

(RESEARCH ARTICLE)



Effect of farmers/herders' conflict on the livelihood of cattle value chain actors in Delta State, Nigeria

OGHORO Norbert Oghenetega, ACHOJA Felix Odemero * and OGISI Oraye Dicta

Department of Agricultural Economics, Faculty of Agriculture, Delta State University, Abraka, Nigeria.

Magna Scientia Advanced Research and Reviews, 2026, 16(01), 110-124

Publication history: Received on 20 December 2025; revised on 05 February 2026; accepted on 07 February 2026

Article DOI: <https://doi.org/10.30574/msarr.2026.16.1.0017>

Abstract

Cattle value chain is relevant to the livelihood of people in Delta State, Nigeria, yet vulnerable to unsecured environment. Empirical information on the effect of farmers/herders' conflict on the income of cattle value chain actors is scanty in Delta State. This study examined the effect of farmers/herders' conflict on the livelihood (income) of cattle value chain actors; Primary data, collected with questionnaire from 200 cattle value chain actors, were analyzed using descriptive and inferential statistical tools. Major causes of conflict identified included crop destruction, lack of grazing reserves, land ownership disputes, and poor conflict governance. Regression results show that cattle rustling, kidnapping, killing, and rape cases significantly ($P \leq 0.05$) reduced the income of cattle value chain actors. The results further indicate that the monthly mean income of traders decreased from ₦267,260 before the conflict to ₦244,760 during the conflict. The structure of cattle trade analysis revealed moderate to high market concentration, while income inequality among cattle traders increased during conflict periods, with the Gini coefficient rising from 0.35 (before conflict) to 0.52 (during conflict). Majority of both herders and traders perceived that the existence of grazing reserves would significantly improve cattle traders' income, trade volume, and market accessibility. We found sufficient evidence to conclude that farmers/herders' conflict to large extent determines the livelihood/income of cattle value chain actors in Delta State, Nigeria. The study recommended the establishment and effective management of grazing reserves and ranching systems as a sustainable strategy for improving cattle trade performance.

Keywords: Farmers/Herders' Conflict; Livelihood; Income; Cattle; Value Chain Actors

1. Introduction

The recurrent conflict between farmers and herders in Nigeria, particularly in the southern states such as Delta State, has emerged as a major threat to agricultural productivity, market stability, and national food security. These violent clashes, often triggered by competition over land and water resources, have led to the destruction of crops, loss of livestock, displacement of rural populations, and disruption of agribusiness activities. The economic implications are far-reaching: reduced agricultural output, rising food prices, and diminished household incomes and rural.

Land remains one of the most valuable assets in agrarian societies, and the core of the conflict lies in its competing uses — farming and pastoralism. The expansion of sedentary agriculture, rapid population growth, and climate-induced migration have intensified pressure on land resources, making violent confrontation between crop farmers and nomadic herders increasingly commonplace. While national and international studies have acknowledged the general impact of conflict on food security, there is a lack of region-specific empirical research that interrogates how the cattle value chain is affected in states like Delta, where these clashes are becoming more frequent and deadly.

* Corresponding author: ACHOJA Felix Odemero

The conflict, being intra-agricultural in nature, has a direct impact on both livestock and crop sub-sectors. However, there is limited empirical evidence detailing how this friction affects economic activities along the cattle value chain - from production and distribution to consumption - and how it, in turn, impacts food availability, accessibility, and affordability. Additionally, the socio-cultural and ethno-religious dimensions of the conflict - including language barriers and identity politics - further complicate efforts at conflict resolution. It is worth noting that many of the cattle grazing in the South are owned by Southerners but are managed by Fulani herders, who are often moderately armed to deter cattle rustling. This arrangement introduces additional layers of vulnerability and misunderstanding. The rising call to classify violent herders as terrorists underscores the urgency and severity of the situation.

Addressing this crisis requires a multi-faceted approach that considers the needs and rights of both farmers and herders, promotes sustainable land use practices, and strengthens conflict-resolution mechanisms. This paper examines this issue. Among other things, the paper evaluates the Economic value of the cattle trade in Delta State over a ten-year period.

