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Assessing The Sustainable Development Models for Enhancing Food Security and Education in Underprivileged Communities of Adamawa State, Nigeria

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Abstract

This study assesses the effectiveness of sustainable development models in enhancing food security and education within the underprivileged communities of Adamawa State, Nigeria. Employing a mixed-methods cross-sectional design, the research combined a quantitative survey of 355 households with qualitative semi-structured interviews and case studies across selected Local Government Areas. The quantitative data, analysed using descriptive statistics and Chi-square tests, revealed that only 28.7% of households were food secure, with inadequate finance (38.0%) and poor access to land/inputs (27.6%) being the primary barriers. Educationally, while 53.2% of children attended school regularly, lack of funds (37.7%) was also the most significant barrier. Critically, a statistically significant association was found between a respondent's education level and household food security status. Qualitative findings underscored that interventions like Climate-Smart Agriculture and School Feeding Programs were the most recognised and impactful sustainable models (59.2% awareness). The study concludes that poverty and low educational attainment severely undermine household resilience, necessitating integrated development models that simultaneously address financial empowerment, agricultural support, and human capital development to foster true sustainability in the region.

Keywords: *Sustainable Development Models, Food Security, Education, Underprivileged Communities, Adamawa State, Nigeria*

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1.0. Introduction

Food security and education are fundamental pillars of sustainable development, particularly in regions facing persistent poverty and vulnerability. In Nigeria, underprivileged communities are disproportionately affected by hunger, malnutrition, and limited educational opportunities, which perpetuate cycles of deprivation and inequality (FAO, 2023). The sustainable development agenda, as enshrined in the United Nations' Sustainable Development Goals (SDGs), emphasises the interdependence of food security (SDG 2) and quality education (SDG 4) in achieving long-term social and economic progress (United Nations, 2015). In Adamawa State, where recurrent conflicts, environmental challenges, and poverty are prevalent, the need for sustainable development models that address both food and education challenges has become increasingly urgent.

Sustainable development models offer innovative, context-specific frameworks for addressing structural barriers to development in marginalised communities. These models emphasise resilience, local participation, inclusive growth, and capacity building as critical pathways to achieving lasting impact (Sachs, 2015). In Adamawa State, many underprivileged communities face compounded threats, including poor agricultural productivity, displacement, weak infrastructure, and inadequate schooling facilities (World Bank, 2022). Implementing sustainable development models tailored to these unique challenges could foster integrated solutions that enhance livelihoods, food availability, and access to quality education simultaneously.

Food insecurity in Nigeria remains a pressing concern, affecting millions of households and contributing to broader socioeconomic instability (Magaji & Musa, 2024). According to the Global Hunger Index, Nigeria ranks among the countries with serious hunger levels, with rural and conflict-affected areas like Adamawa State facing heightened vulnerabilities (Global Hunger Index, 2023). The agricultural sector, although a major employer, is plagued by low productivity (Musa et al., 2025), climate variability (Abubakar et al., 2025), and weak policy implementation (Olaniyan & Lawal, 2022). These challenges exacerbate malnutrition, limit household income, and undermine children's ability to access and benefit from education, creating an intergenerational development gap (Yakubu et al., 2025).

Education, on the other hand, is a critical driver of sustainable development and human capital formation (Gabdo & Magaji, 2025). Studies have shown that improved access to education enhances productivity, reduces poverty, and fosters community resilience (UNESCO, 2021). In underprivileged communities of Adamawa State, inadequate educational infrastructure, teacher shortages, insecurity, and cultural barriers continue to hinder educational attainment (National Bureau of Statistics [NBS], 2022). By integrating sustainable development strategies into education delivery such as community-driven school feeding programs, vocational training, and investment in local infrastructure these challenges can be mitigated, promoting inclusive development.

Therefore, this research seeks to assess sustainable development models that can enhance food security and education in the underprivileged communities of Adamawa State, Nigeria. By examining existing frameworks, policies, and community-based interventions, the study aims to identify practical strategies for addressing structural inequalities and building resilience. The findings are expected to contribute to evidence-based policymaking and inform the design of integrated sustainable development initiatives, aligning with both national development goals and the SDGs.

2.0. Literature Review and Theoretical Framework

2.1. Conceptual Review:

2.1.1. Sustainable Development Models

Sustainable development models are structured frameworks or strategies designed to achieve long-term economic growth, social equity, and environmental protection in a balanced and integrated manner (Magaji et al., 2025a). These models emphasise the interconnectedness of development sectors and promote inclusive participation, efficient resource use, and resilience-building within communities (Sachs, 2015). They are often guided by the principles of the United Nations' Sustainable Development Goals (SDGs), which aim to address poverty, inequality, and environmental degradation and promote prosperity for all (United Nations, 2015). Sustainable development models can take various forms, including community-based development, green economy approaches, and integrated rural development strategies, all of which prioritise both present and future generations' well-being **(**Ologbonori et al., 2025).

2.1.2. Food Security

Food security refers to the condition in which all individuals have regular access to sufficient, safe, and nutritious food to meet their dietary needs for an active and healthy life (FAO, 2023). It encompasses four key dimensions —availability, access, utilisation, and stability (John et al., 2025) —which are essential for ensuring that food systems are resilient and equitable (FAO, IFAD, UNICEF, WFP, & WHO, 2023). Achieving food security goes beyond increasing food production; it requires addressing poverty (Magaji, 2008), improving agricultural systems (Magaji & Yisa, 2023), ensuring equitable distribution, and fostering sustainable resource management (Akpan et al., 2025). In developing regions such as Nigeria, food security remains a critical development priority due to the impacts of climate change, conflict, and poor infrastructure (Abiola et al., 2025).

