EFFECTS OF FARMER-HERDER CONFLICTS ON FOOD SECURITY AMONG FARMING HOUSEHOLDS IN ADAMAWA STATE NIGERIA

Salihu Ahmadu Yahaya
Adamawa State University, Mubi
Department of Economics,
Faculty of Social Sciences,
Communication & Media Studies
amatyahaya@gmail.com
https://orcid.org/0009-0008-7581-8065

Hamisu Ali
Adamawa State University, Mubi
Department of Economics,
Faculty of Social Sciences,
Communication & Media Studies
hamisu682@adsu.edu.ng

Adamu Jibrilla, ***Ph.D***
Adamawa State University, Mubi
Department of Economics,
Faculty of Social Sciences,
Communication & Media Studies
jibrilla653@adsu.edu.ng

****Corresponding Author***
Salihu Ahmadu Yahaya
Adamawa State University, Mubi
Department of Economics,
Faculty of Social Sciences,
Communication & Media Studies
amatyahaya@gmail.com
https://orcid.org/0009-0008-7581-8065

ABSTRACT

This study investigates the effects of farmer–herder conflicts on food security among farming households in Adamawa State, Nigeria, and assesses the mitigation strategies adopted for managing these conflicts. Using a cross-sectional research design and multistage cluster sampling, data were collected from farming households and analyzed using descriptive statistics, a food security index, and a logistic regression model. The results show that about 63 percent of farming households are food insecure. Empirical findings indicate that cattle rustling, violent confrontation, crop damage by cattle encroachment, and interpersonal clashes significantly reduce the likelihood of household food security. The study identifies seven community-based mitigation strategies predominantly applied to resident (local) herders, including verbal warning, arrest and prosecution, alternative dispute resolution, compensation, relief provision, plot reallocation, and payment for loss of cattle. In addition, a state-led seasonal calendar (date-line) approach regulating harvesting periods and pastoral movement is identified as a complementary preventive strategy targeting migrating herders. While most households perceive these measures as effective, gaps remain in enforcement and institutional coordination. The study concludes that farmer–herder conflicts constitute a major constraint to household food security and recommends institutionalizing the seasonal calendar framework, strengthening community-based conflict resolution mechanisms, and integrating conflict-sensitive land-use planning and agro-pastoral practices to enhance sustainable food security outcomes.

Keywords: *Farmer–herder conflict; Food security; Conflict mitigation; Farming households; Adamawa State.*

JEL Classification: D74, D13, Q12

1. INTRODUCTION

Farmers and herders have been involved in a number of disputes in Nigeria, and there are important factors affecting economic, social, political, and ecological features. The majority of these disputes take place where there is intense rivalry for grazing and farming land, but the severity varies from state to state depending on the biological setting and the groups involved Yakubu et al., (2021).

Even if the ties between herders and farmers in northern Nigeria have deteriorated due to droughts and climate change, the intensity and scale of transhuman and immigration southwards have increased as a result of the yearly rainfall decline and shortening of the rainy season changed the ecosystem's dynamics and soured ties, leading to a confrontation between farmers and herders. (Abbass, (2009). These movements and the pursuit of greener pasture have resulted in numerous conflicts and the degradation of farms, all of which have had a negative impact on food security.

The emergence of the aggressive Udawa and Bokoloji pastoralists is linked to the militancy dimension of the conflicts, which further prompted the use of new communication technologies, banditry, and the introduction of guns and other sophisticated weapons. The invasion of about six communities in the Lamurde local government area of Adamawa State by some armed herders resulted in over 2,000 people being homeless as a result of the devastation of villages, in addition to an unconfirmed number of fatalities and injuries (Abbass, 2009).

Due to population growth and climate changes, which resulted in the cultivation of more land intended for grazing along cattle routes, conflict between farmers and herders in Nigeria has lately surged. It is crucial to remember that these conflicts directly affect both the food security of those affected and the nation as a whole (Yakubu et al., 2021). Approximately 4,125 grazing reserves or routes were formally delineated in Nigeria. Only one-third of these are actually used, whereas 270 grazing reserves have been planted (Abbass, 2009).

WFP Nigeria, (2023a) Lean Season Food Security Outlook published over 47% of households in northeast Nigeria have inadequate food consumption in June. This marks an eight-percentage point increase compared to last year and a seven-percentage point increase compared to the start of the lean season. In June, 33% of cultivating households have some food stocks remaining. This marks a one-point decrease compared to same time last year. However, only 20% have stocks that will last longer than a month. Food consumption is therefore expected to worsen rapidly over the coming months.