The historical relationship between farmers and herders in Nigeria has been shaped by the dynamics of traditional pastoralism, land use, and agricultural evolution, often reflecting a complex interplay of cooperation and conflict.

On the other hand, herdsman may not be able to pay for the allocation of commercial grazing reserves got their cattle because of the cost implication, they may prefer to feed their cattle on free pasture in the community. Nigeria has about 19 million cattle much of it is in the hands of pastoralist and we need to seek solution to the problem facing acceptability and willingness of Fulani herdsman to pay for commercial grazing pastures in order to solve the exiting conflict.

Therefore, this study seeks to provide a business-centered analysis of the farmers-herders conflict in Delta State by exploring the relationship between food security and disruptions in the cattle value chain. By doing so, the study aims to uncover new economic opportunities and propose sustainable mitigation strategies that can inform policy and promote peaceful co-existence.

1.1. Objectives to the study

The broad objective of the study is to investigate the effect of farmers/herders` conflict on the livelihood (income) of cattle value chain actors in Delta State, Nigeria. However, the specific objectives are to:

- identify causes of farmer-herders` conflicts in Delta State;
- investigate the structure of cattle trade in Delta State;
- determine the effects of farmers/herders conflict on the income of cattle value chain actors in Delta State; and
- identify what business or livelihood opportunities that could mitigate the conflict and promote peaceful coexistence.
- Assess the relationship between Cattle trade and food Security in Delta State

1.2. Hypotheses of the Study

The following hypotheses were tested to guide the study

- **HO₁:** Farmers–herders` conflict has no significant effect on the income of cattle value chain actors in Delta State.
- **HO₂:** The is no significant relationship between the perceived existence of cattle grazing reserve and cattle trade performance in Delta State.

2. Literature review

Okoli and Atelhe (2014) analyzed the farmers-herders conflict in Nigeria through the lens of political ecology. They argued that environmental degradation and policy failures contributed to the displacement of herders, leading to increased competition with farmers. The resulting frustrations, stemming from perceived injustices and loss of livelihoods, often culminated in aggressive behaviors and violent clashes. Nwosu and Osakwe (2020) examined land tenure issues in southern Nigeria, highlighting how insecure land rights and ambiguous property laws created tensions between farmers and herders. The lack of clear legal frameworks led to frequent disputes, with both groups feeling aggrieved and resorting to aggression as a means of asserting their claims.

Egwu (2014) explored the collapse of traditional conflict resolution institutions and its impact on the farmers-herders conflict. He emphasized that the erosion of customary authorities and communal norms left a vacuum in dispute management, allowing frustrations to fester and escalate into aggression. The study underscored the importance of restoring local governance structures to mitigate conflicts.

2.1. Food Insecurity and Livelihood Disruptions

The farmers-herders conflict has significant implications for food security in Nigeria. Frequent clashes disrupt agricultural activities, leading to reduced crop yields and food shortages. Studies have linked the conflict to increased food insecurity, as displaced farmers abandon their lands and herders lose access to grazing areas (George et al., 2022).

2.2. Empirical Review

Abubakari and Abdu Rauf (2024) carried out a research on Unraveling the Ripple Effects of Farmer-Herder Conflicts on the Cattle Value Chain in the Karaga District, Ghana. The study found out that conflicts have more direct effects on the farmers and the herders than other actors on the value chain.

In another study on Farmers-Herders Rivalry and its Implication for Food Security and Household Income in Nigeria: Interrogating the trending uses carried out by Okwulu, Laraba, Ebimoboere and Idhomi (2024). The study found out that the escalation of tension between farmers and herders exacerbates food insecurity by disrupting agricultural productivity displacing communities and hindering access to vital resources such as food and water. Moreover, the economic repercussions are profound, with household experiencing loss of income, reduced market access and increased vulnerability to poverty.

Oluwaseyi, Odunayo and Olumide (2024) carried out a study on Farmers-Herders conflicts and Government's Economic Diversification initiatives in Nigeria. The study found out that the gains of investment in the sector.