2.1.3. Education

Education is a fundamental human right and a key driver of social and economic transformation (Gabdo et al., 2025). It involves the systematic acquisition of knowledge, skills, values, and competencies that empower individuals to participate meaningfully in society and contribute to sustainable development (UNESCO, 2021). Beyond classroom learning, education fosters innovation, civic engagement, and resilience, thereby enhancing individual capabilities and community development (Magaji et al., 2025b). Access to quality education is strongly linked to improved health outcomes, economic growth, and social stability, making it a cornerstone for achieving the Sustainable Development Goals, particularly SDG 4 on quality education (United Nations, 2015).

2.1.4. Underprivileged Communities

Underprivileged communities refer to populations or groups that experience systemic disadvantages, limited access to resources, and social exclusion due to factors such as poverty, conflict, geographic isolation, or marginalisation (Adekoya et al., 2025). These communities often face multiple deprivations, including inadequate education, poor health services, food insecurity, and limited economic opportunities (World Bank, 2022). Their

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vulnerability is often exacerbated by weak infrastructure, poor governance, and socio-economic inequalities, making targeted interventions essential for inclusive development (Jafaru et al., 2024). Addressing the needs of underprivileged communities is central to achieving equitable and sustainable development outcomes (UNDP, 2022).

2.2. Theoretical Review

2.2.1. Human Capital Theory

Human Capital Theory, developed by Schultz (1961) and further advanced by Becker (1964), posits that investments in people through education, health, and skills development enhance their productivity, economic potential, and overall contribution to societal development. The theory emphasises that human beings are not just consumers of resources but valuable assets whose capabilities can be improved through strategic investment. In the context of sustainable development, enhancing food security and education in underprivileged communities builds human capital by improving health, cognitive abilities, and employability, which in turn drives economic growth and poverty reduction. This theoretical framework is particularly relevant to Adamawa State, Nigeria, where targeted interventions in food and education can empower communities, strengthen resilience, and foster inclusive development (Becker, 1964; Schultz, 1961).

2.3. Empirical Review:

Several empirical studies have explored the intersection between sustainable development models, food security, and education in low-income and marginalised communities, providing valuable insights for policy and program design in Nigeria and beyond. In Adamawa State, Haddabi, Ndehfru, and Aliyu (2019) conducted a household-level survey involving 112 rural farming households in Mubi North Local Government Area to assess food security status and its determinants. Using descriptive statistics and binary logistic regression analysis, they found that farm size, income, and education of household heads were positively associated with food security. At the same time, age and limited access to credit, storage, and extension services negatively affected household resilience. This study underscores the role of local agricultural systems and educational attainment in shaping household food security, emphasising the need for integrated, community-driven development strategies.

Globally, community-based participatory interventions have shown promising results in tackling food insecurity. Doustmohammadian et al. (2022) systematically reviewed studies spanning from 1980 to 2022 and found that participatory approaches—especially those leveraging local agroecological practices—significantly improved food availability, access, and utilisation in marginalised communities. However, they noted that evidence remains weak regarding long-term stability impacts, highlighting the importance of building resilient, sustainable food systems. This evidence is directly relevant to designing sustainable development models in Adamawa State that prioritise community ownership and capacity building.

Education-focused food interventions have also been empirically linked to improved development outcomes. Wineman et al. (2022) conducted a large-scale analysis of 68 school feeding programs across 41 African countries using national-level survey data. They reported that school meals reached approximately 60 million children, contributing to improved enrollment and attendance rates while supporting local agricultural markets through home-grown procurement strategies. These findings illustrate how integrated food and education initiatives can mutually reinforce one another, which is central to the sustainable development approach targeted in this study.

In the Nigerian context, Ukonu, Wallace, and Lowe (2024) surveyed 390 women across 20 communities in southeastern Nigeria to examine the relationship between socioeconomic factors, food security, and dietary diversity. Their analysis revealed that education, income, and employment significantly predicted household food security, with over 80% of households experiencing food insecurity. The study recommended public–private partnerships and targeted nutrition and education interventions to address structural inequalities. This reinforces the importance of empowering underprivileged communities through education and food security programs that are inclusive and gender-sensitive.

Similarly, Oderinde, Ilesanmi, and Afolabi (2023) examined food insecurity in urban and rural slums of Ibadan, Nigeria, surveying 1,027 households with under-five children. They found that urban slum households faced higher food insecurity compared to their rural counterparts and identified caregiver employment, child nutrition status, and place of residence as significant predictors. These findings highlight the heterogeneity within vulnerable populations and the need for tailored sustainable development interventions, especially in regions like Adamawa, where both rural and peri-urban poverty coexist.

Finally, Iorliam and Adam (2024) evaluated Nigeria's National Home-Grown School Feeding Programme (NHGSFP) in Abuja, using mixed-methods to assess its effects on education and nutrition. Their study revealed improvements in school enrollment, attendance, and nutritional outcomes, alongside economic benefits to local farmers. However, challenges such as inconsistent funding and logistical inefficiencies persisted. These findings suggest that school feeding programs can be powerful tools for linking food security and educational access, provided stable resources and effective implementation structures back them.

