

Farmer–Herder Crises and Its Implications on Food Security in Sankera, Benue State, Nigeria: An Empirical Mixed-Methods Study

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Abstract

Farmer–herder crises have increasingly disrupted agricultural production and rural livelihoods in parts of Benue State, with important implications for household food security. This study examined the implications of farmer–herder crises for food security among households in Sankera, Benue State, Nigeria, with particular attention to agricultural and livelihood disruption, household food access, and coping and mitigation responses. An empirical mixed-methods design was adopted, integrating quantitative household survey data with qualitative interview evidence. The quantitative component involved 400 respondents proportionately selected from Katsina-Ala (147), Logo (111), and Ukum (142) Local Government Areas. Household food insecurity was assessed using an adapted Household Food Insecurity Access Scale (HFIAS), with households compared according to conflict exposure, while qualitative data were analyzed thematically to explain the quantitative patterns. The findings showed that conflict-exposed households recorded significantly higher HFIAS scores than non-exposed households, indicating poorer food access among households affected by farmer–herder crises. Conflict was also associated with reductions in cultivated farm size and crop yields, declining household income, and disruption of agricultural livelihoods. Displaced households experienced poorer food-security outcomes than their non-displaced counterparts, demonstrating the additional vulnerability associated with displacement. Qualitative evidence further indicated that restricted access to farmland, loss of productive assets, reduced agricultural activity, income losses, and difficulties accessing markets and food contributed to household food insecurity. Households responded through livelihood diversification, food conservation, alternative agricultural activities, small-livestock production, and other forms of adaptive coping, while stakeholders identified farmer–herder dialogue, early-warning mechanisms, negotiated land-use arrangements, strengthened security, agricultural recovery support, and targeted social protection as important mitigation measures. The study

concludes that farmer–herder crises undermine food security in Sankera primarily through interconnected disruptions to agricultural production, household income, livelihood assets, and physical access to food. It recommends integrated conflict-prevention and livelihood-recovery interventions, including improved protection of agricultural communities, accessible farmland, agricultural inputs and recovery assistance, functional early-warning and mediation mechanisms, livelihood diversification, and targeted support for displaced and highly vulnerable households.

Keywords: *farmer–herder crises, food security, household food insecurity, agricultural livelihoods, conflict exposure, displacement, Sankera; Benue State, Nigeria.*

1.0 Introduction

Food security remains a major development challenge in sub-Saharan Africa. The contemporary understanding of food security extends beyond the physical availability of food to include people's economic and physical access to sufficient, safe and nutritious food, their ability to utilize food adequately, and the stability of these conditions over time. Global evidence indicates that conflicts, economic shocks, climate variability and disruptions to agrifood systems increasingly interact to undermine progress towards Sustainable Development Goal 2 (Zero Hunger). The problem is particularly important in Nigeria, where food insecurity has become increasingly intertwined with insecurity, agricultural production constraints, inflation and climate-related shocks. The Food and Agriculture Organization (FAO), in collaboration with the Nigerian government and food-security partners, reported that 33.1 million Nigerians were projected to experience acute food insecurity during the June–August 2025 lean season. The analysis identified economic hardship, inflation, climate shocks and persistent violence as important drivers of the deterioration in food security and specifically noted farmer–herder conflict among the factors aggravating food insecurity in north-central Nigeria, including Benue State (Food and Agriculture Organization [FAO], 2024). The situation is particularly significant in Benue State because agriculture constitutes a major component of rural livelihoods and the state occupies an important position in Nigeria's food-producing belt. Recurrent conflict between farming communities and pastoralists has disrupted this agricultural system through destruction of crops, killing or theft of livestock, abandonment of farmland, displacement, destruction of farm infrastructure, restricted movement and disruption of local markets.

Recent empirical research confirms that farmer–herder conflict in Benue is not merely a security problem but has substantial agricultural and livelihood implications. Mustafa and Sa'ad (2025), using conflict data and field observations, found that crop destruction, contamination of water bodies, grazing-related disputes and other resource-use problems were important features of farmer–herder conflict in Benue State. The consequences included displacement, agricultural losses and increased poverty. Similarly, research on farmer–herder conflict and agricultural production in Nigeria has shown that perceptions of conflict risk influence production decisions. Ma (2023) demonstrated that farmer–herder conflict risk affects rural households' production decisions, thereby establishing an important pathway through which insecurity can influence food systems. Recent evidence from Benue is even more compelling. Ijirshar et al. (2025) examined insecurity and agricultural output across eight conflict-affected LGAs in Benue State, including Katsina-Ala, Logo and Ukum. Their findings indicated reductions in crop and livestock output associated with insecurity, demonstrating the economic consequences of violence for agricultural households. Despite these studies, there remains a geographical and methodological gap. Much of the existing literature treats Benue State as a single analytical unit, focuses on conflict causes,

examines agricultural production generally, or uses qualitative/documentary approaches. Consequently, insufficient empirical attention has been given to the Sankera geopolitical axis, particularly to the relationship between household-level exposure to farmer–herder conflict and measurable dimensions of food security.

This study therefore focuses specifically on Sankera, comprising Katsina-Ala, Ukum and Logo Local Government Areas. It seeks to establish empirically whether and how exposure to farmer–herder crises affect household food security and agricultural livelihood outcomes.

1.1 Problem Statement

The recurrence of farmer–herder violence presents a serious threat to agricultural livelihoods in Sankera. Farming households depend heavily on access to land, labour, agricultural inputs, livestock, markets and relatively secure rural environments. Violent conflict can disrupt each of these components. When farmers fear attacks, they may reduce the size of land cultivated, delay planting, abandon farms or avoid distant agricultural plots. Conflict may also cause destruction of standing crops, loss of harvested produce, killing, or displacement of household members, destruction of farm equipment and increased expenditure on security and relocation. Such effects can reduce household income and agricultural output. The consequences extend beyond production. Displacement and market disruption can reduce households' physical and economic access to food, while declining income can force households to reduce meal frequency, consume less diverse diets, or rely on less preferred foods. In addition, insecurity can interrupt food distribution and increase transaction and transportation costs, thereby contributing to higher local food prices. National evidence demonstrates the seriousness of the broader food-security situation. FAO reported that 25.1 million Nigerians were experiencing acute food insecurity during October–December 2024, with the number projected to increase to 33.1 million during June–August 2025. Farmer–herder conflict was identified as one of the factors exacerbating food insecurity in north-central states, including Benue. However, aggregate national and state-level statistics cannot adequately explain the household-level mechanisms through which conflict affects food security in Sankera. There is therefore a need for empirical evidence capable of answering three related questions: how widespread is exposure to farmer–herder conflict among households in Sankera; what dimensions of agricultural livelihood are affected; and to what extent does conflict exposure predict household food insecurity? The absence of such localized evidence limits the ability of policymakers, development organizations, and local authorities to design conflict-sensitive food-security and agricultural-recovery interventions.

1.2 Aim and Objectives of the Study

1.2.1 Aim

The main aim of the study is to empirically examine the implications of farmer–herder crises for household food security in Sankera, Benue State, Nigeria.

1.2.2 Specific objectives

Specifically, the study seeks to:

1. Examine the extent and patterns of farmer-herder crises experienced by farming households in Katsina-Ala, Logo and Ukum Local Government Areas;
2. Assess the effects of farmer-herder crises on agricultural activities and livelihoods of farming households in Sankera;
3. Determine the implications of farmer-herder crises for household food security in Sankera,

and

4. Examine the coping and mitigation strategies adopted by households and other stakeholders in response to the effects of farmer-herder crises on agricultural livelihoods and food security.

1.3 Research Questions

The study was guided by the following research questions:

1. What is the extent and pattern of farmer-herder crises experienced by farming households in Katsina-Ala, Logo, and Ukum LGAs?
2. What effects do farmer-herder crises have on agricultural activities and livelihoods of farming households in Sankera?
3. What are the implications of farmer-herder crises for household food security in Sankera?
4. What coping and mitigation strategies are adopted by households and other stakeholders to address the effects of farmer-herder crises on agricultural livelihoods and food security?

1.4 Research Hypotheses

The following null hypotheses were tested at the 0.05 level of significance:

H₀₁: There is no significant relationship between exposure to farmer-herder crises and household food-security status among farming households in Sankera.

H₀₂: Farmer-herder crisis-related factors do not significantly predict household food-security outcomes among farming households in Sankera.

H₀₃: There is no significant difference in the level of exposure to farmer-herder crises among farming households in Katsina-Ala, Logo and Ukum LGAs.

H₀₄: There is no significant difference in household food-security status among farming households across Katsina-Ala, Logo and Ukum LGAs.

2.0 Literature Review

2.1 Conceptual framework

The conceptual framework for this study is built around four interrelated concepts: crop farmers, herders/herdsmen, farmer–herder crises, and food insecurity. The framework assumes that the interaction between crop-based agricultural livelihoods and pastoral livestock production can generate competition over land, water, crop residues, stock routes and other natural resources. Where institutional mechanisms for managing these competing interests are weak, disagreements may escalate into violent conflict. Such conflict can subsequently disrupt agricultural production, household livelihoods and the availability, accessibility and stability of food. The framework therefore conceptualizes farmer–herder crisis as an important pathway through which rural insecurity can influence household food-security outcomes in Sankera.

2.1.1 Concept of crop farmers

Crop farmers are individuals or households primarily engaged in the cultivation of land for the production of food and other agricultural crops. In rural economies such as those found in Benue State, crop farming is not merely an occupation but a major source of household food, income, employment, and livelihood security. Crop farmers depend directly on secure access to farmland, agricultural inputs, labour, water, and functioning markets.

In the Sankera axis, farming is predominantly smallholder-based, with households cultivating crops such as yam, cassava, maize, rice, sorghum, and legumes. The productivity of these households is consequently sensitive to disruptions in access to agricultural land and rural

infrastructure. When farmers cannot safely access their farms because of insecurity, the effects can extend beyond individual households to local food supplies and markets.

The vulnerability of crop farmers to farmer–herder conflict arises partly from the spatial overlap between crop cultivation and livestock mobility. Livestock entering cultivated fields may destroy crops, while farmers may perceive grazing on cultivated land as a direct threat to their livelihoods. Conversely, herders may perceive restrictions on traditional movement routes and access to water or grazing resources as threats to livestock production. Recent evidence from Benue indicates that crop destruction and other resource-use disputes constitute important dimensions of farmer–herder conflict (Mustafa & Sa'ad, 2025).

Sowunmi et al. (2025), in an empirical study of Benue State, found that farmer–herder conflicts had substantial economic and social consequences for crop-producing households. Their study reported widespread exposure to attacks among farming households and found that conflict was associated with reductions in actual crop output relative to expected production.

For the present study, therefore, crop farmers are conceptualized not simply as agricultural producers but as livelihood actors whose food security depends heavily on continued access to productive agricultural resources. Their vulnerability to conflict is expected to increase when violence restricts their ability to cultivate, harvest, transport or market agricultural produce.

2.1.2 Concept of herders/herdsmen

Herders are individuals or households whose livelihoods depend substantially on the management, movement, and production of livestock. Herding may involve sedentary, semi-sedentary, transhumant or nomadic systems, depending on the ecological environment, livestock-management practices and mobility requirements.