Additionally, empirical findings from Silas, Gambo, and Hassan (2021) in Adamawa State revealed that areas with high conflict intensity experienced a 45% decline in crop output and a 30% reduction in cattle population over a five-year period. These declines were statistically significant and were associated with reduced household income,

3. Materials and methods

3.1. Study Area

The study was conducted in Delta State Nigeria. Primary data and secondary data were obtained from previous studies.

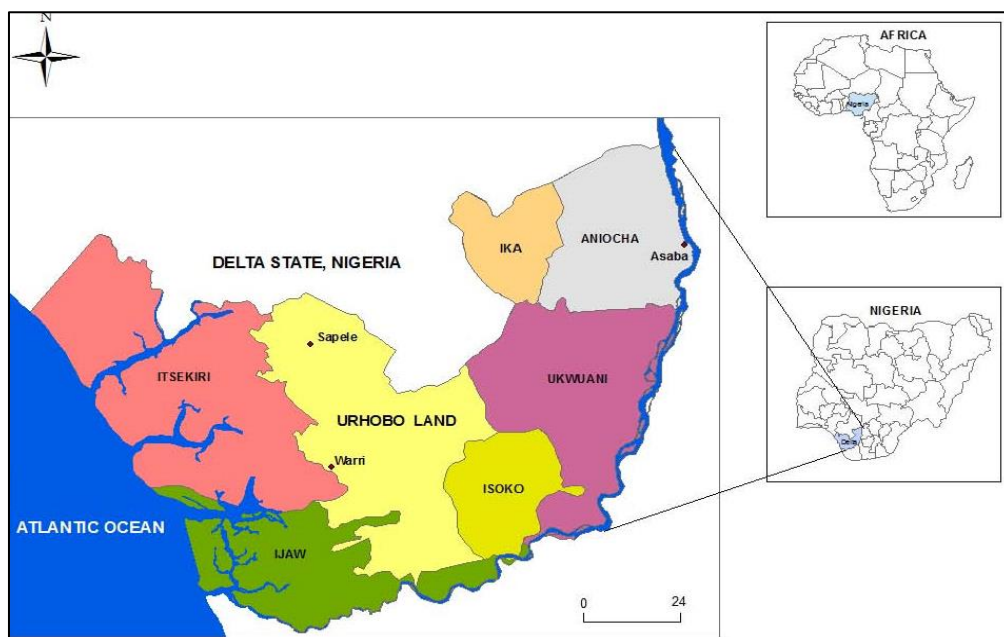


Figure 1 Map of the Study Area

3.2. Sampling Procedure and Sample Size

A multistage sampling procedure was employed to select respondents for this study to ensure broad coverage and representativeness across the study area. In the first stage, ten (10) Local Government Areas (LGAs) were selected across the study area using a stratified sampling technique to ensure geographic and demographic diversity. The second stage involved the purposive selection of five (5) communities within each of the selected LGAs. This purposive approach was necessary to target communities that are directly affected by the conflict and actively engaged in, farming, thereby aligning with the objectives of the study.

In the third and final stage, from each of the purposively selected communities, ten (10) respondents were chosen through simple random sampling. This yielded a total of 500 respondents (10 LGAs × 5 communities × 10 respondents), ensuring a fair and unbiased selection of participants involved in farming activities and potentially affected by the farmers-herders conflict.

In addition to the multistage sampling, a snowball sampling technique was used to identify key cattle trading hubs within the selected LGAs. This method is particularly appropriate for reaching cattle marketers. From these identified hubs, a purposive selection of 200 cattle marketers was made based on their active participation in cattle trade and their availability to provide reliable information.

In total, 200 cattle marketers, ensuring a comprehensive data set for analysis.

3.3. Method of data collection

Data for the study were generated from primary and secondary sources. Primary data were collected with the aid of a well-structured questionnaire from 700 respondents. Secondary data were collected from published report, journals and other relevant materials on cattle trade in Delta State.