Severe and moderate food insecurity are more prevalent in households that reported insecurity, temporary displacement, high food prices, and loss of employment or reduced income compared to households that had not experienced any shocks WFP Nigeria, (2019). Persistent insecurity and access constraints are among the drivers making today a challenging year for food and nutrition security in Nigeria. These have been compounded by steady increases in food prices since 2020. Following the government’s operational changes to foreign exchange markets, official exchange rates have nearly doubled in two years, fuel prices

 @A Publication of the Department of Economics, ADSU, Mubi. ISSN- Print: 2550- 7869; ISSN-Online: 3043-5323. Journal homepage: https://ajaefm.adsu.edu.ng

have doubled since the removal of government subsidies in June. Associated tensions have triggered opportunistic crime in some communities, including looting of government and private warehouses in Adamawa State (WFP Nigeria, 2023b).

Insecurity, high food prices, and unemployment are significant components of shocks that have negatively impacted the food security of households in Adamawa State, this current situation may have long-term negative effects on the state's economy. The prevalence of this problem, how wide it is spreading, and the cost in short and long runs form the basis for this research. In view of the above, the objective of the study is to determine the food security status of the farming households, examining the effects of farmer-herder conflicts on the food security status of farming households, and assessing the mitigation strategies adopted for the management of farmer-herder conflicts in Adamawa State, Nigeria.

2. LITERATURE REVIEW

2.1 Empirical Literature

The major effects of food insecurity on households include a reduction in household income and savings due to increased expenditure on food, among others. 74% of the respondents were food secure, while 26% were food insecure. The results of the logistic regression revealed that educational level, sex, household size, and access to credit were significant determinants of food security Irohibe & Agwu, (2014), in a study, assessed the food security status among farming households in rural areas of Kano State, Nigeria.

Yakubu et al., (2021) in a study, examined the effects of farmer-herder conflicts on rural households' food security in Gombe State, Nigeria. household size and education, farm size, and cattle route encroachment were the major causes of the conflict. In addition, killing of stray cattle, population growth, rape, and sexual harassment were all responsible for farmer-herder conflict with different marginal effects. The selling of grazing areas and corrupt practices by traditional rulers are some of the constraints that affect conflict management.

The unfriendly and conflictual relationship between the two parties in the conflict has greatly impacted food security, especially food for immediate consumption. Empirical results show that both the incidence and the severity of farmer-herder conflicts significantly increase food insecurity (see Ojelade, 2019; Nnaji et al., 2022). The principal causes and aggravating factors behind the escalating conflict are climatic changes, population growth, technological and economic changes, crime, political and ethnic strife, and cultural changes (Akinrinde et al., 2021).

@A Publication of the Department of Economics, ADSU, Mubi. ISSN- Print: 2550- 7869; ISSN-Online: 3043-5323. Journal homepage: https://ajaefm.adsu.edu.ng

In order to create an enabling environment for food security, peace, and sustainable development, Udosen (2021) suggests, among others, that there is a need for the Nigerian government to come up with a proper re-orientation programme that will breed good and social interaction, irrespective of religious and ethnic background. The government at all levels should be firm and fair in its resolution and implementation decisions so as to tackle the crisis to a standstill. Apenda (2016) found that so many human lives were lost; farm lands, residences, and schools were destroyed, leading to a decline in farm output (causing food insecurity) and human capital loss.

Conflict has affected the livelihoods of highly conflict-prone households both in the short and long run, thus hampering the rural economy and the national economy in general. Besides, the negative impact of the conflict is more pronounced on farm income, which is owed to farmland invasion by the herders, thus affecting the income that accrues from the marketable surplus. (Sadiq et al., 2021). Antwi (2018) in Kwahu East District, Ghana, revealed that the major cause of the conflict is competition over arable lands for farming and grazing, especially in the dry season. Other triggers of the conflict reported were crop destruction, stealing and killing of cattle, violence against women, pollution of water bodies, burning of grass, spraying weedicide and pesticide, and farming close to grazing lands.

2.2 Theoretical Literature

According to the World Bank Group, the annual population growth rate for 2020 will be around 2.5%; this is the midyear population's exponential growth rate represented as a percentage World Bank Group, (2022b). The Crop Production Index compares each year's agricultural output to the baseline period of 2014–2016. Everything, save fodder crops, is excluded from it. The newest year, 2018, had a score of 102.0. The underlying values in international dollars, normalised to the base year 2014–2016, are used to produce regional and income group averages for the FAO's production indexes (World Bank Group, 2022a).

For these reasons, this study will review the popular Malthusian Theory, the Social Conflict Theory, and the Environmental Security Theory. This study will further consider the Environmental Security Theory as the most relevant and proven basis of argument, theory-driven significance, and validity approach to the study.