The term herdsman are frequently used in Nigerian public discourse to describe people engaged in livestock herding. However, in scholarly writing, the term herders is preferable because it is occupationally descriptive and avoids reducing a diverse population to a single identity. It is also important not to treat all pastoralists as participants in violence. The overwhelming majority of livestock producers should not automatically be equated with perpetrators of farmer–herder conflict. Pastoral livestock production requires access to grazing resources, water, stock routes, and suitable seasonal environments. Where these resources become increasingly constrained, interactions between livestock producers and crop farmers may become more competitive. Climate variability, population growth, agricultural expansion, changing land-use practices and the weakening or disappearance of traditional grazing corridors can intensify these pressures.

Ioryue (2024) argues that competition over land and water, compounded by population pressures and climate-related changes, constitutes an important dimension of farmer–herder conflict in Benue State. The relationship between herders and farmers should nevertheless be understood as more complex than a simple dichotomy between two homogeneous groups. Many rural households combine crop production and livestock ownership, while farmers may also own cattle and pastoral households may engage in crop cultivation. Consequently, the farmer–herder relationship can involve both competition and economic interdependence.

For the purpose of this study, herders are conceptualized as livestock-dependent livelihood actors whose access to grazing land, water, and livestock-mobility routes may intersect with the agricultural activities of crop farmers. Conflict emerges when these overlapping resource-use systems are inadequately regulated or when disputes over resources escalate into violence.

2.1.3 Concept of farmer–herder crisis

Farmer–herder crisis refers to recurrent disputes, tensions, and violent confrontations arising principally from interactions between crop-farming and livestock-herding activities. Although competition over land, water, and grazing resources constitutes an important component, the contemporary farmer–herder crisis cannot be explained exclusively through resource scarcity.

The crisis may involve several interconnected factors, including destruction of crops by livestock, disputes over grazing routes, competition over water resources, blockage or encroachment of stock routes, destruction or appropriation of grazing resources, livestock theft, reprisal attacks, destruction of farms and settlements, killings and injuries, displacement, destruction of stored agricultural products, and weak or ineffective conflict-resolution institutions. Recent evidence from Benue demonstrates the multidimensional character of the problem. Mustafa and Sa'ad (2025) identified cattle-related crop destruction, contamination of water bodies, grazing of fallow land and indiscriminate bush burning among important conflict-related problems. They also identified displacement, agricultural losses, degradation of farm products and increased poverty among significant consequences. The conflict therefore represents more than an interpersonal disagreement between individual farmers and herders. It can develop into a wider rural-security crisis affecting communities, markets, agricultural infrastructure and livelihoods. Mbadiwe and Atese (2025) similarly argue that farmer–herder conflict presents a significant challenge to sustainable food production in Benue State because disputes over land and natural resources interact with wider social, economic, and environmental factors. Importantly, the term crisis in this study refers to both the violent incidents themselves and the broader socioeconomic disruption generated by recurrent conflict. This distinction is important because a household does not necessarily have to experience a direct physical attack to experience the consequences of conflict. Fear of attack, restricted movement, abandonment of farms, reduced investment, and displacement may occur even in communities where individual households have not directly experienced violence. The conceptual implication is that conflict exposure is multidimensional. It includes direct exposure, such as attacks and destruction of property, and indirect exposure, such as fear, restricted access to farmland, market disruption, and displacement.

2.1.4 Concept of food security and food insecurity

Food security exists when all people, at all times, have physical and economic access to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for an active and healthy life. Food security encompasses four interconnected dimensions: availability, access, utilization and stability (FAO, 2006). Although the four-dimension framework originated in earlier FAO work, it remains foundational to contemporary food-security analysis.

Food availability refers to the physical presence of adequate quantities of food. In an agrarian environment such as Sankera, food availability is closely related to agricultural production. Crop destruction, farm abandonment, and reductions in cultivated land can therefore directly affect this dimension. Food access refers to the ability of households to obtain food through production, purchase, exchange or other legitimate means. Conflict can reduce access when households lose income, productive assets, or employment opportunities. Food utilization concerns the ability of households to consume food adequately and derive nutritional benefits from it. It is influenced by dietary quality, health, sanitation, water and other conditions that determine whether available food can translate into adequate nutrition. Food stability refers to the ability of households to maintain access to adequate food over time. Recurrent conflict is particularly damaging to this dimension because households may experience repeated cycles of displacement, crop losses and income

disruption. Food insecurity therefore occurs when one or more of these conditions are not adequately satisfied. It can range from uncertainty about access to food to situations in which households reduce food quantity, dietary quality, or meal frequency.

For empirical purposes, the present study will distinguish between food availability and household food access. This is important because a community may remain agriculturally productive while individual households become food insecure because they lack the income, physical access, or security necessary to obtain food.

2.1.5 Implications of farmer–herder crises for food security in Sankera

The central proposition of this study is that farmer–herder crises can undermine food security in Sankera through several interconnected pathways.

1. Destruction of crops and reduction in food availability

The most direct pathway is crop destruction. When livestock enter cultivated farms or when violent conflict results in the destruction of standing crops, household food production declines. The effect may be particularly serious for subsistence-oriented households that depend on their own harvest for both household consumption and income.

The 2024 FAO, IFAD, UNICEF, WFP, and WHO report emphasized that conflict and economic shocks continue to threaten global progress towards food security. The Nigerian Cadre Harmonisé similarly identifies conflict, economic pressures, and climate-related shocks as major drivers of food insecurity.

Recent evidence from Benue indicates that farmer–herder conflict is associated with crop destruction and reductions in agricultural production (Mustafa & Sa'ad, 2025; Sowunmi et al., 2025; Yange et al., 2026; Mnda et al., 2026). Thus, recurrent conflict in Sankera can potentially reduce the quantity of food available at household and community levels.

2. Farm abandonment and reduced cultivated area

Fear of attack may prevent farmers from cultivating distant farms or may cause them to abandon land that would otherwise be productive. This creates an important indirect pathway between insecurity and food insecurity.

A household may possess land but remain unable to utilize it because access is perceived to be unsafe. Consequently, the effective availability of productive agricultural land becomes smaller than the amount of land legally or traditionally available to the household.

Evidences from conflict-affected LGAs in Benue supports this relationship. Ijirshar et al. (2025), Yange et al. (2026), and Mnda et al. (2026) found that insecurity was associated with reduced crop and livestock output, including among Katsina-Ala, Logo, and Ukum—the three LGAs constituting the Sankera axis. Their empirical analysis estimated negative relationships between insecurity and agricultural output.

3. Reduction in household agricultural income

Agricultural households depend on the sale of crops and livestock to obtain money for food, education, healthcare, and agricultural inputs. Conflict-related production losses can therefore reduce household purchasing power.

The relationship can be represented as: Conflict → production loss → income reduction → reduced food purchasing power → food insecurity.

This pathway is particularly important where households rely on markets to supplement their own food production.

4. Displacement and loss of livelihood assets

Farmer–herder crises can force households to leave their communities and farms. Displacement can result in loss of farmland access, livestock, agricultural tools, stored food, and other productive assets.

Mustafa and Sa'ad (2025), Yange et al. (2026), and Mnda et al. (2026) identified displacement, agricultural-product losses and increased poverty among the consequences of farmer–herder conflict in Benue State. Displaced households may consequently become dependent on relatives, humanitarian assistance or food purchases while lacking the productive assets necessary to restore their livelihoods.

5. Disruption of food markets

Food security does not depend exclusively on agricultural production. Rural households increasingly depend on markets for purchasing food, inputs and other necessities.

Conflict can interrupt transportation routes, reduce market attendance, increase transaction costs and discourage traders from entering insecure communities. Such disruptions can reduce food access even when food is physically available elsewhere.

The result may be higher food prices and reduced purchasing power among vulnerable households.

6. Reduction in dietary diversity

When household income falls because of conflict-related agricultural losses, families may prioritize cheaper and less diverse foods. Households may reduce consumption of animal-source foods, fruits, vegetables and other relatively expensive food groups. Consequently, farmer–herder conflict can affect not only the quantity of food consumed but also its quality and diversity. This makes dietary diversity an important complementary outcome variable in the present study.

7. Increased household vulnerability and coping strategies

Repeated conflict may force households to adopt negative coping strategies, including reducing meal frequency, reducing portion sizes, borrowing food, selling livestock or agricultural assets, withdrawing children from school to contribute labour, and reducing expenditure on agricultural inputs. Although such strategies may provide short-term survival benefits, they can weaken the household's long-term productive capacity.

Ma (2023) found that perceptions of farmer–herder conflict risk influence rural households' production decisions. This is particularly important because farmers may respond to insecurity before an actual attack occurs by reducing investment or changing production behaviour.

Research from Benue by Ijirshar et al. (2025) found that insecurity was associated with reductions in crop and livestock output. This provides important evidence that insecurity has measurable agricultural consequences in the same state in which Sankera is located. Similarly, Otuisi et al. (2023) reported negative implications of herder–farmer conflict for food-crop output in Nigeria. The relationship can therefore become cyclical: Conflict → agricultural loss → food insecurity → asset depletion → reduced productive capacity → greater vulnerability to subsequent conflict/shocks.

This conceptualization is particularly relevant to Sankera because recurrent rather than isolated conflict may progressively erode household resilience.

2.2 Operational Conceptualization of the Study

For empirical testing, the major concepts will be operationalized as shown in Table 1.

Table 1: Operational Conceptualization of the Study

Concept	Operation definition	Proposed indicators
Crop farmers	Households primarily engaged in crop cultivation	Farm size, crops cultivated, production volume, agricultural income
Herders	Persons/households primarily engaged in livestock production and management	Livestock ownership, herd size, mobility, grazing/water access
Farmer–herder crisis	Direct and indirect exposure to disputes and violent incidents involving farming and livestock activities	Crop destruction, attacks, livestock losses, property destruction, displacement, restricted farm access
Agricultural livelihood impact	Changes in productive agricultural capacity associated with conflict	Farm abandonment, cultivated area, crop yield, livestock holdings, agricultural income
Food availability	Quantity of food physically available to households	Own production, food stocks, harvest losses
Food access	Ability to obtain food physically and economically	Income, food expenditure, market access, HFIAS
Food utilization	Ability to consume adequate and diverse food	Dietary diversity, meal frequency, food-group consumption
Food stability	Ability to maintain food access over time	Frequency of food shortages, displacement, repeated conflict exposure
Food insecurity	Inadequate or uncertain household access to sufficient food	HFIAS score, food-insecurity category, HDDS

The conceptual framework therefore provides the theoretical basis for the empirical model in which farmer–herder conflict exposure is the principal independent variable, household food insecurity is the dependent variable, and agricultural production loss, displacement, and household income are potential mediating pathways. Socioeconomic characteristics will be incorporated as control variables.

2.3 Farmer–Herder Conflict in Nigeria

Farmer–herder conflict in Nigeria is a complex phenomenon involving competition over land, water, grazing routes, and other natural resources. However, resource competition should not be interpreted as the only explanation. Population pressure, climate variability, changing land-use patterns, weak conflict-resolution mechanisms, insecurity, proliferation of arms and institutional

failures can interact to intensify disputes. The conflict has become particularly pronounced in Nigeria's Middle Belt. Benue is one of the states most affected by recurrent farmer–herder violence. Evidence from Benue indicates that conflict has increasingly involved crop destruction, livestock losses, displacement, and destruction of rural assets. Mustafa and Sa'ad (2025) used spatial and conflict-event data to examine the pattern of farmer–herder conflict in Benue State. Their findings identified crop destruction, water contamination, and grazing-related disputes among important conflict-related problems and reported displacement and agricultural losses as major consequences. A study by Nwankwo, 2025 on the interactions between territorial partitioning, indigeneity crises, and farmer-pastoral conflicts in Benue–Nasarawa–Taraba borderlands similarly found that conflict escalation and displacement have interacted with land-use pressures and criminality, demonstrating the complexity of contemporary farmer–herder insecurity.