4. Method of Data Analysis

Factors affecting wiliness to pay by herdsmen for commercial grazing pasture was achieved by regression analysis. Pearson moment product correlation analysis was used to test the hypothesis. The formula is given below

$$= \frac{n\sum xy - (\sum x)(\sum y)}{\sqrt{[n\sum x^2 - (\sum x)^2][n\sum y^2 - (\sum y)^2]}}$$

Objective I: The relationship between FHC and FS was analyzed using Pearson Product Moment correlation. The formula is presented below:

$$r = \frac{n\sum xy - (\sum x)(\sum y)}{\sqrt{[n\sum x^2 - (\sum x)^2][n\sum y^2 - (\sum y)^2]}}$$

Objective II: The effect of FHC on the income of cattle value chain actors in Delta State was achieved using multiple regression analysis. This is specified as follows:

Model 1a: Effect of FHC n the Income of Cattle Herders

$$INC (Herder) = \beta_0 + \beta_1 RS + \beta_2 RP + \beta_3 KD + \beta_4 Kl + e_i$$

$$INC (Marketers) = \beta_0 + \beta_1 RS + \beta_2 RP + \beta_3 KD + \beta_4 Kl + e_i$$

Where;

INC = Income (N), RS = Rustling (cattle loss), RC = Rape Cases (Frequency),

KD = Kidnapping (Frequency), KI = Killing (Frequency), β_0 = Constant or intercept term, $\beta_1 - \beta_4$ = Coefficient of parameter estimates

e_i = stochastic error term

Objective III: Identify causes of farmer/herders conflicts in Delta State was achieved using descriptive statistics such as mean, standard deviation, percentage, frequency table and charts

Objective IV: Identify what business or livelihood opportunities exists that could mitigate the conflict and promote peaceful coexistence was achieved using descriptive statistic such as mean, standard deviation, percentage, frequency table and charts.

4.1. Model Specification

4.1.1. Multiple Regression Model

Model 1a: Effect of FHC n the Income of Cattle Herders

$$INC (Herder) = \beta_0 + \beta_1 CR + \beta_2 K + \beta_3 C + \beta_4 KI + e_i$$

$$INC (Marketers) = \beta_0 + \beta_1 CR + \beta_2 K + \beta_3 C + \beta_4 KI + e_i$$

$$INC (Processor) = \beta_0 + \beta_1 CR + \beta_2 K + \beta_3 C + \beta_4 KI + e_i$$

Where;

INC = Income (N), CR = Cattle rustling Destruction , K = Killing of Cattle (Frequency),

C = Compensation (Frequency), KI = Killing (Frequency), β_0 = Constant or intercept term

$\beta_1 - \beta_4$ = Coefficient of parameter estimates, e_i = stochastic error term

Three functional forms were tried, namely linear, semi- log, double – log and exponential. The explicit form of the model is:

4.1.2. Linear function

$$Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + b_nX_n, + e_i - - - - - - - - - -$$

4.1.3. Semi- log Function

$$Y = b_0 + b_1 \log X_1 + b_2 \log X_2 + b_3 \log X_3 + b_4 \log X_4 + b_5 \log X_5 + b_6 \log X_6 + b_7 \log X_7 + \dots + b_n \log X_n, + e_i -$$

4.1.4. Double – log function

$$\log Y = b_0 + b_1 \log X_1 + b_2 \log X_2 + b_3 \log X_3 + b_4 \log X_4 + b_5 \log X_5 + b_6 \log X_6 + b_7 \log X_7 + \dots + b_n \log X_n, + e_i$$

4.1.5. Rating Scale Technique

The 4-point rating scale was used to identify and rank the improved flood management techniques adopted by fish farmers during flood events it was graded as very effective (VE) = 4, Effective (E) =3, Partially effective (PE) =2 and not effective (SD) = 1. The mean ratings of the respondents based on the 4-point rating scale were graded using real limit of number as stated below:

Likert scale rating scale

Response Categories	ordinal values	real limit values
Strongly Agreed (SA)	= 4	3.50 – 4.00
Agreed(A)	= 3	2.50 – 3.49