 @A Publication of the Department of Economics, ADSU, Mubi. ISSN- Print: 2550- 7869; ISSN-Online: 3043-5323. Journal homepage: https://ajaefm.adsu.edu.ng

2.2.1 Malthusian Theory

Food security is determined by the population of the household's members, and population expansion undoubtedly influences agricultural production. The world's population has increased rapidly, including in Nigeria, while agricultural production in Nigeria has decreased over decades. The Malthusian theory of population is not overemphasised when food security is taken into account, along with population and food production.

Malthus (1789) stated that if there were a billion people on the planet, for example, the human species would continue to exist in arithmetic progression and grow geometrically. Unless humans can limit reproduction voluntarily through self-restraint, the population will be reduced by catastrophic events such as diseases, starvation, misery, and wars. In two centuries and a quarter, the population will be to the means of subsistence as 512 to 10, in three centuries as 4096 to 13, and in two thousand years the difference will be almost incalculable. Malthus divided population control into two categories since he believed that it could not continue unchecked. On the one hand, preventive checks, also known as negative checks, include factors delaying marriage, rising food prices, and factors reducing fertility, such as moral restraint, contraception, and abortion, while on the other, positive checks include factors increasing mortality, such as war, famine, and disease that would increase the death rate.

The birth rate is one of many factors driving population growth in Nigeria, and it has a significant impact on the population growth rate. Other factors driving up the birth rate include earlier marriages, especially in the north of the country, and better medical services and facilities as compared to decades ago. Due to long childbearing and reproductive years, early marriage often results in a high birth rate. Other contributing factors include a small but significant rise in certain families' material well-being (Odusina, 2006). Malthus received harsh criticism for disregarding the impact of evolving technology and the resulting change in a society's socio-economic structure. He did not fully understand how crop fertilisation and modern agricultural technologies could support a huge population. However, in terms of instruments and high-yield varieties of seed, technology is crucial in modern agriculture.

2.2.2 Social Conflict Theory

Conflict theory is a tool used by social scientists to examine how human-interest conflicts arise. This idea, which asserts that distinct social groupings frequently outweigh one another to obtain privileges and other benefits, was championed by Karl Max. Conflict schools of thought academics take into account the

 @A Publication of the Department of Economics, ADSU, Mubi. ISSN- Print: 2550- 7869; ISSN-Online: 3043-5323. Journal homepage: https://ajaefm.adsu.edu.ng

disparities in societal interests between various groups. Conflicts within society's conventional ideas are frequently tied to this idea. Marx argued that in order to provide food, shelter, and clothing for the world's population, man must acquire and employ his abilities. In order to increase the economy's efficiency, he also thinks that the relationship between production and other aspects should be taken into account (Haralambos & Holborn, 2013).

Ralph Dahrendolf, Lois Althuser, Lewis Coser, and Karl Meheim are a few well-known conflict theory proponents. The conflict hypothesis holds that society is made up of individuals and organisations whose competing goals are centred on obtaining limited resources. Experts claim that the ongoing struggle for limited resources causes additional disputes, which ultimately result in social transformation. This is so that those who do not have access to resources are not frustrated by those who do, as groups and individuals often do. According to Haralambos and Holborn (2013), this sort of conflict is also brought on by the absence of cooperation among organisations with competing interests.

The underlying causes of the conflict between farmers and herders in a community can be explained using the conflict theory idea. It claims that the main reason why the two groups fight is because they are competing over a limited supply of land. Lands that were once farmed have been lost as a result of the population boom and the growth of new communities. Additionally, as a result of this, resources are not allocated fairly in society. There will always be conflict when parties have divergent interests. Conflicts between farmers and herders are allegedly a result of constant rivalry for a limited supply of land, among other things. Poor members of society are more likely to be drawn into disputes if they are unable to achieve their fundamental requirements. For organisations looking to commit killings and property devastation, this may make them easy targets (Kwaghtser, 2019).