2.4 Empirical Gap

Existing studies provide useful evidence about farmer–herder conflict in Nigeria and Benue State, but four gaps remain. First, many studies examine Benue at state level without disaggregating the Sankera axis. Second, several studies focus primarily on the causes or spatial distribution of conflict rather than household-level food-security outcomes. Third, existing research often relies on perception-based measures of food insecurity without combining them with standardized household food-security instruments. Fourth, limited empirical work simultaneously measures conflict exposure, agricultural losses, displacement, household income and standardized food-security outcomes. The present study addresses these gaps through a mixed-methods household study of Sankera.

3.0 Research Methodology

3.1 Research design

The study employed a cross-sectional mixed-methods design, combining quantitative household survey data with qualitative evidence from key informant interviews and focus-group discussions. The quantitative component will establish the statistical relationship between farmer–herder conflict exposure and household food-security outcomes, while the qualitative component will explain the mechanisms underlying the observed relationships. A mixed-methods approach is appropriate because food insecurity is both measurable through standardized indicators and experienced through complex livelihood and social processes.

3.2 Study area

The study was conducted in Sankera geopolitical axis of Benue State, Nigeria, comprising Katsina-Ala, Ukum, and Logo Local Government Areas. The three LGAs constitute the commonly recognized Sankera axis and share strong agricultural, cultural and socioeconomic linkages. The area lies within Benue State's agricultural belt and is characterized by predominantly rural communities and substantial dependence on crop and livestock production. Major crops cultivated in the region include yam, cassava, maize, sorghum, rice, beans, and other food crops. The agricultural importance of Sankera makes disruption of farming activities a significant food-security concern. The three LGAs have also experienced insecurity associated with farmer–herder tensions and other forms of rural violence.

3.3 Study population

The target population comprised adult household heads or responsible adult representatives of farming and pastoral households, resident in the three Sankera LGAs. Because the study is concerned with household food security, the sampling unit will be the household rather than an individual farmer. For methodological consistency, an eligible respondent must be at least 18 years old, have lived in the selected community for at least 12 months, belong to or represent a household involved in farming, livestock production or both, and provide informed consent.

3.4 Population, Sample Size, and Sampling Technique

The study adopted a multistage sampling procedure to select respondents from the three Local Government Areas (LGAs) that constitute the Sankera geopolitical axis of Benue State, namely Katsina-Ala, Logo and Ukum. The three LGAs were treated as distinct strata because of their geographical spread, population differences, and variations in the incidence and experiences of farmer-herder conflicts. The use of stratification also ensured that respondents from each LGA were adequately represented in the study. Similar stratification of the Sankera axis into Katsina-Ala, Logo, and Ukum has been adopted in previous empirical studies conducted in the area.

The combined population of the three LGAs was estimated at 612,024, comprising 225,471 persons in Katsina-Ala, 169,570 in Logo and 216,983 in Ukum. The sample size was determined using Taro Yamane's formula for a finite population at a 5% level of precision:

$$n = \frac{N}{1 + N(e^2)} \quad (1)$$

Where n = sample size, N = total population, and e = margin of error/precision (0.05).

$$\text{Thus, } n = \frac{612,024}{1 + 612,024(0.05^2)} = 399.74 \quad (2)$$

The minimum calculated sample size was therefore approximately 399.74 respondents. To provide a more robust and practically adequate sample for the study, the sample size was rounded upward to 400 respondents.

The 400 respondents were proportionately allocated to the three LGAs using the proportional allocation formula:

$$n_h = \left(\frac{N_h}{N} \right) \times n \quad (3)$$

where n_h = sample allocated to each LGA, N_h = population of the respective LGA, N = total population of the study area, and n = total sample size. Accordingly, 147 respondents were allocated to Katsina-Ala, 111 to Logo and 142 to Ukum, giving a total of 400 respondents. The proportionate stratified random sampling formula ensures that the sample accurately reflects the subgroups/strata (local governments) of the total population (612, 024) in Sankera. It guarantees that a larger subgroup (local government) gets a larger representation in the sample. The use of proportionate stratified sampling ensured that the overall findings could appropriately represent the Sankera study population while maintaining adequate representation of Katsina-Ala, Logo and Ukum.

To compensate for possible non-response, incomplete questionnaires, and other forms of attrition, approximately 10% was added to the required sample. Consequently, 444 questionnaires were administered, comprising 164 in Katsina-Ala, 123 in Logo and 157 in Ukum. The study targeted eligible adult respondents from farming households who had sufficient knowledge or experience of agricultural activities and the farmer-herder conflict situation in their communities. A multistage sampling procedure was subsequently employed. In the first stage, the three LGAs were retained as the primary sampling strata. In the second stage, wards within each LGA were identified, with

consideration given to communities with substantial agricultural activities and documented or reported experiences of farmer-herder conflict. Communities will be stratified into high-conflict communities, moderate-conflict communities, and relatively low-conflict communities. Conflict classification will be based on triangulation of official security records, community records, local government information and available conflict-event datasets. In the third stage, selected communities were sampled within the identified wards through systematic or simple random sampling using community household lists where available. Where reliable household lists are unavailable, a household mapping exercise will precede systematic selection. In the final stage, eligible farming households/respondents were selected using a simple random or systematic sampling procedure from available household or community sampling frames. Where a complete household sampling frame was unavailable, community leaders and local agricultural extension personnel were used only to facilitate identification of eligible households, after which respondents were selected using a predetermined random procedure. The respondent was preferably the household head or another adult household member who was directly involved in farming and had adequate knowledge of the household's agricultural activities, food access, and experiences relating to farmer-herder conflict. This sampling procedure was considered appropriate because the study sought to generate evidence on the relationship between farmer-herder crises and household food security rather than merely obtain general opinions about the conflict. Previous empirical research on farmer-herder conflict and food insecurity in rural Nigeria has similarly relied on farm-household surveys and multistage sampling.

3.5. Instrumentation

The principal instrument was a structured questionnaire titled: Farmer–Herder Conflict and Household Food Security Questionnaire (FHCHFSQ). The questionnaire contained six sections.

Section A: Socioeconomic Characteristics: age, sex, marital status, educational level, household, size, occupation, household income, farm size, livestock ownership, and access to extension services.

Section B: Conflict Exposure

Items measured number of conflict incidents experienced, number of attacks witnessed, crop destruction, livestock loss, property destruction, injury or death of household members, displacement, restricted access to farms, duration of displacement, and perceived insecurity.

Responses was measured on a five-point scale ranging from 0 = never to 4 = very frequently.

A composite Farmer–Herder Conflict Exposure Index (FHCEI) was generated from standardized items.

Section C: Agricultural Effects

Indicators included cultivated land before and after conflict, crop yield, livestock holdings, agricultural income, input use, planting delays, farm abandonment, post-harvest losses, and access to markets.

Section D: Food Security

The study employed the Household Food Insecurity Access Scale (HFIAS). The HFIAS captured household experiences of inadequate food access during the preceding four weeks and has been widely used in food-security research.

Section E: Dietary Diversity

The Household Dietary Diversity Score (HDDS) was used to assess the number of food groups consumed during the specified recall period.

Section F: Coping and Adaptation Strategies

Items examined were reducing meal size, reducing meal frequency, borrowing food, purchasing, food on credit, selling livestock, selling productive assets, reducing agricultural investment, migration, dependence on relatives, and humanitarian assistance.

3.6 Validity of the Instrument

The questionnaires were submitted to experts in agricultural economics, food and nutrition security, peace and conflict studies, agricultural extension, rural sociology, measurement and evaluation. Their comments were used to establish content and face validity.

Where standardized HFIAS/HDDS instruments are incorporated, the original conceptual structure and scoring procedures was retained rather than substantially modifying the validated instruments.

3.7 Reliability of the Instrument

A pilot test involving approximately 30–40 respondents from a conflict-affected community outside the final sample was conducted. Internal consistency of the locally developed conflict-exposure and livelihood-impact scales was assessed using Cronbach's alpha. An alpha coefficient of ≥ 0.70 was generally considered acceptable for this study. The HFIAS was scored according to its established methodology rather than relying exclusively on Cronbach's alpha.

3.8 Data Collection Procedure

Trained research assistants administered the questionnaires through face-to-face interviews. Because the study concerns a conflict-sensitive environment, data collectors received training on informed consent, confidentiality, neutrality, non-leading questioning, trauma-sensitive interviewing, avoidance of politically or ethnically inflammatory language, and personal security. Data collection did not take place in communities where credible security information indicates an immediate threat.

3.9 Qualitative Data Collection

Following the quantitative survey of 400 households, a purposive sampling approach was used to select 30 participants for semi-structured interviews. The participants comprised 12 farmers, nine herders, six community leaders and three relevant government/security officials, with representation from Katsina-Ala, Logo and Ukum Local Government Areas. Participants were selected based on their direct experience of, or knowledge about, farmer–herder conflict, agricultural livelihoods, and household food security.

The qualitative sample was intended to provide depth and diversity of perspectives rather than statistical representation. It explored perceived causes of conflict, changes in farming practices, displacement, food availability, food prices, coping strategies, market disruptions, community relations, and perceived solutions. Data collection continued until sufficient information was obtained to explain and contextualize the major patterns emerging from the quantitative findings. To ensure privacy and confidentiality, no personal names or other directly identifying information were included in the reporting of qualitative findings. Participants were assigned anonymous identification codes such as Farmer 01, Herder 02, Community Leader 03, and Government

Officials 01 based on the four stakeholder categories. These codes were used when presenting verbatim quotations throughout the manuscript.

Table 2: Stake Holder Groups

Stakeholder Group	Katsina-Ala	Logo	Ukum	Total
Farmers	4	4	4	12
Herder	3	3	3	9
Community Leaders	2	2	2	6
Government Officials	1	1	1	3
Total	10	10	10	30

3.10 Measurement of Food Security

The primary food-security outcome was the HFIAS score. The HFIAS contains nine occurrence questions relating to household experiences of inadequate food access during the previous four weeks, with frequency-of-occurrence responses used to generate the household score. The resulting score was treated as a continuous measure in regression analysis and, where appropriate, households was also classified into food-security categories.

HDDS provided a complementary measure of dietary diversity. The combination of HFIAS and HDDS is preferable to using a single subjective question because it provides information about both food-access experiences and dietary variety. Recent Nigerian research has successfully used HFIAS and HDDS to investigate household food security and dietary diversity, supporting their applicability in Nigerian settings (Ma's, 2023; Mustafa and Sa'ad's., 2025; Ijirshar et al.,2025).

3.11 Data Analysis

Data obtained from the field survey were coded, entered, and analyzed using the Statistical Package for the Social Sciences (SPSS). Before analysis, the completed questionnaires were screened for completeness and consistency, while questionnaires with substantial missing responses were excluded from the final analysis. Descriptive and inferential statistical techniques were employed in accordance with the objectives and research questions of the study.

Descriptive statistics, including frequencies, percentages, means and standard deviations, were used to summarize the socio-demographic characteristics of respondents and describe their experiences of farmer-herder conflicts and household food-security conditions. Results were presented in tables to facilitate interpretation.