Disagreed (DA)	= 2	1.50 – 2.49
Strongly Disagreed (SD)	= 1	1.00– 1.49

4.2. Logistics Model

These choices can be represented econometrically in consumer theory by using a binomial logit to model random utility theory. A farmer n chooses from a set of mutually exclusive fish farmers in clusters and improved Risk Management Strategies (FRMS) options, $j = 1, \dots, J$. The decision-maker obtains a certain level of utility Unj from each alternative. The discrete choice model builds on the belief that a farmer chooses the outcome that maximizes utility. The researchers do not observe farmer's utility, but observe some attributes of the farmer which is faced by a decision to choose FRMS. Hence, the utility is decomposed into deterministic ψnj and random part ϵnj :

$$Unj = \psi nj + \epsilon nj \quad 3.1$$

The error term ϵnj is unobservable and makes the prediction of a farmer's choice not to be exact. On the other hand, we calculate the likelihood of each specific result. The density of the stochastic component is $f(\epsilon nj)$. $f(\epsilon n)$ is the joint density for a vector of the stochastic portion. We utilize probability to map out farmers' n 's choice of alternative i on a spectrum of J possibilities:

$$Pnt = \Pr (Unt > Unj, \forall j \neq i)$$

$$Pnt = \Pr(Uni + \epsilon ni > Unj + \epsilon nj, \forall j \neq i)$$

$$Pnt = \int (Uni + \epsilon ni > Unj + \epsilon nj, \forall j \neq i) (\epsilon) \epsilon \quad 3.2$$

The Independence of Irrelevant Alternatives (IIA) assumption underlies the binary logit model. But in many situations, this presumption is unrealistic. A variant of binomial logit is the nested logit model. In this study, all right hand side variables are farmer's characteristics, thus, the nested logit model will in essence produce similar results as the multinomial model. The model is specified as

$$Inv D = \beta_0 + \beta_1 CD + \beta_2 RP + \beta_3 KD + \beta_4 Kl + e_i$$

Where;

Inv D = Investment Decision on crop enterprise, CD = Crop Destruction (loss (kg),

RC = Rape Cases (Frequency), KD = Kidnapping (Frequency), Kl = Killing (Frequency)

β_0 = Constant or intercept term, $\beta_1 - \beta_4$ = Coefficient of parameter estimates,

e_i = stochastic error term

4.3. Z test

Test of Z was consulted and was used to compare the means of two groups. It is a type of inferential statistic used to determine if there any significant difference between the mean of two groups which may be related in certain features. The t-test was employed in this study to test the null hypothesis: there is no significance difference between profitability index of flood prone and non-flood prone fisheries agribusiness clusters operators.

Z test is a statistical used to determine whether there is a statistically significant difference between the mean of sample and a known or hypothesized population mean when the population standard deviation is known, and its similar to a t-test but relies on standard normal distribution instead of of the t-distribution.

4.4. The Z-test

Z-test will be used to test hypothesis (H_0 : 3 There is no significant relationship between farmers/herders conflicts on productivity) of the study. Z-test may be outlined as follows: If we want to test the null hypothesis (H_0 :) against the alternative hypothesis (H_i :)

Mathematically, $Z^* = \frac{\hat{b}_i - b_i^*}{\sigma(\hat{b}_i)}$

Where;

$\hat{b}_i$ = Estimate b_i ;

b_i^* = Certain value (in this case 0); and

$\sigma(\hat{b}_i)$ = Standard error.

A two-tailed will performed on the Standard Normal Distribution at five percent (5%) level of significance to establish the level of significance of the explanatory variables on the dependent variable. If the empirical Z^* falls in the critical region, (i.e. if $Z^* > 1.96$ or $Z^* < -1.96$) we reject our hypothesis, if $-1.96 < Z^* < 1.96$, we accept our basic hypothesis (Koutsoyiannis, 1977).

5. Results and discussion

5.1. Effect of Farmers–Herders Conflict on Income of Cattle Value Chain Actors

Table 1. presents the mean income of cattle actors before and during farmers/herders' conflicts, highlighting the economic impact of these clashes. The results indicate a significant decline in income for both herders and marketers during conflict periods. Herders experienced a reduction in mean income from ₦2,672,600 before the conflict to ₦2,447,600 during the conflict, representing a mean difference of ₦225,000 ($t = 4.82$, $p < 0.01$). This significant decrease reflects the direct effects of conflict on herders' livelihoods, including cattle losses, disruption of grazing activities, and limited access to markets. These findings are consistent with Abubakari and Abdu Rauf (2024), who reported that violent conflicts in Ghana disrupted livestock management and reduced the income of herders due to fatalities, property destruction, and the breakdown of the cattle value chain.