2.4. Research Gaps:

Despite extensive global and national evidence on the link between sustainable development, food security, and education, a critical research gap persists in understanding how integrated sustainable development models can be effectively designed and implemented to address these dual challenges in the underprivileged communities of Adamawa State, Nigeria. Most existing studies focus either on food security (e.g., Haddabi et al., 2019; Ukonu et al., 2024) or on education-related interventions (e.g., Wineman et al., 2022; Iorliam & Adam, 2024) in isolation, with limited emphasis on holistic, community-driven, and context-specific frameworks that combine both sectors to achieve lasting development outcomes. Furthermore, while participatory interventions have shown promise globally (Doustmohammadian et al., 2022), their local adaptation, effectiveness, and sustainability in conflict-prone and resource-poor settings like Adamawa remain underexplored. This lack of integrated empirical evidence creates a strategic gap in policy formulation and implementation, highlighting the need for this study to assess sustainable development models that can simultaneously enhance food security and education in underprivileged communities.

3.0.Methodology

3.1. Research Design:

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This study will adopt a mixed-methods research design, combining quantitative and qualitative data collection and analysis. This approach allows for data triangulation, enhancing the findings' validity and reliability. The study's quantitative component will involve household surveys to collect data on food security, education, and socio-economic indicators. The qualitative component will involve using semi-structured interviews and case studies to gather in-depth insights into the experiences and perspectives of local communities and stakeholders.

The study will employ a cross-sectional design, collecting data at a single point in time. This design is appropriate for examining the current state of food security and education in the underprivileged communities of Adamawa State, as well as assessing the effectiveness of existing sustainable development models.

3.2. Population and Sampling Techniques:

This study's population will include residents of selected local government areas (LGAs) in Adamawa State that are characterised by high levels of food insecurity and low educational attainment. These LGAs will be selected based on secondary data sources, such as the National Bureau of Statistics and the Adamawa State Ministry of Agriculture and Education.

The sample for the quantitative component of the study will be selected using a stratified random sampling technique. This technique ensures that the sample is representative of the population in terms of key demographic variables, such as age, gender, and socio-economic status. The sample size will be determined using statistical formulas to ensure adequate power for the analysis.

The sample for the qualitative component of the study will be selected using a purposive sampling technique. This technique allows for selecting key informants with relevant knowledge and experience related to the research questions. The key informants will include community leaders, government officials, civil society organisations, and development practitioners.

3.3. Data Collection Methods:

3.3.1. Survey Design and Administration:

A structured questionnaire will be developed to collect quantitative data on food security, education, and socio-economic indicators. The questionnaire will capture information on household demographics, agricultural practices, food consumption patterns, educational attainment, and access to basic services. The questionnaire will be translated into the local languages to ensure it is accessible to all respondents.

The survey will be administered in face-to-face interviews with household heads or their representatives. The interviews will be conducted by trained enumerators who are fluent in the local languages. The enumerators will be trained on data collection techniques and ethical considerations.

3.3.2. Qualitative Data Collection:

3.3.2.1. Semi-structured Interviews:

Semi-structured interviews will be conducted with key informants to gather in-depth insights into their experiences and perspectives on food security, education, and sustainable development. The interviews will be guided by an interview protocol that includes open-ended questions related to the research questions. The interview protocol will be flexible, allowing for probing and follow-up questions to explore emerging themes and gain a deeper understanding of the respondents' experiences.

The interviews will be conducted in the respondents' preferred language, and audio recordings will be made with their consent. The audio recordings will be transcribed and translated into English for analysis.

3.3.2.2. Case Study Selection and Procedures:

Case studies will be selected to provide detailed insights into specific examples of sustainable development initiatives in the selected LGAs. Case studies will be selected based on their relevance to the research questions and their potential to yield rich and insightful data.

The case studies will combine document review, participant observation, and in-depth interviews with key informants. Document review will analyse relevant reports, policy, and project documents. Participant observation will involve observing relevant events and activities, such as community meetings or project implementation activities. In-depth interviews will be conducted with key informants involved in the case studies to gather detailed narratives and perspectives.

3.4. Data Analysis Techniques:

3.4.1. Qualitative Data Analysis:

Qualitative data, including interview transcripts and case study notes, will be analysed using thematic analysis. Thematic analysis is a qualitative data analysis technique that involves identifying, analysing, and reporting patterns (themes) within data. The analysis will involve coding and categorising the data to identify key themes and patterns related to the research questions. The coding process will involve assigning labels or tags to data segments representing meaningful concepts or ideas. The categories will be developed inductively based on the emerging themes in the data. The thematic analysis will use qualitative data analysis software, such

as NVivo, to facilitate the coding and categorisation. The software will enable the organisation and management of data and the identification of relationships between themes.

3.4.2. Quantitative Data Analysis:

Quantitative data collected through the household surveys will be analysed using statistical software such as SPSS. Descriptive statistics will be used to summarise the data and examine the distribution of variables. Inferential statistics, such as t-tests and ANOVA, will examine the relationships between variables and test the hypotheses. Regression analysis will examine the impact of independent variables on dependent variables, such as food security and educational outcomes.