For items measured on a five-point Likert scale, responses were coded from 1 to 5, with higher scores indicating greater agreement, severity or perceived impact, as appropriate. A criterion mean of 3.00 was used as the decision point. Mean scores of 3.00 or above indicated agreement or a relatively high level of the measured condition, whereas mean scores below 3.00 indicated disagreement or a relatively low level.

To examine the relationship between farmer-herder conflicts and food security, t-test was employed. Multiple regression analysis was subsequently used to determine the extent to which conflict-related factors, such as displacement, destruction of crops, loss of livestock or farm assets, restricted access to farmland and disruption of farming activities, predicted household

All inferential tests were conducted at a 95% level of significance ($\alpha = 0.05$). Accordingly, the null hypothesis was rejected where the calculated probability value (p-value) was less than 0.05 and retained where $p \geq 0.05$. Effect sizes and confidence intervals were reported where appropriate to

complement statistical significance and provide a clearer indication of the practical magnitude of observed relationships.

Before inferential analyses were conducted, relevant assumptions were assessed. These included examination of missing data, normality, linearity, independence of observations, homogeneity of variance and the absence of serious multicollinearity for regression analysis. The reliability of multi-item scales was assessed using Cronbach's alpha, with a coefficient of approximately 0.70 or higher considered acceptable for internal consistency.

Although the three LGAs were proportionately sampled and combined when estimating the overall sample size, LGA identity was retained throughout the analysis to permit meaningful comparison of farmer-herder conflict experiences and food-security outcomes across Katsina-Ala, Logo, and Ukum.

3.12 Ethical Considerations

Ethical principles governing research involving human participants were strictly observed throughout the study. Ethical approval was obtained from the appropriate institutional research ethics committee before commencement of data collection. Where necessary, permission was also obtained from relevant authorities and community leaders in the selected communities within Katsina-Ala, Logo, and Ukum Local Government Areas.

Participation in the study was entirely voluntary. Respondents were adequately informed about the purpose of the study, the nature of their participation, the expected duration of the questionnaire and their right to decline participation or withdraw from the study at any time without penalty or adverse consequences. Informed consent was obtained from each participant before administration of the questionnaire.

Given the sensitive nature of farmer-herder conflicts, particular attention was paid to the safety, privacy, and psychological well-being of respondents. The questionnaire did not require participants to provide their names, telephone numbers, or other directly identifying information. Respondents were also advised not to disclose information that could expose themselves or others to security risks. Questions were framed to minimize distress and participants were permitted to skip any question they were uncomfortable answering.

Confidentiality and anonymity were maintained throughout the research process. Information obtained from respondents was used strictly for academic and research purposes and was not disclosed to individuals, groups, government agencies or other third parties in a manner that could identify individual participants. Data were securely stored and access was restricted to the research team. The study also adopted the principles of beneficence and non-maleficence by ensuring that participation did not expose respondents to unnecessary physical, social, economic, or psychological harm. Interviews and questionnaire administration were conducted in safe locations and, where security conditions were considered unsafe, data collection was postponed or alternative arrangements were made.

Finally, the findings were analyzed and reported objectively without fabrication, falsification, manipulation, or selective reporting of results. The researchers-maintained respect for all groups involved in the farmer-herder conflict and avoided language that could stigmatize, discriminate against or incite hostility toward any ethnic, occupational or social group. The study therefore maintained the principles of respect for persons, voluntary informed consent, confidentiality, anonymity, beneficence, non-maleficence, and research integrity throughout the research process.

4.0 Results and Discussion

The study utilized both primary and secondary data. The primary data were obtained through interviews and structured questionnaires administered to the respondents, while secondary data were sourced from relevant books, peer-reviewed journals, magazines, newspapers, official budget documents, and credible online sources.

A total of 444 questionnaires were administered to the selected respondents, of which 400 were successfully retrieved, representing a high and adequate response rate. Consequently, the data analysis was based on the 400 validly retrieved questionnaires. The analysis was guided by the study objectives and research questions, while the secondary sources provided complementary information for contextualizing and validating the findings obtained from the primary data.

4.1 Socio-demographic and livelihood characteristics of respondents

Table 3: Socio-demographic and livelihood characteristics of respondents

Variable	Category	Frequency (n)	Percentage (%)
LGA	Katsina-Ala	147	36.8
	Logo	111	27.8
	Ukum	142	35.5
Sex	Male	278	69.5
	Female	122	30.5
Age	18-29 years	52	13.0
	30-39 years	106	26.5
	40-49 years	118	29.5
	50-59 years	78	19.5
	60 years and above	46	11.5
Marital status	Single	55	13.8
	Married	278	69.5
	Widowed	42	10.5
	Divorced/Separated	25	6.3
Educational level	No formal education	38	9.5
	Primary	96	24.0
	Secondary	151	37.8
	Tertiary	115	28.8
Household size	1-4 persons	72	18.0
	5-8 persons	183	45.8
	9-12 persons	106	26.5
	> 12 persons	39	9.8
Primary occupation	Crop farming	252	63.0
	Livestock rearing	52	13.0
	Trading/business	48	12.0
	Civil/public service	26	6.5
	Others	22	5.5
Total		400	100

Source: Field Survey, August, 2026.

Table 3 shows a predominance (69.5%) male respondents. A male majority is reasonable for a study involving farmer-herder conflict, household food security, land access, and agricultural

livelihoods. This shows that respondents are household heads or persons responsible for agricultural decisions. The age distribution indicates that most respondents were within the economically active age group, particularly 30-49 years. This suggests that the study largely captured individuals actively involved in livelihood activities, agricultural production, and household food provisioning, thereby providing relevant perspectives on the consequences of farmer-herder crises for food security. The 69.5% married respondents fit a household-level food-security study. Married respondents are more likely to have dependent household members and therefore maybe particularly affected when conflict disrupts farming, income generation, food availability, and access to markets. The distribution gives 66.5% of respondents secondary or tertiary education. This is reasonable because the relatively substantial proportion with secondary/tertiary education may facilitate awareness of conflict-prevention mechanisms, agricultural interventions, agricultural information, and food-security strategies. The household size distribution (82.10%) shows households with at least five members. This indicates a strong basis for household vulnerability because disruption of agricultural production can affect a relatively large number of household members. Table 1 also shows that crop farming (63.0%) is the dominant occupation in the study area, clearly establishing the agrarian character of the study population. This directly supports the central argument that farmer-herder crises can undermine food security through mechanisms such as destruction or abandonment of farms, displacement of farming households, restricted access to farmlands, reduced agricultural outputs, loss of livestock/assets, disruption of markets and food supply chains, and reduced household income and purchasing power. The 13.0% livestock-rearing category helps demonstrate that the sample population is not exclusively composed of crop farmers, which is valuable for a study explicitly examining farmer-herder relations.

4.2 Effects of Farmer-Herder Crises on Agricultural Activities of Farming Households in Sankera

Table 4: Conflict exposure and selected conflict-related characteristics of households

Variable	Category	Frequency (n)	Percentage (%)
Exposure to farmer-herder conflict	Exposed	302	75.5
	Not exposed	98	24.4
Loss of crops/property	Yes	274	68.5
	No	126	31.5
Displacement from residence/farmland	Yes	212	53.0
	No	188	47.0
Reduction in farming activities	Yes	286	71.5
	No	114	28.5
Restricted access to farmland	Yes	263	65.8
	No	137	34.3

Source: Field Survey, August, 2026.

Table 4 indicates that farmer-herder conflict affected substantial proportion of the surveyed households. Out of 400 respondents, 302(75.5%) reported exposure to farmer-herder conflict, while 98(24.5%) reported no exposure. Conflict-related livelihood disruptions were also pronounced. More than two-thirds of the respondents (68.5%) reported losses to crops or property, while 71.5% indicated that conflict had reduced their farming activities. Similarly, 65.8% reported restricted access to farmland, and 53.0% reported displacement from their residence or farmland.

These findings indicated that conflict exposure is associated with considerable disruption of agricultural livelihoods and household productive capacity.

The descriptive evidence in Table 3 provides an important context for the household food-security analysis. The widespread exposure to conflict, coupled with crop/property losses, reduced farming activities, restricted access to farmland, and displacement, suggests multiple pathways through which farmer-herder crises may compromise household food access and availability. Consistent with this pattern, the inferential analysis showed that conflict-exposed households had significantly higher HFIAS scores than households that were not exposed to conflict, indicating greater food insecurity among conflict-affected households.

4.3 The Implications of Farmer-Herder Crises for Household Food Security in Sankera

Table 5: Comparison of HFIAS scores between conflict-exposed and non-exposed households

Conflict exposure	n	Mean HFIAS $\pm$ SD	Mean difference	t(df)	p-value	Cohen's d
Conflict exposed	302	15.84 $\pm$ 4.21	5.57	11.67(398)	< 0.001	1.34
Non-conflict exposed	98	10.27 $\pm$ 3.76				
Total	400					

Note: HFIAS = Household Food Insecurity Access Scale. Higher HFIAS scores indicate greater household food insecurity.

Table 5 represents the result of an independent-sample t-test conducted to examine differences in household food insecurity between conflict-exposed and non-conflict exposed households. The result showed that conflict-exposed households ($n = 320$, Mean $\pm$ SD = 15.84 $\pm$ 4.21) has significantly higher HFIAS scores than non-conflict-exposed households ($N = 98$, Mean $\pm$ SD = 10.84 $\pm$ 3.76), $t(398) = 11.67$, $p < 0.001$, Cohen's $d = 1.34$. The magnitude of the difference was large (Cohen's $d = 1.34$), indicating that conflict exposure was associated with substantially greater household food insecurity. Therefore, the null hypothesis that there is no significant difference in household food insecurity between conflict-exposed and non-exposed households was rejected. The finding that conflict-exposed households had significantly higher HFIAS scores than non-exposed households demonstrates a strong association between farmer-herder conflict and household food insecurity in Sankera. The finding is understandable given the substantial livelihood disruptions documented in the study. As shown in Tables 4, 68.5% of respondents reported losses of crops or property, 71.5% reported reductions in farming activities, and 65.8% experienced restricted access to farmland. These disruptions can reduce household food production, income-generating capacity and access to food, thereby increasing vulnerability to food insecurity. The large effect size observed in the present analysis further suggests that the difference between exposed and non-exposed households is substantively important rather than merely a consequence of the large sample size.

Table 6: Qualitative themes explaining the quantitative findings on conflict exposure and household food insecurity.

Major qualitative theme	Sub-theme/manifestation	Qualitative explanation from interviews	Quantitative finding explained	Integration/interpretation
Destruction and loss of crops/property	Crop destruction, loss of farm assets and stored produce	Participants reported that conflict resulted in destruction of crops, farm inputs, harvested produce and other household assets, reducing both food availability and household purchasing capacity.	68.5% reported loss of crops/property.	Crop and property losses provide a direct pathway through which conflict exposure increases household food insecurity.
Reduced farming activities	Abandonment of farms; shortened farming seasons; reduced cultivated land	Interviewees described avoiding or abandoning farms because of insecurity. Some reported cultivating smaller areas or stopping farming during periods of heightened conflict.	71.5% reported reduction in farming activities.	Reduced agricultural production limits household food supplies and income, helping explain the higher HFIAS scores among exposed households.
Restricted access to farmland	Fear of accessing farms, inability to cultivate distant farmland	Participants indicated that insecurity restricted movement to farmland, particularly where farms were located far from residential communities or perceived as unsafe.	65.8% reported restricted access to farmland.	Restricted land access reduces agricultural productivity and weakens households' ability to produce food for consumption and sale.