3. METHODOLOGY

This study used a cross-sectional research strategy to allow the researcher to test hypotheses and respond to the research questions while collecting data from a broad pool of individuals quickly and efficiently. In a cross-sectional study, participants are only chosen in accordance with the inclusion and exclusion criteria established for the investigation. The study's population, which consists of farming households in Adamawa, is the population of interest. However, a person's eligibility to take part in a research study is determined by the eligibility requirements. Because of the implications for cost, effort, and the accuracy of the sample estimate, obtaining a representative sample size is still crucial for survey researchers. Using the Yamane (1967) formula, the sample size was determined from the sample frame. Throughout the data

 @A Publication of the Department of Economics, ADSU, Mubi. ISSN- Print: 2550- 7869; ISSN-Online: 3043-5323. Journal homepage: https://ajaefm.adsu.edu.ng

gathering process, 400 questionnaires in total were distributed. Nigeria is divided into 36 states for administrative convenience. Adamawa State is one of such states. Adamawa State is in the north eastern region of Nigeria, between latitudes 7° 11′ N and 11° 14′ E. Nigeria and Cameroun share a border along the state's eastern edge internationally Musa & Tukur (2009). A multi-stage cluster sampling was employed as a sampling technique for the purpose of this study, this involves systematic sampling and selection of farming household, also allowing strong statistical inferences about the whole sample frame. Three local government was sampled out of the twenty-one Local Government Areas in the state, one Local Government Area is selected from each Senatorial Zone, these Local Government Areas selected include; Mubi-South, Gombi and Ganye Local Government Areas from the north, central and southern senatorial zones respectively. In addition, two wards were selected form the selected local government areas above base on the frequency of Farmer-Herder conflicts. Lasty, questionnaires were administered to head of farming households' or their representative based on convenience random sample of enumeration areas.

3.1 Model Specification

Formulating a Probability Model Jack and John, (1997) linear probability model has intrinsic defect some applications, to consider alternatives. A useful way to think about the problem is to recognise that Xβ can be transform into a probability. A function *F* needed such that.

$$prob(y_i = 1) = F(X_i\beta)$$

a natural choice of a function F that translates $X\beta$ into a number between 0 and 1 in a sensible way is a distribution function, or the cumulative density. In fact, binary response model can be defining this way. If we choose *F* to be the identity function, so that

$$prob(y_i = 1) = X_i\beta$$

We get the linear probability model already discussed. It is clear by inspection that such a choice for F does not yield the type of function we want, for nothing constrains $X\beta$ to lie between 0 and 1. Choosing F to be standard normal yields one attractive possibility, the probit model:

$$prob(y_i = 1) = \Phi(X_i\beta) = \int_{-x}^{X_i\beta} \frac{1}{\sqrt{2\pi}}\, exp\left(\frac{-\mathcal{Z}^2}{2}\right) d\mathcal{Z}$$

 @A Publication of the Department of Economics, ADSU, Mubi. ISSN- Print: 2550- 7869; ISSN-Online: 3043-5323. Journal homepage: https://ajaefm.adsu.edu.ng

the standard normal transformation $\Phi(\cdot)$ constrains the probability to lie between 0 and 1. Choosing F to be the logistic distribution yields another attractive possibility the logit model:

$$prob(\mathrm{y_i} = 1) = \Lambda(\mathrm{X_i}\beta) = \frac{\exp(\mathrm{X_i}\beta)}{1 + \exp(\mathrm{X_i}\beta)}$$

Although the Probit and Logit are the most common models in practice. It is instructive to consider the Probit and Logit models in somewhat more detail.

3.1.1 Logit Model

The development of the logit is identical to that of probit model,

$$prob(y_i = 1) = \Lambda(X_i\beta) = \frac{exp(X_i\beta)}{1 + exp(X_i\beta)}$$

The latent variable interpretation of the logit proceeds exactly the same way as in the probit except that in equation below;

$$y_i^* = X_i\beta + \epsilon_i$$

follows what is called an extreme value distribution. Like the probit unlike linear probability model, the formulation of the model ensures that the predicted lie between 0 and 1. The main difference between the normal distribution and the logistic distribution is that the latter has more weight in the tails. The derivative of the probability with respect to one element of X varies with X as in the probit model:

$$\frac{\partial E(y)}{\partial X_k} = \frac{exp(X\beta)}{\left(1 + exp(X\beta)\right)^2}\beta_k$$

a convenient way to rewrite the derivative is

$$\frac{\partial E(y)}{\partial X_k} = p(1-p)\beta_k$$

Where;

$$p = \frac{exp(X\beta)}{1 + exp(X\beta)}$$

 @A Publication of the Department of Economics, ADSU, Mubi. ISSN- Print: 2550- 7869; ISSN-Online: 3043-5323. Journal homepage: https://ajaefm.adsu.edu.ng

3.1.2 Food Security Index

$$Fi = \frac{Per\ capita\ food\ expenditure\ for\ the\ ith\ household}{^{2}/_{3}\ mean\ per\ capita\ food\ expenditure\ of\ all\ households}$$

Where; Fi = Food security index. When *Fi > 1= Food Secure* ith household and when *Fi< 1= Food Insecure* ith household.