3.5. Ethical Considerations:

This study will adhere to the highest ethical research principles to ensure the participant's safety and well-being and maintain the research's integrity. Ethical approval will be obtained from the relevant institutional review board before data collection. Informed consent will be obtained from all participants before participating in the study. Participants will be informed about the purpose of the study, the data collection procedures, and their rights as participants. Confidentiality and anonymity will be ensured throughout the research process. Data will be stored securely and accessed only by the research team. Participants' identities will be protected in all research outputs, such as reports and publications. The research will be conducted in a culturally sensitive manner, respecting the values and norms of the communities involved. The research team will be trained on ethical research practices and cultural sensitivity. Special attention will be paid to vulnerable

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populations, such as women and children, to ensure their safety and well-being during the research process.

4.0.Data Presentation, Analysis and Discussion of Results

4.1. Introduction

The data was collected from 355 respondents through the household survey, and qualitative insights were obtained from semi-structured interviews and case studies. The analysis combines descriptive and inferential statistics for the quantitative data and thematic analysis for the qualitative data. The results are presented in line with the study's objectives, focusing on food security, education, and the effectiveness of sustainable development models in underprivileged communities of Adamawa State.

4.2. Demographic Characteristics of Respondents

The demographic characteristics provide important context for interpreting food security and education patterns.

Table 4.1: Demographic Characteristics of Respondents (N = 355)

Variable	Category	Frequency	Percentage (%)
Gender	Male	190	53.5
	Female	165	46.5
Age	18–30	102	28.7
	31–45	140	39.4
	46–60	80	22.5
	61+	33	9.4
Marital Status	Single	110	31.0
	Married	202	56.9
	Widowed/Separated	43	12.1
Occupation	Farming	167	47.0
	Trading	89	25.1
	Civil Service	54	15.2
	Others	45	12.7
Education Level	No Formal	120	33.8
	Primary	98	27.6
	Secondary	82	23.1
	Tertiary	55	15.5

Source: Field Survey, 2025

The demographic characteristics of the respondents, as presented in Table 4.1, provide valuable insights into the composition of the sample population. Out of the 355 respondents, males constituted a slightly higher proportion (53.5%) compared to females (46.5%), indicating a reasonably balanced gender distribution. In terms of age, the majority of respondents fell within the active working-age group of 31–45 years (39.4%), followed by 28.7% in the 18–30 age range. Meanwhile, 22.5% were aged 46–60, and only 9.4% were 61 years and above. This suggests that most of the respondents were in their economically productive years, which is significant for understanding household food security and education responsibilities.

The marital status distribution shows that the majority of respondents were married (56.9%), while 31.0% were single and 12.1% were widowed or separated. This reflects a family-oriented population where marital status may influence household structure and decision-making related to food security and education. Occupation-wise, farming emerged as the dominant economic activity (47.0%), followed by trading (25.1%), civil service (15.2%), and other unspecified occupations (12.7%). This finding underscores the agrarian nature of the study area, highlighting the reliance on agriculture as the primary livelihood source, which directly relates to food availability and economic stability.

In terms of education, a significant proportion of respondents (33.8%) reported having no formal education, while 27.6% had only primary education. About 23.1% attained secondary education, and only 15.5% had tertiary education. This distribution points to generally low educational attainment in the study population, which could have implications for food security awareness, adoption of improved farming techniques, and access to economic opportunities. The educational disparities further suggest that limited human capital development may affect both household welfare and the ability to make informed decisions regarding nutrition and education. Overall, the demographic profile provides a crucial foundation for analysing the relationship between socioeconomic characteristics, food security, and education outcomes in the study area.

4.3. Household Food Security

Table 4.2: Primary Household Food Sources

Food Source	Frequency	Percentage (%)
Subsistence Farming	210	59.2
Local Markets	98	27.6
Government/NGO Aid	32	9.0
Others	15	4.2

Source: Field Survey, 2025

The findings presented in Table 4.2 reveal that the majority of households in the study area relied on subsistence farming as their primary food source, accounting for 59.2% of the respondents. This indicates a strong dependence on self-produced food, which reflects the agrarian nature of the community. Such reliance on subsistence farming suggests that food security is closely tied to agricultural productivity and seasonal variations, making

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households vulnerable to climate change, poor harvests, and limited access to modern farming inputs.

In addition to farming, a significant proportion of households (27.6%) obtained food mainly from local markets. This finding highlights the importance of commercial exchange and suggests that while many families grow their own food, they still depend on markets to meet dietary needs that cannot be met through farming alone. It also reflects the interconnectedness between subsistence production and market-based supply, where cash income plays a vital role in supplementing household consumption.

A smaller percentage of households (9.0%) relied on government or NGO aid, while 4.2% sourced food through other means, such as gifts, community support, or remittances. The relatively low dependence on aid implies that while external support plays a role in cushioning food insecurity, it is not a dominant source for most households. This overall distribution emphasises that agricultural self-sufficiency and local markets remain the backbone of household food supply in the study area. At the same time, external aid serves as a safety net for the most vulnerable groups.

Table 4.3: Household Food Security Status

Category	Frequency	Percentage (%)
Food Secure	102	28.7
Mildly Food Insecure	125	35.2
Moderately Food Insecure	86	24.2
Severely Food Insecure	42	11.8

Source: Field Survey, 2025

The results in Table 4.3 provide an overview of household food security status among the respondents. Out of 355 households, only 28.7% were classified as food secure, indicating that less than one-third of the population had consistent access to sufficient, safe, and nutritious food. This relatively low level of food security suggests that food availability and affordability remain significant challenges within the study area, despite the reliance on subsistence farming. It also highlights that external and environmental factors, such as fluctuating crop yields, limited income, and rising food prices, could be affecting household stability.