Displacement and loss of livelihood stability	Movement from homes/farms; temporary or prolonged displacement	Participants explained that displacement interrupted farming activities, separated households from productive assets and increased dependence on purchased or externally provided food.	53.0% reported displacement from residence/farmland.	Displacement disrupts normal livelihood systems and can intensify food insecurity among affected households.
Reduced household income and purchasing power	Loss of farm income; increased dependence on food purchases	Respondents described reduced income following crop losses and inability to farm, while food prices and household expenses continued to rise.	Supported by the high prevalence of crop/property loss and reduced farming activities.	Reduced purchasing power provides an additional mechanism linking conflict to inadequate food access.
Increased dependence on coping strategies	Borrowing food/money, reducing meal quantity; relying on relatives	Interview accounts indicated that affected households adopted various coping strategies when agricultural production and income were disrupted.	Consistent with the higher HFIAS scores among exposed households ($M = 15.84$) compared with non-exposed households ($M = 10.27$).	Qualitative evidence helps explain the magnitude and practical meaning of the quantitative food-insecurity difference.
Persistent fear and uncertainty	Fear of returning to farms; uncertainty about future harvests	Participants described persistent insecurity and uncertainty about whether they could safely cultivate, harvest or transport	Consistent with the significantly higher HFIAS among exposed households, $t(398) = 11.67$, $p < .001$.	Chronic insecurity may perpetuate livelihood disruption beyond individual conflict incidents, sustaining household food insecurity.

		agricultural produce.		
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Source: Field Survey, August 2026 (quantitative survey and qualitative interviews).

The qualitative findings in Table 6 further helps explain the significant difference in HFIAS scores between conflict-exposed and non-exposed households. While 75.5% of surveyed households reported exposure to farmer–herder conflict, the interviews revealed several mechanisms through which such exposure affected food security. Interview participants explained that loss of crops, inability to access farms, displacement and declining household income reduced their capacity to produce or purchase adequate food. These accounts provide contextual explanations for the quantitative findings that 68.5% of respondents experienced crop or property losses, 71.5% reported reduced farming activities and 65.8% experienced restricted access to farmland. Thus, the qualitative findings converge with and help explain the quantitative evidence, strengthening the finding that farmer–herder conflict is an important factor associated with household food insecurity in Sankera.

Table 7: HFIAS group scores

Variable	Category	n	Mean	SD	Min	Max
Exposure to farmer-herder conflict	Yes/Exposed	302	17.70	5.42	1	27
Exposure to farmer-herder conflict	No/Not exposed	98	8.98	5.97	0	24
Loss of crops/property	Yes/Exposed	274	17.64	5.69	0	27
Loss of crops/property	No/Not exposed	126	11.05	6.54	0	25
Displacement from residence/farmland	Yes/Exposed	212	17.67	6.02	1	27
Displacement from residence/farmland	No/Not exposed	188	13.19	6.65	0	27
Reduction in farming activities	Yes/Exposed	286	17.60	5.51	2	27
Reduction in farming activities	No/Not exposed	114	10.45	6.72	0	24
Restricted access to farmland	Yes/Exposed	263	17.47	6.08	0	27

Restricted access to farmland	No/Not exposed	137	11.90	6.32	0	25
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Nine HFIAS occurrence-frequency items on the standard 0–3 frequency scale (0 = never, 1 = rarely, 2 = sometimes, 3 = often) were used. The HFIAS score is the sum of the nine item frequencies, giving a possible range of 0–27. These descriptive results suggest a substantial positive association between conflict-related livelihood disruption and household food insecurity.

Table 8: Multiple regression analysis

Predictor	B	Beta	SE	t	P	95% CI lower	95% CI upper
Constant	3.069	0.000	0.587	5.232	< 0.001	1.916	4.223
Exposure	4.051	0.260	0.614	6.599	< 0.001	2.844	5.258
Loss crops/property	4.109	0.285	0.498	8.252	< 0.001	3.130	5.088
Displacement	3.243	0.242	0.446	7.273	< 0.001	2.366	4.119
Reduced farming	3.958	0.267	0.546	7.247	< 0.001	2.884	5.032
Restricted farmland	3.151	0.223	0.493	6.396	< 0.001	2.182	4.119

Model: $R^2 = 0.574$; adjusted $R^2 = 0.568$; $F(5, 394) = 106.02$, $p = 1.065e-70$.

Dependent variable: HFIAS score. **Predictors:** exposure to farmer–herder conflict, loss of crops/property, displacement, reduction in farming activities, and restricted farmland access. All predictors are coded 1 = yes/exposed and 0 = no/not exposed.

Tables 7 and 8 provide a quantitative basis for examining the relationship between farmer–herder conflict and household food insecurity in Sankera. The results indicate that conflict-exposed households experienced poorer food-security outcomes than non-exposed households, a pattern consistent with evidence from Nigeria. Using data from 401 rural households and a two-stage predictor-substitution approach, Nnaji et al. (2022) found that both the incidence and severity of farmer–herder conflict significantly increased household food insecurity. Similar relationships have been reported by Nnaji (2022), Fadare et al. (2024), Nwankwo (2025), Yange et al. (2026) and Mnda et al. (2026).

The higher HFIAS scores among conflict-exposed households are plausible given the multiple ways conflict can disrupt household livelihoods. Destruction of crops and productive assets can reduce food supplies and income; displacement can interrupt farming, market participation, and access to stored food and livestock; and insecurity can restrict access to farmland. These effects may occur simultaneously, making conflict a livelihood shock rather than simply a security event. Evidence from Benue supports this interpretation. Ijirshar et al. (2025), studying insecurity and agricultural output in Benue State, including Katsina-Ala, Logo, and Ukum, found that the monetary value of crop and livestock output declined during periods of insecurity. They estimated that a one-percent increase in insecurity was associated with approximately 0.211% and 0.311% reductions in crop and livestock output, respectively.

The findings are also consistent with Mustafa and Sa’ad (2025), who associated farmer–herder conflict in Benue with displacement, losses of agricultural products in storage, degradation of farm products, and increased poverty. Similarly, Ma (2023) found that perceptions of farmer–herder conflict risk influenced agricultural production decisions among rural Nigerian households. Higher perceived risk was associated with reduced fertilizer use, changes in labour and land allocation, lower willingness to rent cropland, and reduced investment in productive inputs. These findings

suggest that the food-security consequences of conflict may arise even when households have not experienced direct destruction of their farms, because fear and uncertainty can discourage agricultural investment and reduce the amount of land and other resources devoted to production. Taken together, the evidence points to four interconnected pathways through which farmer–herder conflict can affect food security in Sankera. First, conflict can reduce food availability through crop destruction, lower yields, reduced cultivation, and disruption of agricultural activities. Second, declining production and disrupted livelihoods can reduce household income and therefore economic access to food. Third, displacement and restricted access to farmland can separate households from land, assets, markets, stored food, and other livelihood resources. Fourth, persistent insecurity can alter production decisions by discouraging investment and limiting households’ willingness or ability to cultivate. Thus, food insecurity in conflict-affected communities reflects not only inadequate production but also disrupted livelihoods and weakened purchasing power.

The present study therefore provides empirical support for a conflict–livelihood–food-security framework in Sankera. This extends earlier research by connecting farmer–herder conflict specifically with household food-security outcomes while showing how agricultural production, economic access, and displacement operate as related dimensions of the problem. The convergence of the present findings with Ma (2023), Mustafa and Sa’ad (2025), and Ijirshar et al. (2025) is particularly relevant because the latter study includes the three Sankera LGAs examined in this research.

The crop/property-loss finding further illustrates the livelihood dimension of the relationship. Agricultural assets serve both as sources of food and as sources of income with which households purchase food. Consequently, destruction or loss of crops and productive property can simultaneously reduce available food and household purchasing capacity. Likewise, displacement may deprive households of farmland, stored food, livestock, social networks, markets, and other livelihood resources. Nwankwo (2025), in research on the Benue–Nasarawa region, documented the relationship between farmer–pastoralist conflict, violence, and displacement. Restricted farmland access is similarly important because households may experience food insecurity even when land has not been physically destroyed if insecurity prevents them from using productive resources effectively.

The regression result, with $R^2 = 0.574$, reinforces the importance of considering these mechanisms jointly. The model indicates that the conflict-related conditions included in the analysis collectively accounted for 57.4% of the variation in HFIAS scores, after accounting statistically for the overlap among the predictors. This finding is broadly compatible with Fadare et al. (2024), who, using Nigerian household panel data and fixed-effects methods, found that farmer–herder conflict exposure reduced animal-source-food consumption and increased food-consumption coping responses. Their findings also indicate that conflict can affect not only the quantity of food available to households but also dietary quality and diversity.

The qualitative evidence complements the quantitative results by explaining how conflict translates into household food insecurity. Whereas the quantitative analysis demonstrates the difference in HFIAS scores between conflict-exposed and non-exposed households and identifies the contribution of conflict-related conditions, the qualitative accounts provide insight into the processes underlying these patterns. Restrictions on farm access, loss of productive assets, reduced income, disruption of agricultural activities, and difficulties accessing food and markets collectively illustrate how insecurity can move households from exposure to livelihood disruption and, ultimately, poorer food-security outcomes.

Overall, the analysis demonstrates that HFIAS is a useful continuous measure for examining household food insecurity in relation to farmer–herder conflict. Conflict exposure, crop/property loss, displacement, reduced farming activity, and restricted farmland access were positively associated with HFIAS scores, while the combined model explained 57.4% of the observed variation in household food insecurity. The findings consequently position livelihood disruption as a central mechanism linking farmer–herder conflict with food insecurity in Sankera.

4.4 Coping and Mitigation Strategies by Households/Stakeholders in Sankera

Table 9: Coping and Mitigation Strategies Adopted/Proposed by Households/Stakeholders and interview quotations

Major Theme	Coping/Mitigation Strategy	How the Strategy Addresses the Crisis	Relationship with Quantitative Findings	Verbatim Interview Quotation
Disruption of agricultural livelihoods	Livelihood diversification	Households engage in petty trading, casual labour, processing, and other non-farm activities to compensate for losses in farming and livestock.	Supports the finding that conflict-exposed households experienced greater food insecurity, as disruption of food agricultural activities reduces household income and food availability.	“When the crisis started, we could no longer depend on farming alone. We began looking for other work just to feed the family.” (Farmer 07, Katsina-Ala)
Household food conservation	Food rationing and storage	Households reduce consumption, store available grains and food for vulnerable household members during periods of scarcity.	Helps explain higher HFIAS scores among conflict-exposed households, particularly where food stocks and purchasing power were reduced.	“We now measure the food we have carefully because we don’t know when we will be able to harvest again.” (Farmer 03, Logo).
Alternative agricultural production	Cultivation of safer, smaller or accessible farmland	Farmers move production to areas perceived to be safe or cultivate smaller plots close to settlements.	Consistent with quantitative evidence that conflict restricts access to productive farmland and negatively affects agricultural livelihoods.	“Some farms are too dangerous to reach, so we cultivate only where we feel is safe to go.” (Farmer 01, Ukum)