Similarly, marketers of cattle were also affected by the conflicts, as shown by a decrease in mean income from ₦156,556.70 before the conflict to ₦91,988.33 during the conflict, with a mean difference of ₦64,568.37 ($t = 3.17$, $p < 0.01$). This indicates that conflicts not only affect primary producers but also downstream actors in the cattle supply chain, reducing profitability and market operations. Oluwaseyi, Odunayo, and Olumide (2024) highlighted that farmers–herders conflicts increase the cost of food production and trade, eroding the gains of economic diversification initiatives and impacting the broader agricultural economy. The reduction in marketers' income can be attributed to limited cattle availability, transportation risks, and insecurity that discourages trade activities during periods of conflict.

The significant decline in income for both herders and marketers underscores the wide-reaching economic consequences of farmers/herders' conflicts. Okwulu, Laraba, Ebimoboere, and Idhomi (2024) emphasized that these conflicts disrupt livelihoods, reduce household incomes, and exacerbate vulnerability to poverty. The income reductions documented in this study demonstrate that beyond affecting food security and agricultural productivity, conflicts undermine economic stability for all actors involved in the cattle value chain. Consequently, addressing the root causes of farmers/herders' conflict through structured ranching, policy intervention, and conflict mitigation strategies is crucial to protect livelihoods and sustain economic activities in affected communities (Otuisi, Ogisi, & Emaziye, 2022; Okeke, 2014).

Table 1 Mean Income of Cattle Actors Before and During Conflict

Category	N	Mean Income Before Conflict (₦)	Mean Income During Conflict (₦)	Mean Difference (₦)	t-value	Df	Sig. (2-tailed)
Herders	126	2,672,600	2,447,600	225,000	4.82	125	0.000
Marketers	18	156,556.70	91,988.33	64,568.37	3.17	17	0.005

Source: Field Survey, 2025

Table 2 presents the effect of farmers/herders' conflict on the income of cattle value chain actors, specifically herders and marketers. The regression results indicate that all measured conflict variables such as crop destruction, rape cases, kidnapping, and killings have a statistically significant negative effect on the income of both herders and marketers at p

< 0.01 or $p < 0.05$. For herders, killings ($\beta = -0.468$, $t = -5.035$) and crop destruction ($\beta = -0.413$, $t = -4.253$) had the most substantial negative effects, highlighting the direct impact of violent conflicts on their primary means of livelihood. This finding aligns with Abubakari and Abdu Rauf (2024), who noted that violent interactions between farmers and herders disrupt livestock production and result in fatalities, property losses, and reduced income for herders in Ghana. Similarly, Otuisi, Ogisi, and Emaziye (2022) observed that herders in Nigeria suffer significant financial losses due to destruction of grazing lands and lack of access to secure pasture areas during conflicts.

For marketers, the negative effects of conflict are also evident, although slightly less pronounced than for herders. Crop destruction ($\beta = -0.289$, $t = -3.400$) and killings ($\beta = -0.276$, $t = -3.407$) remain the most influential factors affecting their income, followed by kidnapping and rape cases. This suggests that conflicts disrupt not only the primary production of livestock but also the downstream trade and distribution network. Oluwaseyi, Odunayo, and Olumide (2024) highlighted that insecurity arising from farmers/herders conflict restricts market operations, reduces the availability of cattle for sale, and increases transaction risks, leading to decreased income for actors along the value chain. Marketers' vulnerability to these disruptions emphasizes that the economic repercussions of conflicts extend beyond herders to all participants in the livestock sector.