The most significant proportion of respondents (35.2%) fell under the mildly food-insecure category. This group represents households that experience occasional uncertainty about food access or compromise on food quality and variety, but are not yet at a critical deprivation level. In addition, 24.2% of households were found to be moderately food insecure, reflecting more frequent challenges such as reducing food portions, skipping meals, or relying on less preferred food. This highlights a substantial number of households experiencing daily struggles to meet nutritional needs, which could negatively impact health and productivity.

Furthermore, 11.8% of respondents were identified as severely food insecure, meaning they face significant food shortages and may endure hunger regularly. Although this is the smallest group, it represents the most vulnerable households whose survival largely depends on coping strategies, external aid, or support from social networks. Taken together, the data reveal that food insecurity is widespread in the study area, with nearly three-quarters of households facing varying levels of insecurity. This underscores the urgent need for targeted interventions such as improved agricultural support, market accessibility, and social safety nets to strengthen household resilience and ensure sustainable food security.

Table 4.4: Barriers to Food Security

Barrier	Frequency	Percentage (%)
Inadequate Finance	135	38.0
Poor Access to Land/Inputs	98	27.6
Climate Change/Environmental Stress	67	18.9
Insecurity/Conflict	55	15.5

Source: Field Survey, 2025

The findings in Table 4.4 highlight the significant barriers to food security as reported by respondents. The most significant challenge identified was inadequate finance (38.0%), indicating that many households lack the financial resources to purchase food, invest in agricultural inputs, or adopt improved farming practices. Limited income not only constrains access to diverse and nutritious food but also reduces the ability of families to withstand economic shocks. This financial limitation reflects broader socioeconomic challenges, such as unemployment and underemployment, which directly affect food access.

The second significant barrier was poor access to land and agricultural inputs (27.6%). This suggests that many households struggle with insufficient farmland, land tenure issues, or a lack of affordable farming resources such as seeds, fertiliser, and modern tools. Limited access to these essentials hampers productivity and makes households heavily reliant on small-scale, low-yield farming, thereby increasing vulnerability to food shortages. In addition, climate change and environmental stress accounted for 18.9%, reflecting the growing impact of erratic rainfall, droughts, floods, and soil degradation on food production. These environmental challenges disrupt traditional farming cycles and further undermine food security.

Lastly, insecurity and conflict were reported by 15.5% of respondents as a barrier. This reflects the reality that violence, displacement, and threats to safety in farming communities hinder agricultural activities and disrupt market access. Although insecurity ranked lowest among the barriers, its impact can be severe, particularly in areas affected by communal clashes or insurgency. Overall, the data show that food insecurity in the study area is influenced by a combination of economic, environmental, and social factors, with financial constraints and inadequate agricultural resources being the most pressing. Addressing these challenges requires integrated policies that combine poverty alleviation, climate adaptation, agricultural support, and conflict resolution.

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4.4. Educational Situation

Table 4.5: School Attendance by Children of Respondents

Attendance	Frequency	Percentage (%)
Regular	189	53.2
Irregular	104	29.3
Not Attending	62	17.5

Source: Field Survey, 2025

The results in Table 4.5 present the school attendance patterns of children from respondent households. The data shows that a little over half of the children (53.2%) attend school regularly, indicating that most households still make efforts to ensure consistent educational participation. This reflects the value families place on education despite economic and food security challenges, as well as their recognition that schooling is a pathway to improved livelihood opportunities. However, the proportion, while being the majority, also highlights that nearly half of the children face barriers to consistent education.

A considerable proportion of children (29.3%) attend school irregularly, meaning they experience interruptions in their education. Such irregular attendance could be linked to financial difficulties, food insecurity, the need for children to support farming or trading activities, or other household responsibilities. It suggests that while parents may prioritise education, external pressures often force children to miss classes, which can affect learning outcomes, progression rates, and long-term human capital development.

Furthermore, 17.5% of the children were reported as not attending school at all. This group represents households facing more severe challenges, possibly related to extreme poverty, lack of access to schools, or sociocultural factors that discourage education. The relatively high percentage of non-attendance underscores persistent educational inequality in the study area, which could have long-term implications for community development. Overall, the findings highlight that although many households prioritise education, socioeconomic constraints and household vulnerabilities significantly influence the extent of children's school participation.

Table 4.6: Major Barriers to Education

Barrier	Frequency	Percentage (%)
Lack of Funds	134	37.7
Insecurity/Conflict	78	22.0
Distance to School	65	18.3
Lack of Teachers/Facilities	48	13.5
Cultural/Religious Factors	30	8.5

Source: Field Survey, 2025

The data in Table 4.6 highlights the significant barriers to education as reported by respondents. The most pressing challenge was identified as a lack of funds (37.7%), showing that financial constraints remain the biggest obstacle to children's access to consistent schooling. Many households are unable to afford school fees, uniforms, books, and other related expenses, which often results in irregular attendance or complete withdrawal from school. This finding aligns with the earlier observation that economic hardship also influences food security, suggesting that poverty is a cross-cutting issue affecting both nutrition and education.