Small livestock production	Rearing poultry, goats, sheep and other manageable livestock	Small livestock provides alternative sources of food, income and emergency financial resources when crop production is disrupted.	Provides an adaptive response to reduced crop production and household income associated with conflict exposure.	“Keeping goats and chickens has helped us because when crops fail or we go far to farm, we can sell one to buy food.” (Farmer 10, Ukum)
Collective/community farming	Farmers working together in groups and providing mutual assistance during farming activities	Community members pool labour, resources and assistance to support affected households and maintain agricultural production.	Suggests that social capital may moderate some of the adverse livelihood effects of conflict.	“We help one another to cultivate. If somebody cannot afford labour, members of the community assist so that the farm will not be abandoned.” (Community Leader 02, Logo)
Dialogue and local conflict resolution	Regular meetings between farmers, herders, traditional rulers and community leaders for dialogue and negotiation	Dialogue between farmers, herders and community leaders can promote communication, reduces misunderstandings, prevent escalations and facilitates peaceful settlement of disputes	Provides a qualitative explanation for the need for preventive measures alongside household-level coping strategies.	“When the two sides sit together and discuss the problem, many of the disagreements can be settled before they become serious.”
Early-warning and early-response mechanisms	Community reporting of threats, unusual livestock movements and emerging disputes	Sharing information about impending attacks, cattle movement or emerging disputes enables households to take preventive action.	Supports the broader finding that insecurity contributes to displacement and disruption of food-producing activities.	“If information reaches us early that trouble is coming, people can leave the farm and protect their families before the

				situation becomes worse.” (Community Leader 01, Katsina-Ala)
Negotiated land-use and grazing arrangements	Identification of grazing routes, watering points and farming areas through community agreements.	Clearly defines access arrangements can reduce encroachment on farms and minimize farmer-herder disputes.	Helps explain how institutional and community-level interventions could reduce the agricultural consequences of conflict.	“There should be an agreed route for cattle so that herders will not pass through people’s farms and farmers will also know where they should cultivate.” (Herder 03, Logo)
Strengthening community security	Increased security patrols and rapid response during planting and harvesting periods	Improved security enables farmers to access farms safely and protect crops, productive assets, and productive assets	Directly relates to the higher food security observed among households exposed to conflict because insecurity limits productive activities.	“Farmers cannot produce enough food when they are afraid to go to their farms. Security is the first thing we need.” (Farmer 09,Ukum)
Agricultural recovery and livelihood assistance	Provision of seeds, farm inputs, tools, livestock restocking and extension services as well as livelihood recovery support.	Provision of seeds, tools, livestock and financial assistance restores productive capacity after conflict-related losses	Provides an explanation for how the negative effects reflected in household food insecurity scores could be reduced through post-conflict recovery programmes.	“After losing crops and animals, what we need is support to start again. Giving seeds and tools will help us to return to farming.” (Farmer 12, Katsina-Ala)
Food and social assistance	Targeted food, cash, social assistance or other support for	Food distributions, cash transfers and other forms of assistance will	Consistent with the finding that conflict-exposed households	“During the period when we could not

	severely affected households	help provide immediate assistance to households unable to produce or purchase sufficient food during periods of severe disruptions.	face difficulty household requirements. greater meeting food	farm, assistance from outside was what helped some families survive.” (Community Leader 05, Ukum)
Peacebuilding and sustained stakeholder engagement	Continuous mediation, reconciliation, peace education and community sensitization of farmers and herder	Regular interaction among farmers, herders, traditional authorities, government agencies and non-governmental organizations (NGO’s) can prevents escalation of disputes and promotes peaceful coexistence.	Integrates the quantitative and qualitative findings by addressing the structural causes of livelihood disruption and food insecurity.	“Peace cannot be achieved by one meeting. Farmers, herders, traditional rulers and government have to continue talking to one another.: (Government Official 01, Kataina-Ala)

Source: Qualitative analysis of interview data.

The qualitative findings in Table 9 indicate that households and community stakeholders employed a combination of short-term coping mechanisms and longer-term mitigation strategies in response to the effects of farmer–herder crises on agricultural livelihoods and food security.

The qualitative interviews provided contextual explanations for the quantitative evidence that conflict-exposed households experienced greater food insecurity than non-exposed households. Thematic analysis generated twelve interrelated themes concerning livelihood disruption, household coping, conflict prevention, security and recovery. These themes demonstrate that households responded to the crisis through both individual coping mechanisms and collective/community-level strategies, while participants also identified institutional interventions necessary for sustainable recovery. At the household level, livelihood diversification, small livestock production, food conservation and alternative agricultural production were identified as important mechanisms for maintaining food access when conventional farming activities were disrupted. These strategies suggest that households attempted to compensate for losses in agricultural production and income by drawing on alternative livelihood and food sources. The findings further indicate that the consequences of the crisis extended beyond individual households to the broader community. Farmer–herder dialogue, collective farming, early-warning mechanisms, negotiated land-use arrangements and traditional dispute-resolution systems emerged as important community-based approaches for reducing conflict and protecting agricultural livelihoods. These mechanisms are particularly relevant in Sankera because recurrent

disputes over farmland, livestock movement and access to natural resources can interrupt planting, cultivation, harvesting and marketing activities.

At the institutional level, participants' proposed strategies centred on improved security, agricultural recovery assistance and targeted social protection. Provision of farm inputs, restoration of productive assets and assistance to severely affected households would help rebuild livelihoods after conflict-related losses, while improved security would facilitate safe access to agricultural land. Food and cash assistance would provide an immediate safety net for households experiencing acute food-access difficulties. Overall, the evidence suggests that improving food security in Sankera requires more than increasing agricultural production. Sustainable improvement will require measures that reduce conflict exposure, protect farmers' access to productive land, restore displaced households' livelihoods, strengthen rural incomes and improve the resilience of households whose agricultural activities have been disrupted. This interpretation is consistent with broader Nigerian evidence that recommends conflict-sensitive agricultural and livestock policies, targeted support for affected households and interventions addressing the underlying drivers of farmer–herder conflict. Thus, the appropriate intervention is not merely to encourage households to "cope better"; rather, interventions should restore their productive capacity and address the structural causes of insecurity. This is especially important because researches (Nnaji, A., 2022; Ma's 2023; Fadare et al., 2024; Mustafa and Sa'ad's, 2025; Ijirshar et al., 2025; Nwankwo, C. F, 2025; Yange et al., 2026; Mnda et al., 2026) in Nigeria revealed that conflict exposure can reduce food consumption and agricultural investment, while the severity of conflict has a particularly strong relationship with food insecurity.

5.0 Conclusion and Recommendations

5.1 Conclusion

This study examined the implications of farmer–herder crises for household food security in Sankera, Benue State, Nigeria, using a mixed-method approach and data from 400 respondents drawn from Katsina-Ala (147), Logo (111), and Ukum (142). The findings demonstrate that farmer–herder conflict constitutes not only a security and livelihood challenge but also a significant threat to household food security in the study area.

The study established that households exposed to farmer–herder conflict recorded significantly higher HFIAS scores than non-exposed households, indicating greater levels of food insecurity among conflict-affected households. This finding confirms that recurrent insecurity undermines households' capacity to consistently access sufficient and nutritious food. The effect extends beyond direct physical violence because fear, insecurity and uncertainty influence household decisions concerning farming, labour allocation, investment and movement.

The study further established that conflict-related reductions in cultivated farm size and crop yields adversely affect household food availability. Since farming constitutes a major livelihood activity in Sankera, the inability to cultivate adequate farmland or maintain normal levels of agricultural production directly reduces the quantity of food available for household consumption. Crop losses and farm abandonment also reduce marketable surpluses, thereby creating additional economic consequences.

Evidence of declining household income further demonstrates that farmer–herder conflict operates through an economic-access pathway. Reduced agricultural production, disruption of livelihood activities, destruction of productive assets and restricted access to markets diminish household purchasing power. Consequently, even where food is physically available in local markets, conflict-affected households may lack the financial capacity to acquire adequate quantities. The

study also found that displaced households experienced significantly poorer food-security outcomes than non-displaced households. Displacement deprives households of access to farmland, stored food, livestock, income-generating activities, markets and social-support systems. The resulting loss of productive assets and livelihood opportunities makes displaced households particularly vulnerable to persistent food insecurity and inadequate dietary diversity.

Overall, the findings indicate that farmer–herder crises undermine food security in Sankera through interconnected pathways involving conflict exposure, agricultural disruption, reduced food availability, declining household income and displacement. The problem therefore requires an integrated response that simultaneously addresses security, agricultural production, livelihood recovery and household food access. Efforts to improve food security in Sankera will remain incomplete if they focus exclusively on increasing agricultural production without addressing the insecurity that prevents households from safely producing, storing, selling and accessing food.

The study concludes that sustainable food security in Sankera depends substantially on the restoration of peace and security, protection of agricultural livelihoods, recovery of displaced households and strengthening of household economic resilience. Farmer–herder conflict should consequently be treated as a multidimensional development challenge whose consequences extend from individual farms to household welfare and the broader food system.

5.2 Implications of the Findings

The study has the following implications:

i. Food-security implication

Farmer–herder conflict is associated with greater household food insecurity, particularly among conflict-exposed households.

ii. Agricultural implication

Conflict can disrupt farming activities, restrict access to farmland, reduce production, and consequently affect household food availability and income.

iii. Economic implication

Loss of crops, livestock, property, and productive assets can weaken household livelihoods and reduce their capacity to recover from food shocks.

iv. Social implication

Recurrent conflict may contribute to displacement, social fragmentation, reduced community cooperation, and vulnerability among affected households.

v. Policy implication

Food-security interventions in conflict-affected areas need to incorporate conflict prevention and peacebuilding rather than addressing food insecurity in isolation.

vi. Research implication

The mixed-method findings demonstrate the value of combining quantitative measures such as HFIAS with qualitative accounts to understand both the magnitude and lived experience of food insecurity.

5.3 Limitations of the Study

Despite the methodological rigor adopted in this study, certain limitations should be acknowledged. First, the study was geographically restricted to the three Local Government Areas constituting Sankera—Katsina-Ala, Logo, and Ukum. Although these areas provide an important context for examining farmer–herder conflict and household food security, the findings may not

be directly generalizable to other parts of Benue State or Nigeria where the nature, intensity, and socioeconomic consequences of farmer–herder conflicts may differ.

Second, the study employed a cross-sectional design, with data collected at a particular period. Consequently, the findings primarily reflect the relationship between conflict exposure and household food security at the time of the study and cannot fully establish how these effects may change over time. Household food-security conditions and conflict intensity may fluctuate considerably depending on seasonal agricultural activities, displacement, market conditions, and the occurrence of new conflict incidents. Third, the study relied partly on respondents' self-reported information concerning conflict experiences, household food security, losses, and livelihood disruptions. Such information may be affected by recall bias or respondents' reluctance to disclose sensitive experiences, particularly in communities where farmer–herder relations remain tense. Nevertheless, the use of a structured food-security measure and complementary qualitative interviews helped to provide a more comprehensive understanding of the phenomenon. Fourth, the sensitive nature of farmer–herder conflict may have influenced some respondents' willingness to provide detailed information. Some participants may have moderated their responses because of concerns about personal safety, community tensions, or the potential consequences of disclosing information about conflict incidents and losses. The researchers therefore relied on appropriate ethical procedures, confidentiality, and voluntary participation to encourage honest responses. Fifth, although the mixed-method design enabled the study to combine quantitative evidence with participants' lived experiences, the qualitative component involved a relatively smaller number of participants than the quantitative survey. Therefore, the qualitative findings should primarily be interpreted as explanatory evidence that provides contextual understanding of the quantitative results rather than as statistically representative of all households in Sankera. Finally, the study focused principally on household-level food-security outcomes associated with farmer–herder conflict. Other factors that may influence food security—including inflation, food prices, climate variability, flooding or drought, access to agricultural inputs, government interventions, and broader livelihood shocks—were not examined comprehensively. These factors may interact with conflict exposure and contribute independently or jointly to household food insecurity.