Therefore, the linear relationship for the purpose of this research is specified in equation (3.10)

$$FSI_i = \beta_0 + \beta_1 IC_i + \beta_2 GC_i + \beta_3 VC_i + \beta_4 DP_i + \beta_5 MK_i + \beta_6 CR_i + \beta_7 KSC_i + \beta_8 CDC_i + \epsilon_i \qquad (3.10)$$

Where; β_0 is a Constant and $\beta_1 - \beta_8$ are regression coefficients, ϵ_i = Error term

Y = households food security *(Y=0 for food secure Y=1 for food insecure)*

IC_i = Interpersonal dispute/clashes *(numbers of personal clashes)*

GC_i = Group disputes/clashes *(numbers of group clashes)*

VC_i = Violent confrontation *(numbers of violent confronted)*

DP_i = Destruction of properties *(value in Naira of properties destructed)*

MK_i = Maiming and killing *(numbers of family member injured or lost)*

CR_i = Cattle rustling *(numbers of cattle stole)*

KC_i = Killing of cattle's *(numbers of cattle lost)*

CDC_i = Crop damage by cattle encroachment *(bags of crop destroyed)*

4. DATA ANALYSIS AND DISCUSSION

This section is composed of data presentation and analysis, which include an analysis of food security status among farming households, an analysis of the effects of farmer-herder conflicts on the food security status of farming households, and mitigation strategies adopted for the management of farmer-herder conflicts in Adamawa State.

4.1 Analysis of Food Security Status Among Farming Households in Adamawa State

The population of each household was divided by the sum of each household's expenditure on food to arrive at the per capita food expenditure of each household. Furthermore, the two-thirds mean per capita food expenditure of all households was derived, and the summary of the food security index is presented in Table 4 below.

 @A Publication of the Department of Economics, ADSU, Mubi. ISSN- Print: 2550- 7869; ISSN-Online: 3043-5323. Journal homepage: https://ajaefm.adsu.edu.ng

Table 4.1: Food Security Index for Farming Household

Food Security Index	Freq.	Percent (%)	Cum.
Food insecure	229	63.61	63.61
Food secure	131	36.39	100
Total	**360**	**100**	

Source: Field Survey (2025)

Household food security status was assessed using the Food Security Index (FSI), derived from per capita food expenditure. For each household, per capita food expenditure was computed by dividing total household food expenditure by household size. The food insecurity line was defined as two-thirds of the mean per capita food expenditure of all sampled households. Based on this threshold, households were classified into two categories: food secure (FSI ≥ 1) and food insecure (FSI < 1).

The results indicate that a substantial proportion of farming households fall below the food insecurity line. Specifically, 63.6 percent of the sampled households were classified as food insecure, while 36.4 percent were classified as food secure. This distribution suggests that the majority of farming households in Adamawa State are unable to meet minimum food expenditure requirements, underscoring the severity of food insecurity in the study area.

The observed prevalence of food insecurity among farming households reflects the combined effects of livelihood disruptions, conflict-related shocks, and rising food prices. These findings provide an empirical basis for examining how farmer–herder conflicts further exacerbate household food insecurity in Adamawa State.

4.2 Analysis of the Effects of Farmer-Herder Conflicts on the Food Security Status of Farming Households in Adamawa State

About 360 observations were used in the analysis; fewer observations would have been used if any of the variables had a missing value. The likelihood ratio chi-square of 74.50 and a p-value of 0.0000 imply that the model as a whole fit significantly. In table 2 below, a summary of coefficients and t-statistics in parenthesis are presented.

Table 4.1: Logistic Regression Coefficient and Odd Ratios of Farmer Herder Conflict on Food Security

Variable	Logit	Odd Ratio
Cattle rustling	-0.693*	0.5002*
	(-2.50)	(-2.50)
Violent confrontation	-0.579**	0.5602**
	(2.77)	(-2.77)
Crop damage by cattle encroachment	-0.605**	1.8306**
	(3.24)	(3.24)
Interpersonal clashes	-1.096***	2.9934**
	(5.44)	(5.44)
cons	-1.024***	0.3592***
	(-4.68)	(-4.66)
N	360	360

*Source: Authors computation using stata14; t-statistics in parentheses, *, **, *** indicates significance at 10%, 5% and 1% respectively.*

Cattle rustling is found to be negatively related to the dependent variable and statistically significant at 10 percent. As presented, cattle rustling is decreasing the chances of being food secure. For every one unit increase in cattle rustling, the log odd of farming households being food secure is reduced by about 0.5. Similarly, violent confrontation is inversely related to the dependent variable and is statistically significant at 5 percent. Violent confrontation as a variable is found to be decreasing the chance of being food secure, and for every one unit increase in violent confrontation, the log odds of farming households being food secure decrease by about 0.56. Additionally, farming households faced with cattle rustling and violent confrontation have about 50 and 44 percent less chance of being food secure.