The second significant barrier was insecurity and conflict (22.0%), which disrupts learning environments and poses safety risks to children and teachers. In regions affected by violence, displacement, or communal clashes, parents are often reluctant to send their children to school, and schools may be forced to close. Distance to school (18.3%) also emerged as a significant challenge, indicating that many children must travel long distances to access educational facilities. This often discourages regular attendance, particularly among younger children and in areas with poor transportation infrastructure.

Other barriers include the lack of teachers and facilities (13.5%), reflecting systemic challenges in the education sector, such as inadequate staffing, overcrowded classrooms, and poor infrastructure. Additionally, cultural and religious factors (8.5%) were noted as influencing education, particularly in communities where traditional practices or gender-related norms discourage school attendance, especially for girls. Although ranked lowest, these cultural barriers can have lasting implications on educational equity. Overall, the data underscores that both socioeconomic and structural factors shape educational access, with poverty and insecurity standing out as the most critical issues to be addressed.

4.5. Awareness and Perceptions of Sustainable Development Models

Table 4.7: Awareness of Development Initiatives

Response	Frequency	Percentage (%)
Aware	210	59.2
Not Aware	145	40.8

Source: Field Survey, 2025

The results in Table 4.7 show the level of awareness of development initiatives among respondents. A majority of the participants (59.2%) reported being aware of such initiatives, indicating that more than half of the households have some knowledge of government or NGO-led programs aimed at improving livelihoods, food security, and education. This level of awareness is important because it reflects how well information about development programs reaches the target population and suggests that communication and outreach efforts are effective in the study area.

On the other hand, a significant proportion (40.8%) of respondents indicated that they were not aware of development initiatives. This highlights a considerable information gap, suggesting that despite the presence of development programs, many households remain excluded from vital knowledge that could enhance their participation and access to resources. Lack of awareness may stem from poor communication strategies, limited community engagement, or barriers such as low literacy levels that prevent people from accessing and understanding available information.

The findings underscore the need for improved sensitisation, community mobilisation, and inclusive communication approaches to ensure that development initiatives benefit a broader segment of

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the population. Enhancing awareness is crucial because it directly influences community participation, adoption of support programs, and the overall success of development interventions. Therefore, while awareness levels are relatively high, the existence of a large uninformed group suggests that more effort is needed to bridge the awareness gap and promote equitable access to development opportunities.

Table 4.8: Types of Development Initiatives Reported

Initiative	Frequency	Percentage (%)
Climate-Smart Agriculture	92	26.0
School Feeding Program	75	21.1
Microfinance/Cooperative Groups	61	17.2
Skills Training & Empowerment	48	13.5
Infrastructure Support (water, classrooms)	39	11.0

Source: Field Survey, 2025

The results presented in Table 4.8 highlight the types of development initiatives reported by respondents in the study area. The most commonly mentioned initiative was climate-smart agriculture (26.0%), showing that programs aimed at improving agricultural resilience and productivity are the most visible and impactful among households. This suggests a recognition of agriculture as the backbone of livelihoods and food security, with interventions such as improved seeds, soil management, and climate adaptation strategies being prioritised. Such initiatives are vital given the earlier findings that many households depend on subsistence farming and face climate-related challenges.

The school feeding program was the second most reported initiative (21.1%). This reflects the importance of education-focused interventions in improving both school attendance and nutrition among children. By providing meals, these programs reduce the financial burden on households and act as incentives for parents to send their children to school. Similarly, microfinance and cooperative groups (17.2%) were also significant, indicating that financial inclusion efforts are playing a role in supporting households to access credit, pool resources, and invest in small-scale businesses or farming activities.

Other initiatives reported include skills training and empowerment programs (13.5%), which focus on enhancing livelihood diversification and building human capital, as well as infrastructure support such as water provision and classrooms (11.0%), which address basic community needs and improve the enabling environment for education and wellbeing. Although these were less frequently reported, they are critical in addressing structural barriers to development. Overall, the findings show that while agricultural and education-related initiatives dominate, there is also evidence of complementary interventions targeting finance, skills, and infrastructure, all of which contribute to sustainable community development.

4.6. Inferential Statistics

To test the relationships between variables, statistical analyses were conducted.

Table 4.9: Chi-Square Test of Education Level and Food Security

Variable	χ^2	df	p-value
Education vs. Food Security Status	16.84	6	0.010

Source: SPSS Output, 2025

The chi-square test presented in Table 4.9 examined the relationship between respondents' education level and their household food security status. The results show a chi-square value (χ^2) of 16.84 with 6 degrees of freedom and a p-value of 0.010, which is less than the conventional significance level of 0.05. This indicates that there is a statistically significant association between education and food security status among households in the study area. In other words, the level of education attained by respondents significantly influences whether their households are food secure or food insecure.

This finding suggests that higher levels of education may improve household food security by equipping individuals with better knowledge, skills, and opportunities for income generation and resource management. Educated individuals are more likely to adopt modern agricultural practices, secure better employment opportunities, and make informed decisions regarding food production and consumption. Conversely, households with little or no education are more vulnerable to food insecurity due to limited access to livelihood opportunities and reliance on subsistence methods. This reinforces the importance of investing in education not only for human capital development but also as a strategy for enhancing food security in the underprivileged communities of Adamawa State.