The model summary further strengthens the robustness of these findings. The high R^2 values for herders ($R^2 = 0.684$) and marketers ($R^2 = 0.622$) indicate that a substantial proportion of the variation in income is explained by the conflict variables. This confirms the strong and systematic relationship between conflict and income losses, highlighting the importance of conflict mitigation strategies for sustaining economic activities. Empirical studies by Okwulu, Laraba, Ebimoboere, and Idhomi (2024) and Okeke (2014) similarly emphasize that violent conflicts lead to disruption of livelihoods, reduced household incomes, and broader socio-economic instability. These findings underscore the urgent need for structured ranching, policy interventions, and effective security measures to protect both herders and marketers from the economic shocks associated with farmers/herders' conflicts.

5.2. Test of Hypothesis (H₀₂): Farmers/herders conflict has no significant effect on the income of cattle value chain actors in Delta State.

Multiple regression analysis showed that crop destruction, kidnapping, rape cases, and killings had statistically significant negative effects on the income of herders and marketers ($p < 0.01$ and $p < 0.05$). The t-test further confirmed a significant decline in income before and during conflict. Hence, the null hypothesis is rejected, demonstrating that farmers/herders conflict significantly reduces the income of cattle value chain actors.

Table 2 Effect of Farmers/Herders Conflict on Income of Cattle Value Chain Actors

Variables	Herders			Marketers		
	B	Std. Error	t-value	B	Std. Error	t-value
(Constant)	3.127	0.482	6.487	2.019	0.387	5.220
Cattle Rustling	-0.413***	0.097	-4.253	-0.289***	0.085	-3.400
Killing of Cattle	-0.278***	0.089	-3.124	-0.145**	0.070	-2.071
Compensation	-0.349***	0.091	-3.845	-0.198**	0.078	-2.538
Killing	-0.468***	0.093	-5.035	-0.276***	0.081	-3.407
Model Summary						
R	0.827			0.789		
R ²	0.684			0.622		
Adjusted R ²	0.667			0.585		
F-Stat	24.604			15.632		

5.3. Causes of Farmers–Herders Conflict

Table 3 highlights the major causes of farmers–herders conflict as perceived by both farmers and herders. Among farmers, crop destruction (mean = 3.480), ethnic/religious tensions (mean = 3.360), lack of grazing reserves (mean = 3.290), and land ownership disputes (mean = 3.210) were identified as the most significant causes of conflict. These

findings indicate that both resource-based and sociocultural factors play a critical role in driving disputes between farmers and herders. The high mean values suggest widespread recognition of these issues and competition over natural resources are central triggers of violent interactions in Nigerian rural communities.

For herders, the most significant causes of conflict also include crop destruction (mean = 3.260), ethnic/religious tensions (mean = 3.190), lack of grazing reserves (mean = 3.140), and land ownership disputes (mean = 3.080). This demonstrates a convergence of perspectives between farmers and herders on the primary drivers of conflict, although herders rated some causes slightly lower than farmers. Encroachment by herders received a lower mean (2.440), indicating a mixed perception of its significance. These results are consistent with Otuisi, Ogisi, and Emaziye (2022) who highlighted that conflicts often emerge from overlapping land use, disputes over grazing rights, and socio-cultural tensions that exacerbate the competition for scarce resources.

Additionally, competition over water resources (farmers mean = 3.050; herders mean = 2.940) and government negligence (farmers mean = 2.980; herders mean = 2.850) were also recognized as contributing factors, though slightly less prominent. The identification of government negligence underscores the role of institutional failure in exacerbating conflicts, as weak enforcement of grazing regulations and inadequate provision of grazing reserves create conditions for disputes. Table 3 illustrates that both resource scarcity and socio-political factors are central to the escalation of conflicts, highlighting the need for comprehensive land management, community dialogue, and government intervention to mitigate these disputes.