Cattle encroachment is statistically significant at 5 percent and inversely related to the food security index. This implies that the log odd of farming households being food secure is reduced by about 1.8 with a unit increase in crop damage from cattle encroachment. Similarly, farming households challenged with crop damage by cattle encroachment have fewer chances of becoming food secure by about 83 percent. Interpersonal clashes are found to be inversely related to the dependent variable and statistically significant at 1 percent. For every one unit increase in interpersonal clashes, the log odd of farming households being food secure will decrease by about 2.99. Therefore, interpersonal clashes between farmers and herders have a direct negative relationship with the food security of the farming household.

4.3 Assessment of the Mitigation Strategies Adopted for the Management of the Farmer-Herder Conflicts Within the Case Study Area.

In the process of ending a dispute and reaching an agreement that satisfies all parties involved, mitigation strategies are adopted for farmer-herder conflict resolution. In this section of the study, seven mitigation strategies were selected by the respondents as strategies adopted for the management of farmer-herder conflict, as presented in Table 3 below. Furthermore, their opinion on whether the mitigation strategies adopted are effective or otherwise is also presented.

Table 3: Mitigation Strategies Adopted for the Management of the Farmer-Herder Conflicts and Perception of Farming Household on the Mitigation Strategies Adopted Weather Effective or Otherwise

Mitigation Strategy Adopted	**Freq.**	**Percent**	**Cum.**
Verbal warning	222	38.47	38.47
Arrest and persecution	127	22.01	60.48
Alternative dispute resolution	72	12.48	72.96
Payment of compensation	65	11.27	84.23
Provision of relief material	46	7.97	92.20
Re-allocation of new plot	35	6.07	98.27
Payment for the loss of cattle	10	1.73	100
Effectiveness	**Freq.**	**Percent**	**Cum.**
Effective	249	69.17	69.17
Not Effective	91	25.28	94.44
Neutral	20	5.56	100
Total	**360**	**100**	

Source: Field Survey (2023)

Mitigation strategies for farmer–herder conflicts in Adamawa State operate at two interrelated levels; community base measures applied largely to resident (local) herders, and state led regulatory measures targeting seasonal and migrating herders. The present study focuses primarily on the former, while also contextualizing the latter as a complementary intervention.

As presented in Table 3, respondents identified seven mitigation strategies commonly employed in managing conflicts involving local herders residing within farming communities. These strategies are largely implemented through traditional institutions, local government structures, and community-level enforcement mechanisms.

Among the locally applied strategies, verbal warning is the most frequently used, accounting for 38.47 percent of responses. This approach is typically administered by village heads, district heads, and

@A Publication of the Department of Economics, ADSU, Mubi. ISSN- Print: 2550- 7869; ISSN-Online: 3043-5323. Journal homepage: https://ajaefm.adsu.edu.ng

community elders and reflects the centrality of customary authority in conflict management. Arrest and prosecution follow with 22.01 percent, representing formal enforcement actions undertaken in collaboration with local security agencies.

Alternative Dispute Resolution (ADR) mechanisms such as mediation, dialogue, and negotiated settlement account for 12.48 percent, while payment of compensation for crop damage or property loss represents 11.27 percent. These measures emphasize reconciliation and restoration of social relations between farmers and herders. Other strategies include provision of relief materials (7.97 percent), reallocation of new plots to affected farmers (6.07 percent), and payment for loss of cattle (1.73 percent). The relatively low utilization of land reallocation and compensation for cattle losses reflects financial constraints and limited institutional capacity at the community level.

Beyond these locally applied measures, field evidence reveals the implementation of a State-Led Seasonal Calendar (Date-Line) Approach, which is distinct from the seven strategies presented in Table 3 and is primarily targeted at migrating or transhumant herders. Under this policy, the Adamawa State Government, in collaboration with traditional authorities and security agencies, sets specific deadlines for farmers to complete harvesting, after which migrating herders are permitted to move livestock through designated routes and locations.

The date line approach functions as a preventive and regulatory mechanism, aimed at reducing overlap between standing crops and seasonal livestock movement. By aligning agricultural and pastoral calendars, the policy seeks to minimize crop destruction, regulate transhumance, and reduce the likelihood of violent confrontation. Compliance is largely enforced through traditional rulers and community leaders, with support from security agencies, and relies more on administrative coordination than judicial sanctions.

