure, and economic opportunities compared to more remote rural areas. However, the finding that nearly 40% of households remain food insecure is a cause for concern, particularly given that the study was conducted in a relatively well-served urban/peri-urban context. The food security index (poverty line) of ₦27,141.67 per capita per month indicates that households below this threshold struggle to meet basic caloric and nutritional needs.

Determinants of Food Security

Logistic regression was used to analyze the influence of socioeconomic variables on food security status. The R-squared value was 0.492, indicating that the independent variables explained 49% of the variation in food security status. At the 5% level of probability, the regression coefficients of membership in farmers' groups and income were positive and significant.

Table 2: Determinants of Food Security Status of Respondents

Variable	Coefficient	Std. Error	t-stat	Sig.
Constant	1.011	.375	2.692	.008
Years spent in formal education	.008	.019	-.410	.683
Farming Experience	.019	.045	.413	.681
Annual Income	8.745	.000	3.654	.005**
Farm Size	.043	.071	.603	.548
Household Size	.036	.030	1.223	.225
Extension Contact	-.008	.183	-.043	.966
Gender	-.453	.280	-1.614	.110
Membership Cooperative	.287	.047	6.085	.002**

Source: Field work, 2025

****Significant at 1% level**

The estimated coefficient of years of schooling was .008 and positively related to food security, implying that a one-year increase in education level helps reduce the chances of falling into food insecurity. This finding shows that education is important in facilitating the adoption of innovation, which in turn helps households engage in economic activities to boost household income and achieve food security.

The parameter estimate of farm size was positive (0.43) but statistically insignificant. This implies that an increase in farm size, all things being equal, increases the odds of being food secure. This finding aligns with Babatunde et al. (2008), who opined that increase in farm size reduces chances of food insecurity.

The coefficient of household size was .036 and positive, signifying that an additional increase in household members increases the probability of a household falling into food security status, especially if household members are economically active (Babatunde et al., 2008).

Membership in cooperative society was found to be a vital socio-economic instrument in dealing with food security in the rural area. The coefficient of cooperative membership was positive (0.287) and significant at the 1% level. The result indicates that the likelihood of a household being food secure increases with membership in a cooperative society. Being a member of a cooperative can help households become food secure because it offers opportunities to access production inputs at cheaper rates.

However, the coefficients of extension contacts and gender were negatively signed. This suggests that existing agricultural extension services may not be effectively reaching or addressing the needs of farmers in Lafia, a gap noted in other Nigerian studies where extension systems are often under-resourced or poorly targeted (Idoko, 2016). The gender dimension also highlights persistent inequalities in access to resources, which can limit the food security of female-headed households (Doss et al., 2018).

CONCLUSION AND RECOMMENDATIONS

Conclusion

This study investigated the impact of urbanization on food security in Lafia Local Government Area, Nasarawa State, Nigeria, from 1984 to 2024. Using a mixed-methods approach—including GIS/remote sensing for land use analysis and logistic regression for socioeconomic determinants—the research reveals that rapid urban expansion has significantly reduced agricultural land, threatening local food production.

To identify the spatial patterns of land use/land cover changes, the study revealed a significant and consistent transformation, with a marked expansion of built-up areas and substantial decline in farmland and vegetation cover. Urbanization has been the dominant driver of land cover change, with agricultural and natural landscapes being converted into residential, commercial, and administrative uses.

To determine the extent of land use/land cover, the quantitative analysis confirmed a dramatic reduction in farmland from 5,822,596 hectares in 1984 to 3,860,561 hectares in 2014. This loss of agricultural land underscores the direct and extensive impact of urban expansion on the area's capacity for local food production.

To estimate the determinants of food security, the socio-economic analysis identified annual income and membership in cooperative societies as the most significant positive determinants of household food security in Lafia. Factors such as education level and farm size also showed positive correlations. The findings emphasize that economic empowerment, social capital (through cooperatives), and resource access are critical for enhancing household resilience to food insecurity.

In general, this study conclusively demonstrates that rapid urbanization in Lafia Local Government Area has

profoundly impacted land use and undermined local food security. The conversion of prime agricultural land into built-up environments, driven by population growth and urban expansion, has directly reduced the area available for food production, increasing reliance on external markets and making the urban population more vulnerable to food price volatility. The determinants of food security identified—particularly income and cooperative membership—point to the need for strategies that bolster economic resilience and community-based support systems among affected populations.

Recommendations

Based on the findings, the following recommendations are proposed:

For Land Use Planning and Management:

1. **Implement GIS-Based Land Use Monitoring Systems:** Establish a continuous, real-time land use monitoring system using GIS and remote sensing to track urban expansion and agricultural land loss, enabling proactive planning and early intervention.
2. **Develop Land Use Zoning Policy:** Introduce and enforce strict zoning regulations that designate and protect agricultural zones, green belts, and peri-urban farmland from unplanned urban encroachment.
3. **Promote Compact Urban Development:** Encourage vertical and infill development within existing urban areas to reduce horizontal sprawl and preserve surrounding agricultural and natural landscapes.
4. **Establish an Agricultural Land Reserve:** Legally designate and protect high-value agricultural land to ensure its long-term availability for food production.

For Enhancing Food Security:

5. **Strengthen Cooperative Societies and Farmer Groups:** Provide financial and technical support to existing cooperatives and encourage the formation of new ones to improve access to credit, inputs, and markets.
6. **Enhance Household Income and Livelihood Diversification:** Develop and promote non-farm income-generating activities, vocational training, and micro-enterprise support to boost household resilience to food insecurity.
7. **Improve Agricultural Extension Services:** Revitalize extension services with targeted, gender-sensitive programs that provide training in climate-resilient farming, sustainable practices, and post-harvest management.
8. **Address Gender Disparities in Agriculture:** Implement policies and programs that ensure women have equal access to land, credit, inputs, and training to improve food security in female-headed households.
9. **Agricultural Credit:** Make agricultural credit available to farmers to boost farm production, which in turn will lead to food security. Government should encourage farmers to borrow money on a regular basis from microfinance banks through favorable lending terms.
10. **Agricultural Policy:** Government should formulate agricultural policy aimed at reducing and regulating the price of agricultural inputs with the aim of encouraging agricultural production to reduce the incidence of food insecurity among farming households.

Without deliberate intervention to balance urban growth with agricultural sustainability, urbanization will continue to pose a significant threat to food security in Lafia and similar rapidly urbanizing regions in Nigeria and Sub-Saharan Africa.

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