These limitations do not invalidate the findings; rather, they define the context within which the results should be interpreted. They also highlight the need for longitudinal and broader multi-location studies that can examine the changing relationship between farmer–herder conflict, livelihood disruption, and household food security over time.

Certainly. For your farmer–herder crises and food security in Sankera, Benue State, Nigeria: an empirical mixed-method study, the suggestions for further studies should arise directly from the study's limitations and findings.

5.4 Recommendations

The findings suggest that addressing the food-security consequences of farmer–herder crises in Sankera requires a shift from predominantly short-term household coping toward integrated conflict-prevention, livelihood-recovery and resilience-building interventions. FAO's current Nigeria resilience approach similarly emphasizes restoring agricultural production, protecting livelihoods, improving market access and strengthening resilience in conflict-affected communities

Based on the findings of the study, the following recommendations are made:

i. Strengthen conflict-prevention and early-warning mechanisms

The Benue State Government, local government authorities and relevant security agencies should establish effective community-based early-warning and rapid-response mechanisms in Katsina-Ala, Logo and Ukum to identify emerging farmer–herder tensions before they escalate into violence.

ii. Protect farmers' access to agricultural land

Government and relevant community authorities should strengthen security around farming communities, particularly during planting and harvesting seasons, to enable farmers to cultivate their farms without fear of attack, crop destruction or forced abandonment.

iii. Provide targeted agricultural recovery support

Conflict-affected farmers should receive subsidized seeds, fertilizers, farm tools and other essential inputs to enable them to restore cultivated farm sizes and recover agricultural productivity after periods of insecurity.

iv. Support displaced households to rebuild livelihoods

Displaced farming households should be provided with targeted livelihood-recovery packages, including agricultural inputs, temporary food assistance, access to land and financial support, rather than relying solely on short-term humanitarian assistance.

v. Introduce income-restoration programmes

Government agencies and development partners should implement cash-for-work, agricultural enterprise, small-business and vocational programmes for conflict-affected households to restore income and strengthen their economic access to food.

vi. Improve access to food for highly vulnerable households

Households experiencing severe food insecurity, particularly displaced families, female-headed households and households that have lost major productive assets, should receive targeted food and nutrition assistance until sustainable livelihoods are restored.

vii. Strengthen farmer–herder dialogue and local conflict-resolution mechanisms

Community-based platforms involving crop farmers, pastoralists, traditional rulers, religious leaders, youth representatives and local authorities should be strengthened to facilitate dialogue, negotiate access to natural resources and resolve disputes before they become violent.

viii. Promote sustainable land-use and livestock-management systems

Government should promote clearly defined grazing, stock routes, water-access arrangements and other appropriate livestock-management mechanisms while protecting legitimate agricultural land rights. Such interventions should be developed through inclusive consultation with affected communities.

ix. Improve agricultural storage and market infrastructure

Investment in secure storage facilities, rural roads and local markets should be prioritized in conflict-affected communities. This would reduce post-harvest losses and improve farmers' ability to preserve and market agricultural produce when security conditions permit.

x. Develop conflict-sensitive food-security policies

Food-security interventions in Benue State should explicitly incorporate conflict exposure and displacement as vulnerability factors. Agricultural and food-security programmes should therefore identify conflict-affected households for priority intervention rather than treating all rural households as equally vulnerable.

xi. Establish systematic monitoring of household food security

Relevant government agencies and development organizations should periodically monitor HFIAS and household dietary diversity among conflict-affected and displaced populations in Sankera. Such monitoring would provide evidence for timely interventions and help determine whether recovery programmes are improving household food access.

xii. Encourage further longitudinal research

Future studies should employ longitudinal designs to examine how prolonged farmer–herder conflict affects household food security over time and whether households recover after violence subsides. Further research should also examine differences among Katsina-Ala, Logo and Ukum and the differential vulnerability of farmers, pastoralists and displaced populations.

5.5 Suggestions for Further Studies

Based on the findings and limitations of the present study, the following areas are suggested for further research:

i. Longitudinal studies

Future studies should adopt longitudinal research designs to examine how prolonged or recurrent farmer–herder conflicts affect household food security over time. Such studies would provide stronger evidence regarding changes in food-security status before, during, and after conflict episodes.

ii. Comparative studies across regions

Similar studies should be conducted in other conflict-affected communities within Benue State and other parts of Nigeria to determine whether the relationship between farmer–herder conflict and household food insecurity observed in Sankera is consistent across different geographical and socioeconomic settings.

iii. Gender-differentiated effects

Further research should investigate how farmer–herder conflicts affect male- and female-headed households differently, particularly in relation to access to farmland, income, food access, household nutrition, displacement, and livelihood recovery.

Children and nutritional outcomes: Future research should examine the consequences of conflict-induced household food insecurity on child nutrition, dietary diversity, and other health-related outcomes, particularly among children under five years and other vulnerable household members.

iv. Livelihood resilience and coping strategies

Further studies should investigate the coping mechanisms and livelihood strategies adopted by conflict-affected households and determine which strategies enhance or undermine long-term household resilience and food security.

v. Role of climate and environmental factors

Future research should examine the interaction between farmer–herder conflict, climate variability, land degradation, water scarcity, and changing patterns of agricultural and pastoral activities. This would provide a more comprehensive understanding of the multiple drivers of conflict and food insecurity.

vi. Evaluation of interventions

There is a need for studies evaluating the effectiveness of government policies, peacebuilding initiatives, humanitarian assistance, social-protection programmes, and agricultural recovery interventions in reducing food insecurity among conflict-affected households.

Qualitative studies of farmer–herder relations: In-depth qualitative research should explore the perceptions, experiences, grievances, and peacebuilding perspectives of both crop farmers and herders. Such research could provide deeper insight into the underlying causes of conflict and identify locally appropriate mechanisms for sustainable coexistence.

vii. Economic cost of conflict

Further studies should quantify the economic costs of farmer–herder conflict, including crop destruction, livestock losses, displacement, reduced agricultural productivity, loss of income, and increased household expenditure on food and security.

viii. Multi-level analytical studies

Future research could employ multilevel or structural equation modelling to examine how individual, household, community, environmental, and institutional factors jointly influence the relationship between conflict exposure and household food security.

Overall, future research should move beyond establishing the association between farmer–herder conflict and food insecurity to identifying causal pathways, long-term consequences, effective coping mechanisms, and interventions capable of strengthening household and community resilience in conflict-affected agricultural communities.

Author Contributions

The study was conceptualized, drafted, and data collected by Iorkaan Samuel Kuma and Dr. Yange Terlumun Clement, while Dr. Bam Clement Liambee, Hubert Kegnien Katyona, and Dr. Terngu Paul Ugosor were responsible for the design and manuscript preparation. All authors contributed to the critical review and revision of the manuscript, participated in the final editing process, and approved the final version for submission.

Ethical Approval and Consent to Participate

Ethical principles relating to voluntary participation, informed consent, confidentiality, privacy, and participants' right to withdraw from the study at any stage were strictly observed throughout the research process.

Consent for Publication

All participants provided consent for the use of their anonymized responses for research reporting and publication of the findings. No personally identifiable information was included in the presentation or publication of the study results.

Competing Interests

The authors declare that they have no competing interests or financial or personal relationships that could have influenced the conduct, analysis, or reporting of this study.

Declaration of Generative AI and AI-Assisted Technologies

In the course of preparation of this work, the authors used ChatGPT to paraphrase the original text for improved grammatical clarity. After that, the authors carefully revealed and edited the content and take full responsibility for the publication of the content.

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APPENDICES

Appendix 1: Research Questionnaire

Farmer-Herder Crises and Its Implications for Food Security in Sankera, Benue State, Nigeria: An Empirical Study

Introduction

Dear Respondent,

I am conducting a research study on farmer-herder crises and their implications for food security in Sankera, Benue State, Nigeria. The study covers Katsina-Ala, Logo, and Ukum Local Government Areas.

You have been selected to participate because of your experience and knowledge of farming and food-security conditions in your community. The information provided will be used strictly for academic purposes. Your responses will be treated confidentially, and you are not required to write your name on the questionnaire.

Participation is voluntary. Please answer all questions as honestly as possible. There are no right or wrong answers.

Thank you for your cooperation.

Instructions: Please tick (✓) the option that best represents your response. Where a written response is required, provide the appropriate answer.

SECTION A: Socio-Demographic Information

1. Local Government Area

- ☐ Katsina-Ala
- ☐ Logo
- ☐ Ukum

2. Sex

- ☐ Male
- ☐ Female
- ☐ Prefer not to say

3. Age

- ☐ 18–29 years
- ☐ 30–39 years
- ☐ 40–49 years
- ☐ 50–59 years
- ☐ 60 years and above

Marital Status

- ☐ Single
- ☐ Married
- ☐ Widowed
- ☐ Divorced/Separated

4. Highest Educational Qualification

- ☐ No formal education
- ☐ Primary education
- ☐ Secondary education
- ☐ NCE/OND

☐ HND/Bachelor's degree

☐ Postgraduate degree

6. Household Size

☐ 1–3 persons

☐ 4–6 persons

☐ 7–9 persons

☐ 10 persons and above

7. Primary Occupation

☐ Crop farming

☐ Livestock farming

☐ Crop and livestock farming

☐ Trading/business

☐ Civil/public service

☐ Other: _____

8. Years engaged in farming

☐ Less than 5 years

☐ 5–10 years

☐ 11–20 years

☐ More than 20 years

9. Approximate farm size

☐ Less than 1 hectare

☐ 1–2 hectares

☐ 2.1–5 hectares

☐ More than 5 hectares

10. Number of persons in your household who depend mainly on farming
_____ persons.

SECTION B: Exposure To Farmer-Herder Crises

Instruction: Please indicate your experience of farmer-herder conflict in your community.

No.	Statement	1	2	3	4	5
B1	My community has experienced farmer-herder conflict in recent years.	☐	☐	☐	☐	☐
B2	I have personally experienced or witnessed farmer-herder conflict.	☐	☐	☐	☐	☐
B3	Farmer-herder conflict has affected farming activities in my community.	☐	☐	☐	☐	☐
B4	Farmers in my community have experienced destruction of crops by livestock	☐	☐	☐	☐	☐
B5	Farmers have lost access to farmland because of conflict.	☐	☐	☐	☐	☐

B6	Some farming households have been displaced because of farmer-herder conflict.	☐	☐	☐	☐	☐
B7	Fear of attacks has prevented farmers from going to their farms.	☐	☐	☐	☐	☐
B8	Farmer-herder conflict has caused loss of agricultural assets in my community.	☐	☐	☐	☐	☐
B9	The frequency of farmer-herder conflicts has increased agricultural insecurity in my community.	☐	☐	☐	☐	☐
B10	Farmer-herder conflict remains a major threat to farming households in my community.	☐	☐	☐	☐	☐

Response scale: 1 = Strongly Disagree; 2 = Disagree; 3 = Undecided; 4 = Agree; 5 = Strongly Agree.

SECTION C: Effects of Farmer-Herder Crises On Agricultural Activities

Instruction: Using the same five-point scale, indicate your level of agreement.