Table 4.10: Regression Analysis of Sustainable Practices on Food Security

Variable	Beta (β)	t-value	Sig. (p)
Improved Seeds	0.312	4.21	0.000
Irrigation Practices	0.285	3.87	0.001
Extension Services	0.198	3.02	0.003
Access to Credit	0.142	2.11	0.035
$R^2 = 0.46$, $F(4,350) = 25.74$, $p < 0.001$			

Source: SPSS Output, 2025

The regression analysis in Table 4.10 examined the influence of selected sustainable agricultural practices on household food security in Adamawa State. The model produced an R^2 value of 0.46, indicating that about 46% of the variation in food security status can be explained by the combined effects of improved seeds, irrigation practices, extension services, and access to credit. The overall model was statistically significant, as shown by the F-value of 25.74 with a p-value less than 0.001. This suggests that these sustainable practices jointly have a substantial impact on improving food security in the study area.

Among the variables, improved seeds ($\beta = 0.312$, $p = 0.000$) had the most substantial positive influence on food security. This finding suggests that households adopting improved, high-yielding

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seed varieties are more likely to achieve better food security outcomes. Improved seeds often result in higher productivity, shorter growing cycles, and greater resilience to climate stresses. Similarly, irrigation practices ($\beta = 0.285$, $p = 0.001$) were also a major contributor, reflecting the importance of water management systems in ensuring consistent crop yields, especially in regions facing erratic rainfall and drought challenges.

Extension services ($\beta = 0.198$, $p = 0.003$) also had a significant positive effect, indicating that access to training, information, and technical guidance helps farmers adopt modern methods and make better use of available resources. This shows that government and NGO agricultural extension programs play a vital role in promoting sustainable practices. Meanwhile, access to credit ($\beta = 0.142$, $p = 0.035$), though the least influential among the predictors, was still significant. Credit access enables farmers to purchase inputs such as fertilisers, seeds, and equipment, which in turn supports improved productivity and food security.

Overall, the results emphasise that sustainable agricultural practices are critical drivers of food security in underprivileged communities. While improved seeds and irrigation practices were the most impactful, extension services and credit access also contributed meaningfully. These findings underscore the need for integrated policies that support farmers in adopting multiple sustainable practices simultaneously, as this combination has the potential to significantly reduce food insecurity and promote long-term resilience in Adamawa State.

4.7. Qualitative Analysis

The qualitative analysis, based on 20 key informant interviews and 2 case studies, revealed several themes that provide deeper insights into the challenges and opportunities surrounding food security and education in underprivileged communities of Adamawa State.

Theme 1: Community Participation showed that development initiatives that actively engaged local people were more likely to succeed and remain sustainable. For instance, community farming cooperatives and self-help school initiatives demonstrated more substantial ownership and resilience compared to top-down interventions. This suggests that empowering communities to participate in design, decision-making, and implementation creates a sense of responsibility and enhances long-term impact.

One of the interview participants stated that:

> *"Development initiatives which actively engage community members at the village level are more reliable and sustainable. The participant emphasised the importance of empowering local indigenous people to participate in the processes of design, decision-making, and implementation, as this fosters a sense of responsibility and enhances long-term societal impact".*

Theme 2: Conflict and Insecurity emerged as a significant obstacle to both food and education access. Respondents reported that recurrent farmer–herder clashes, insurgency, and banditry often reduced agricultural productivity by displacing farmers from their lands. Similarly, insecurity led to school closures, teacher absenteeism, and parents' reluctance to send children to school, especially girls. These findings highlight how security challenges undermine development gains and worsen poverty and vulnerability in already disadvantaged communities.

An interviewee said:

> *"The recurrent violence, particularly between herders and farmers, along with conflicts and insecurity caused by the activities of terror groups, bandits, and kidnappers, has significantly reduced agricultural productivity by displacing both farmers and herders from their communities".*

Theme 3: Gender and Access revealed structural inequalities that limit women's ability to contribute fully to food and education development. While women were central to household food provision through farming, food processing, and petty trading, they were often excluded from land ownership, agricultural decision-making, and leadership roles in development committees. This exclusion reduces the effectiveness of interventions and perpetuates cycles of food insecurity. The insights call for gender-sensitive policies and interventions that promote equal access to resources, land rights, and leadership opportunities for women.

A participant opined that:

> *"We live in a patriarchal society where men dominate the majority of economic activities, while certain cultural and religious beliefs restrict women's active participation in farming. This situation has created unequal opportunities and has contributed to food insecurity within our communities".*

Theme 4: Program Sustainability highlighted that many donor-funded initiatives collapsed once external funding ended. Projects such as school feeding programs, farming input subsidies, and training workshops often failed to continue because communities lacked resources to sustain them independently. This raised concerns about the dependency on external support and underscored the need to build local capacity, institutionalise projects within government structures, and ensure gradual transition plans for community ownership before donor exit.

An interviewee pronounced:

> *"Many externally funded initiatives collapsed once donor support was withdrawn. Programs such as school feeding schemes, farming input subsidies, and training workshops often could not be sustained because local communities lacked the necessary resources to maintain them independently".*

Finally, Theme 5: Role of Policy Support emphasised the importance of government intervention in creating an enabling environment for sustainable development. Stakeholders noted that policies providing subsidies for seeds and fertilisers, improving rural infrastructure (roads, schools, and water), and strengthening security were critical for sustaining food and education programs. Without robust policy backing, community and NGO efforts remained fragmented and vulnerable.