With respect to perceived effectiveness, 69.17 percent of respondents indicated that the mitigation strategies adopted in their communities are effective, while 25.28 percent viewed them as ineffective and 5.56 percent remained neutral. The relatively high level of perceived effectiveness suggests that community-based strategies targeting local herders, when complemented by state-led regulation of migrating herders, contribute meaningfully to conflict management in Adamawa State. Nevertheless, the persistence of farmer–herder conflicts indicate the need for stronger institutionalization, clearer enforcement mechanisms, and integration of these approaches into long term land-use and food security policies.

 @A Publication of the Department of Economics, ADSU, Mubi. ISSN- Print: 2550- 7869; ISSN-Online: 3043-5323. Journal homepage: https://ajaefm.adsu.edu.ng

5. Conclusion and Recommendations

This study examined the effects of farmer–herder conflicts on food security among farming households in Adamawa State, Nigeria, with particular attention to the mitigation strategies adopted for managing these conflicts. Using a food security index and a logistic regression framework, the study finds that a substantial proportion of farming households in the state are food insecure. The results indicate that cattle rustling, violent confrontation, crop damage by cattle encroachment, and interpersonal clashes significantly reduce the likelihood of farming households being food secure.

The findings further demonstrate that farmer–herder conflicts exert a direct and adverse effect on household food security, primarily through loss of farm output, destruction of productive assets, and heightened insecurity. These outcomes reinforce existing empirical evidence that conflict related shocks undermine agricultural livelihoods and household welfare in conflict prone rural settings.

With respect to conflict management, the study identifies seven community-based mitigation strategies verbal warning, arrest and prosecution, alternative dispute resolution, payment of compensation, provision of relief materials, reallocation of plots, and payment for loss of cattle which are predominantly applied to resident (local) herders. Among these, verbal warning and arrest/prosecution are the most frequently employed, reflecting the dominant role of traditional institutions and local enforcement structures in conflict resolution. A majority of farming households perceive these strategies as effective, suggesting their relevance in managing localized disputes.

In addition to these community level measures; the study documents the use of a State-Led Seasonal Calendar (Date-Line) Approach targeted at migrating or transhumant herders. By setting deadlines for crop harvesting and regulating the timing of pastoral movement, this preventive policy reduces overlap between standing crops and grazing activities, thereby addressing one of the major triggers of farmer–herder conflict. When combined with community-based interventions, the date-line approach represents a complementary and context-specific mechanism for managing farmer–herder relations in Adamawa State.

Based on the findings of this study, it is necessary to provide a set of policy recommendations. The State-Led Seasonal Calendar (Date-Line) Approach should be formally institutionalized within Adamawa State's agricultural and livestock governance framework. This requires clear articulation of harvesting deadlines and pastoral movement schedules, early dissemination of information to farming and pastoral communities, and coordination among traditional authorities, agricultural extension officers, and security

 @A Publication of the Department of Economics, ADSU, Mubi. ISSN- Print: 2550- 7869; ISSN-Online: 3043-5323. Journal homepage: https://ajaefm.adsu.edu.ng

agencies. Institutionalizing this preventive mechanism will enhance compliance among migrating herders, reduce overlap between grazing activities and standing crops, and minimize conflict triggers associated with uncontrolled transhumance.

Conflict management efforts should also be systematically integrated into agricultural extension services and land-use planning policies. Strengthening land-use governance through the demarcation and protection of transhumance routes, preservation of farmlands, and development of pasture and water infrastructure will reduce competition over scarce natural resources. Embedding conflict sensitive planning within agricultural extension programs will further ensure that both farmers and herders are informed of land-use regulations and seasonal movement frameworks, thereby promoting coexistence and reducing the recurrence of violent confrontations.

Furthermore, the promotion of agro-pastoralism and sustainable livelihood diversification is critical for addressing the structural drivers of farmer–herder conflicts. Encouraging herders to combine livestock rearing with crop production will reduce dependence on open grazing and shared farmlands, while supporting farmers to adopt modern agricultural technologies such as high-yield varieties, mechanized harvesting, and improved farm inputs will shorten harvesting periods and increase productivity. Together, these measures will lower resource competition, enhance household incomes, and contribute to improved food security outcomes in Adamawa State.

References

Abbass, I. M. (2009). No Retreat No Surrender Conflict for Survival Between Fulani Pastoralists and Farmers in Northern Nigeria. *European Scientific Journal*, *Vol. 8*, 331–346.

Akinrinde, O. O., Osuwa, A. A., Olawoyin, K. W., & Moeakinyo, D. A. (2021). Farmers-Herders Conflict and Nigeria ' s Quest for Food Security : The Imperative Need for Information Communications Technology. *Journal of Digital Food, Energy & Water Systems*, *2*(2), 33–54.