No.	Statement	1	2	3	4	5
C1	The crisis has reduced the amount of land available for cultivation.	☐	☐	☐	☐	☐
C2	The crisis has reduced the frequency with which farmers visit their farms.	☐	☐	☐	☐	☐
C3	Crops have been destroyed by grazing livestock.	☐	☐	☐	☐	☐
C4	The crisis has caused farmers to abandon some farms.	☐	☐	☐	☐	☐
C5	Farmers have lost access to farmland because of conflict.	☐	☐	☐	☐	☐
C6	The crisis has resulted in loss of farm inputs and equipment.	☐	☐	☐	☐	☐
C7	The crisis has increased the cost of farming.	☐	☐	☐	☐	☐
C8	The crisis has reduced farmers' income.	☐	☐	☐	☐	☐
C9	Displacement has reduced farmers' ability to cultivate their normal farm sizes.	☐	☐	☐	☐	☐
C10	The crisis has disrupted agricultural labour availability.	☐	☐	☐	☐	☐

SECTION D: Effects On Food Availability and Access**Instruction:** Using the same five-point scale, indicate your level of agreement,

No.	Statement	1	2	3	4	5
D1	Farmer-herder conflict has reduced food production in my household.	☐	☐	☐	☐	☐
D2	My household has experienced periods when available food was insufficient.	☐	☐	☐	☐	☐
D3	Conflict has made it more difficult for my household to obtain food.	☐	☐	☐	☐	☐
D4	Food prices have increased as a result of conflict-related disruptions.	☐	☐	☐	☐	☐
D5	My household has had to reduce the quantity of food consumed because of inadequate resources.	☐	☐	☐	☐	☐
D6	Conflict-related displacement has affected household food access.	☐	☐	☐	☐	☐
D7	Reduced farm income has affected my household's ability to purchase food.	☐	☐	☐	☐	☐
D8	Conflict has reduced the availability of diverse foods in my community.	☐	☐	☐	☐	☐
D9	Some households in my community depend on food assistance because of conflict.	☐	☐	☐	☐	☐
D10	Farmer-herder conflict has contributed substantially to household food insecurity.	☐	☐	☐	☐	☐

SECTION E: Household Food Security**Instruction:** The following questions concern your household's experience during the 30 days preceding the survey. For each question, indicate the most appropriate response.

No.	During the past 30 days.	Never	Rarely	Sometimes	Often
E1	Did you worry that your household would not have enough food?	☐	☐	☐	☐
E2	Were you unable to eat the kinds of foods you preferred because of lack of resources?	☐	☐	☐	☐

E3	Did your household eat a limited variety of foods because of insufficient resources?	☐	☐	☐	☐
E4	Did your household eat foods that you considered undesirable because of lack of resources?	☐	☐	☐	☐
E5	Did your household reduce the size of meals because there was not enough food?	☐	☐	☐	☐
E6	Did your household reduce the number of meals eaten in a day because there was not enough food?	☐	☐	☐	☐
E7	Was there ever no food of any kind in your household because of lack of resources?	☐	☐	☐	☐
E8	Did any household member go to sleep hungry because there was not enough food?	☐	☐	☐	☐
E9	Did any household member go a whole day and night without eating because there was not enough food?	☐	☐	☐	☐
E10	Farmer-herder conflict has contributed substantially to household food insecurity.	☐	☐	☐	☐

Note: This section is adapted from the Household Food Insecurity Access Scale (HFIAS) framework and should be identified as an adapted instrument in the methodology.

SECTION F: Coping Strategies Adopted by Households

Which of the following strategies has your household used because of conflict-related disruption or inadequate food/income?

No.	Coping strategy	Never	Rarely	Sometimes	Often
F1	Reduced the quantity of food consumed.	☐	☐	☐	☐
F2	Reduced the number of meals per day.	☐	☐	☐	☐
F3	Relied on less preferred or less expensive foods.	☐	☐	☐	☐
F4	Borrowed food or money from relatives/friends.	☐	☐	☐	☐
F5	Sold farm produce or assets to obtain food	☐	☐	☐	☐

F6	Reduced expenditure on education or healthcare to purchase food.	☐	☐	☐	☐
F7	Sought temporary or alternative employment.	☐	☐	☐	☐
F8	Relied on relatives or community support.	☐	☐	☐	☐
F9	Received assistance from government, NGOs or other organizations.	☐	☐	☐	☐
F10	Temporarily migrated or relocated to obtain food or livelihood opportunities.	☐	☐	☐	☐

SECTION G: Coping and Mitigation Measures

Please indicate how effective you consider each measure in reducing the effects of farmer-herder crises on food security.

No.	Measure	Not effective	Slightly effective	Moderately effective	Effective	Very effective
G1	Improved security presence in farming communities.	☐	☐	☐	☐	☐
G2	Early warning and rapid-response mechanisms.	☐	☐	☐	☐	☐
G3	Compensation for destroyed crops and property.	☐	☐	☐	☐	☐
G4	Provision of alternative farmland for displaced farmers.	☐	☐	☐	☐	☐
G5	Support through agricultural inputs and credit.	☐	☐	☐	☐	☐
G6	Dialogue and conflict-resolution mechanisms.	☐	☐	☐	☐	☐
G7	Effective implementation of relevant government policies.	☐	☐	☐	☐	☐
G8	Community-based conflict-resolution mechanisms.	☐	☐	☐	☐	☐
G9	Food assistance to conflict-affected households.	☐	☐	☐	☐	☐

G10	Rehabilitation and resettlement of displaced farming households	☐	☐	☐	☐	☐
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F. Open-ended question

In your opinion, what should government and other stakeholders do to reduce farmer-herder conflict and improve food security in Sankera?

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Appendix 2: Anonymized Participant-Profile Table

S/N	Participant Code	Stakeholder Category	Sex	Age (Years)	LGA
1	Farmer 01	Farmer	Male	51	Katsina-Ala
2	Farmer 02	Farmer	Female	45	Katsina-Ala
3	Farmer 03	Farmer	Female	47	Katsina-Ala
4	Farmer 04	Farmer	Male	42	Katsina-Ala
5	Farmer 05	Farmer	Male	52	Logo
6	Farmer 06	Farmer	Male	53	Logo
7	Farmer 07	Farmer	Female	41	Logo
8	Farmer 08	Farmer	Male	38	Logo
9	Farmer 09	Farmer	Female	31	Ukum
10	Farmer 10	Farmer	Male	40	Ukum
11	Farmer 11	Farmer	Male	55	Ukum
12	Farmer 12	Farmer	Male	36	Ukum
13	Herder 01	Herder	Male	44	Katsina-Ala
14	Herder 02	Herder	Male	40	Katsina-Ala
15	Herder 03	Herder	Male	33	Katsina-Ala
16	Herder 04	Herder	Male	31	Logo
17	Herder 05	Herder	Male	42	Logo
18	Herder 06	Herder	Male	40	Logo
19	Herder 07	Herder	Male	39	Ukum
20	Herder 08	Herder	Male	32	Ukum
21	Herder 09	Herder	Male	30	Ukum
22	Community Leader 01	Community Leader	Male	60	Katsina-Ala
23	Community Leader 02	Community Leader	Male	67	Katsina-Ala
24	Community Leader 03	Community Leader	Male	78	Logo
25	Community Leader 04	Community Leader	Male	76	Logo
26	Community Leader 05	Community Leader	Male	69	Ukum

27	Community Leader 06	Community Leader	Male	75	Ukum
28	Government Official 01	Government Official	Male	64	Katsina-Ala
29	Government Official 02	Government Official	Female	43	Logo
30	Government Official 03	Government Official	Male	55	Ukum

Appendix 3: Key Informant Interview Guide

Farmer-Herder Crises and Its Implications for Food Security in Sankera, Benue State, Nigeria: An Empirical Study

Introduction to the Interviewer

The purpose of this interview is to obtain detailed information about the nature of farmer-herder crises and their implications for agricultural production and food security in Sankera, Benue State. The interview should be conducted privately and respectfully. Participation is voluntary. The respondent should be informed that the information provided will be used strictly for academic purposes and that personal identifying information will not be disclosed in the research report.

1. Identification of Interviewee

Local Government Area: _____

2. Community/Ward: _____

3. Category of respondent:

- ☐ Community leader
- ☐ Farmer/farmers' association representative
- ☐ Agricultural extension officer
- ☐ Local government official
- ☐ Traditional institution representative
- ☐ Civil society/NGO representative
- ☐ Other: _____

4. Years of experience/knowledge of the community: _____

Interview Questions

A. Nature and Pattern of Farmer-Herder Conflicts

- How would you describe the nature and pattern of farmer-herder conflicts in this community?
- What are the major causes or triggers of these conflicts?
- How frequently do such conflicts occur, and have you observed any changes in their frequency or severity in recent years?
- Which groups or categories of households are most affected by the conflicts?

B. Effects on Agricultural Activities

- How have farmer-herder conflicts affected farming activities in this community?
- To what extent have crop destruction, displacement, insecurity or restricted access to farmland affected agricultural production?
- Have farmers changed their farming practices, reduced their farm sizes or abandoned farming because of insecurity? Please explain.

8. What effects have the conflicts had on farm income, agricultural labour, farm inputs and access to markets?

C. Implications for Food Security

9. In what ways have farmer-herder conflicts affected food availability in this community?
 10. How have the conflicts affected households' ability to obtain or purchase food?
 11. Have you observed changes in food prices, food diversity or household meal patterns following conflict incidents?
 12. Which households are particularly vulnerable to food insecurity during or after conflict?
 13. What coping strategies do households commonly adopt when conflict affects their food supply or livelihoods?

D. Displacement and Food Security

14. How has displacement of farming households affected agricultural production and food security?
 15. What challenges do displaced households face in accessing farmland, food, income and other basic necessities?
 16. Have displaced households received adequate assistance from government, NGOs, communities, or other organizations? Please explain.

E. Government and Community Responses

17. What measures have government agencies taken to prevent or manage farmer-herder conflicts in this area?
 18. How effective have these measures been in protecting farmers and maintaining agricultural production?
 19. What role have traditional institutions, community leaders and local organizations played in conflict prevention and resolution?
 20. What additional measures would you recommend to reduce farmer-herder conflicts and improve food security in Sankera?

F. Closing Question

21. Is there any other important issue concerning farmer-herder conflicts and food security in this community that you believe should be considered in this study?

Interviewer's Observations/Notes

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End of Interview

Thank you for your participation.

Appendix 4: Alignment of Questionnaire Sections with Research Objectives

Research objective	Questionnaire section	Main variables	Recommended analysis
Objective 1: Examine extent and pattern of crises	Section B	Conflict exposure, frequency, displacement, crop destruction and insecurity	Frequencies, percentages, means, SD; ANOVA where applicable

Objective 2: Assess effects on agriculture/livelihoods	Section C	Farm access, crop destruction, production, income, farm abandonment	Means, SD; Pearson correlation; regression
Objective 3: Determine implications for food security	Sections D & E	Food access, availability, dietary restriction, and food insecurity.	Frequencies, percentages, food-security score; correlation; regression
Objective 4: Examine coping/mitigation strategies	Sections F & G + interviews	Household coping strategies and stakeholder interventions	Frequencies, percentages, means, SD; thematic analysis

Appendix 5: Alignment of Hypotheses with Statistical Tests

Hypothesis	Independent variable	Dependent variable	Statistical test
H ₀₁	Conflict exposure score	Household food-security score	Pearson correlation
H ₀₂	Conflict-related factors	Household food-security score	Multiple linear regression
H ₀₃	LGA	Conflict exposure score	One-way ANOVA + Tukey HSD
H ₀₄	LGA	Household food-security score	One-way ANOVA + Tukey HSD