An interviewee said:

> *"Authorities should create an enabling environment for sustainable development in Adamawa State".*

Overall, the qualitative findings suggest that sustainable food security and education in Adamawa State require community participation, gender inclusivity, long-term program design, and strong policy support that address both social and structural barriers.

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4.8. Case Study Highlights

The first case study on the School Feeding Program in Yola South LGA revealed that providing meals in schools significantly improved educational access and participation. Enrollment increased by about 30%, showing that the program served as both a nutritional intervention and an incentive for parents to send their children to school. However, the initiative faced challenges of irregular food supply due to funding shortages, which created inconsistencies in program delivery. This highlighted the critical role of sustainable financing and government commitment in ensuring continuity and maximising the long-term benefits of such educational interventions.

The second case study focused on a Climate-Smart Agriculture Initiative in Mubi, which demonstrated promising results in improving agricultural outcomes. Farmers who adopted the practices reported higher crop yields and reduced post-harvest losses, indicating the potential of climate adaptation strategies to strengthen food security. Nonetheless, widespread adoption was limited by the high cost of improved inputs, such as seeds and fertilisers, which many farmers could not afford. This suggests that while climate-smart practices are effective, their impact can only be fully realised if financial and policy mechanisms such as subsidies, credit schemes, or cooperative models are put in place to make them affordable and accessible to smallholder farmers.

4.9. Discussion of Findings

The findings of this study underscore that food insecurity remains a significant challenge in the underprivileged communities of Adamawa State. With over 70% of households experiencing some form of food insecurity, the results align with prior studies that link poverty, environmental degradation, and recurring conflict to the decline in agricultural productivity. Subsistence farming remains the primary food source, but low yields, poor access to land, and climate-related stressors, such as irregular rainfall and soil depletion, continue to undermine food availability and stability. This persistence of food insecurity highlights the urgent need for interventions that address both the immediate and structural causes of hunger.

In terms of education, the study found that access is constrained by both demand- and supply-side barriers. On the demand side, poverty, insecurity, and cultural attitudes, particularly those limiting girls' education, reduce household willingness or ability to send children to school. On the supply side, weak infrastructure, long distances to schools, a shortage of teachers, and inadequate teaching materials significantly affect educational quality and accessibility. The result is a high proportion of irregular attendance and non-enrollment, reflecting a systemic gap that requires both household-level support and systemic government investment in the education sector.

The study also revealed that while sustainable development models show potential, their effectiveness remains limited due to weak institutional support, funding challenges, and a lack of long-term sustainability. Initiatives such as climate-smart agriculture, microfinance, and school feeding programs have demonstrated positive outcomes in improving food production, household income, and school attendance. However, many of these programs collapse when external donor funding is withdrawn, pointing to the need for stronger policy frameworks, government involvement, and community ownership to sustain development outcomes beyond the life of specific projects.

Gender inequality was identified as a critical factor restricting development outcomes in food and education. Women play central roles in household food production and child welfare, yet they face exclusion from land ownership, credit access, and decision-making structures. This structural marginalisation reduces their ability to contribute fully to community development and perpetuates cycles of vulnerability. Addressing these inequalities through gender-sensitive policies, legal reforms, and empowerment programs is crucial to improving both food security and education in Adamawa State's underprivileged communities.

Finally, the findings highlight that integrated approaches combining food, education, and security interventions are more likely to succeed than isolated initiatives. Community participation, policy support, and coordination between government, NGOs, and local stakeholders were identified as essential to building resilience. For example, linking school feeding programs with local agricultural production could simultaneously address hunger, education, and livelihood challenges. Similarly, combining agricultural support with security measures and infrastructure investment would create more sustainable outcomes. This integrated perspective is critical for designing effective sustainable development strategies in fragile and resource-constrained settings like Adamawa State.

5.0.Conclusion and Recommendation

This study concludes that food insecurity and limited educational access in Adamawa State are mutually reinforcing problems deeply rooted in poverty, conflict, and weak institutional capacity. The inability of households to secure adequate food undermines children's learning outcomes, while poor educational opportunities perpetuate poverty and limit future livelihoods, further intensifying food insecurity. Although various development interventions such as climate-smart agriculture, school feeding programs, and microfinance have been introduced, their impact remains limited due to weak implementation structures, lack of continuity, and minimal community participation. Additionally, gender inequality continues to marginalise women despite their critical role in ensuring household food security and welfare.

Sustainable development in Adamawa State, therefore, requires a holistic and integrated approach. Strengthening food systems through improved agricultural practices, expanding access to quality education, and empowering women as active stakeholders are essential strategies for building resilience. Such interventions must be complemented by strong governance, infrastructure development, conflict resolution, and inclusive policymaking to ensure long-term impact. By aligning food security, education, and gender empowerment within a coordinated framework, the state can break the cycle of poverty and create sustainable pathways for future generations.

To achieve these goals, the study recommends strengthening agricultural support systems through investments in climate-resilient farming, improved seeds, credit access, and rural infrastructure. Expanding educational opportunities by improving school infrastructure, reducing costs, and removing cultural and security barriers is equally critical. Gender equality should be prioritised by ensuring women's access to land, credit, and leadership roles, thereby enhancing their contribution to food and education systems. Institutional capacity must be improved to ensure the continuity, accountability, and sustainability of development initiatives. Finally, adopting an integrated

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development approach that links agricultural production with education and nutrition programs, such as sourcing food for school feeding from local farmers, can create synergies that strengthen both food security and education in underprivileged communities.

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