Antwi, S. (2018). *Farmer – herder conflict and food security in Kwahu East District , Eastern Region , Ghana.* Norwegian University of Life Sciences.

Apenda, T. I. (2016). An assessment of the impact of farmers- herder's conflict on food security in benue state, nigeria. *International Journal of Development Strategies in Humanities, Management and Social Sciences.*, *6*(2), 187–200.

Haralambos, M., & Holborn, M. (2013). *Sociology Themes and Perspectives.* (8th ed.). Herper Collins Publishers Limited.

Irohibe, I. J., & Agwu, A. E. (2014). Assessment of food security situation among farming households in rural areas of Kano State, Nigeria. *Journal of Central European Agriculture*, *15*(1), 94–107. https://doi.org/10.5513/JCEA01/15.1.1418

Jack, J., & John, D. (1997). *Econometrics Methods* (fourth edi). McGraw-Hill. www.mhcollege.com

Kwaghtser, P. A. (2019). Impact of the conflict between farmers and herds men on food production in the agro-ecological Zone-B of Benue State, Nigeria. *Ianna Journal of Interdisciplinary Studies*, *1*(1), 56–64.

Malthus, T. (1789). *An Essay on the Principle of Population, as it Affects the Future Improvement of Society with Remarks on the Speculations of Mr. Godwin, M. Condorcet, and Other Writers.* www.esp.org

Musa, A. A., & Tukur, A. L. (2009). Measuring Landcover Indices of Adamawa State Using Remote Sensing And Geographic Information System (GIS) Techniques. *FUTY Journal of the Environment*, *4*(1), 1–11.

Nnaji, A., Ma, W., Ratna, N., & Renwick, A. (2022). Farmer-herder conflicts and food insecurity : Evidence from rural Nigeria. *Agricultural and Resource Economics Review (2022)*, *51*, 391–421. https://doi.org/10.1017/age.2022.9

Odusina, E. K. (2006). Implications of a Rapidly Growing Nigerian Population: a Review of Literature. *Department Of Demography and Social Statistics Joseph Ayo Babalola University, Ikeji Arakeji, Osun State, Nigeria.*

Ojelade, S. E. (2019). International Journal of Law and Politics Studies (IJLPS) Effect of Herdsmen and Farmers ' Crises on Food Security in Nigeria. *International Journal of Law and Politics Studies (IJLPS)*, *1*(1), 15–26.

Sadiq, S. M., Singh, I. P., Ahmad, M. M., & Orifah, M. O. (2021). Impact of farmers-herders conflict on livelihoods of farming households in Nigeria ' s middle-belt region. *Moroccan Journal of Agricultural Sciences*, *2*(1), 14–24.

Udosen, M. N. (2021). Farmers-Herders Crisis And Food Security In Nigeria : Causes And Implications. *European Journal of Political Science Studies*, *5*(1), 24–44. https://doi.org/10.46827/ejpss.v5i1.1165

WFP Nigeria. (2019). *Emergency Food Security Assessment in Borno , Adamawa and Yobe States*. https://vam.wfp.org/CountryPage_overview.aspx?iso3=NGA https://dataviz.vam.wfp.org/InteractiveReports-List

WFP Nigeria. (2023a). *Lean Season Food Security Outlook*. http://www.wfp.org/nigeria

WFP Nigeria. (2023b). *Situation Report*. http://www.wfp.org/nigeria

World Bank Group. (2022a). *Crop production index (2014-2016 = 100) - Nigeria | Data*. https://data.worldbank.org/indicator/AG.PRD.CROP.XD?locations=NG

World Bank Group. (2022b). *Population growth (annual %) - Nigeria | Data*. https://data.worldbank.org/indicator/SP.POP.GROW?locations=NG

Yakubu, S. M., Musa, M. W., Bamidele, T. E., Ali, M. B., Bappah, M. T., Munir, R. T., & Manuwa, A. (2021). Effects of Farmer-Herder Conflicts on Rural Households Food Security in Gombe State, Nigeria. *Journal of Agricultural Extension*, *25*(1), 11–20.

Yamane, T. (1967). *Statistics, an Introductory Analysis.* (2nd Ed). Harper and Row.

ACKNOWLEDGMENTS

We sincerely acknowledge and appreciate the Tertiary Education Trust Fund (TETFund) for sponsoring this study. We also extend our gratitude to the Directorate of Research and Innovation, as well as the Management** of **Adamawa State University, Mubi for their support and facilitation throughout the research process.