Table 3 Major Causes of Conflict

Cause of Conflict	Farmers (n = 500)		Herders (n = 200)		Remark
	Mean	Std. Dev.	Mean	Std. Dev.	
Land ownership dispute	3.210	0.782	3.080	0.804	Agreed
Encroachment by herders	2.760	0.872	2.440	0.884	Mixed
Crop destruction	3.480	0.703	3.260	0.745	Agreed
Lack of grazing reserves	3.290	0.768	3.140	0.801	Agreed
Water resource competition	3.050	0.812	2.940	0.836	Agreed
Ethnic / religious tensions	3.360	0.741	3.190	0.776	Agreed
Government negligence	2.980	0.821	2.850	0.847	Agreed

5.4. Structure of Cattle Trade in Delta State

Table 4 presents the structure of the cattle trade in Delta State, analyzed using the Herfindahl-Hirschman Index (HHI) and concentration ratios (CR4). In terms of roles along the trade chain, traders (28.6%) and owners (23.7%) dominate the sector, followed by butchers (19.1%), transporters (16.4%), and middlemen (12.2%). The CR4 value of 87.8% and HHI of 0.229 indicate a moderately concentrated market with a few key actors controlling a large share of trade activities. This structure suggests that while several actors participate in the cattle trade, ownership and trading roles are relatively more influential in shaping pricing, supply, and market dynamics.

Regarding the source of cattle, over half of the respondents (53.8%) source cattle within Delta State, while others obtain livestock from other Nigerian states (33.7%) or neighboring countries (12.5%). The CR4 of 87.5% and HHI of 0.362 reflect moderate to high concentration in sourcing patterns, suggesting reliance on local production while also integrating external supplies to meet market demand. The integration of external cattle sources highlights the interdependence of local and regional livestock markets and indicates that disruptions in either internal or cross-border supply chains could significantly affect trade operations.

Market channels and major trade challenges further illustrate the operational realities of the cattle sector in Delta State. Weekly markets are the most common channel for trade (48.6%), followed by direct sales to consumers (26.7%) and brokers (19.8%), with a CR4 of 95.1% and HHI of 0.308, indicating high concentration and reliance on a few dominant marketing avenues. Key challenges faced by actors include transport disruption (29.2%), cattle theft (26.1%), market closures (24.3%), and security threats (20.4%), with a CR4 of 100% and HHI of 0.247, underscoring the pervasive impact of operational risks on trade efficiency. These results resonate with Otuisi, Ogisi, and Emaziye (2022), who

reported that insecurity, theft, and infrastructure limitations are major constraints in the livestock sector, affecting supply consistency, market access, and profitability. Table 4 shows that while the cattle trade in Delta State is structured around a few dominant actors and channels, the sector remains highly vulnerable to operational and security challenges, highlighting the need for targeted interventions to strengthen trade resilience and efficiency.

Table 4 Structure of Cattle Trade in Delta State using Herfindahl-Hirschman Index (HHI) and Concentration Ratios (CR4)

Trade Variable	Category	% Share of Respondents	Cumulative %	CR4 (%)	HHI
Role in trade chain	Owner	23.7	23.7		
	Trader	28.6	52.3		
	Transporter	16.4	68.7		
	Butcher	19.1	87.8	87.8	0.229
	Middleman	12.2	100		
Source of cattle	Within Delta State	53.8	53.8		
	Other Nigerian States	33.7	87.5		
	Neighboring countries	12.5	100	87.5	0.362
Market channels	Weekly market	48.6	48.6		
	Direct to consumers	26.7	75.3		
	Through brokers	19.8	95.1	95.1	0.308
	Others	4.9	100		
Major trade challenges	Transport disruption	29.2	29.2		
	Market closures	24.3	53.5		
	Cattle theft	26.1	79.6		
	Security threats	20.4	100	100	0.247

5.5. Inequality in Cattle Trade Income Among Traders Using Lorenz Curve and Gini Coefficient

Table 5 presents the mean income and Gini coefficient of cattle traders before and during farmers/herders' conflicts in Delta State. The results indicate that the mean income of traders decreased from ₦267,260 before the conflict to ₦244,760 during the conflict, reflecting a significant loss of earnings among actors in the cattle value chain. This reduction in income underscores the disruptive effect of conflict on trade activities, including decreased cattle availability, transport disruption, and heightened insecurity. Farmers–herders conflicts reduce profitability for traders due to fatalities, theft, and market interruptions, thereby affecting both upstream and downstream actors in the livestock sector.

The Gini coefficient increased sharply from 0.35 before the conflict to 0.52 during the conflict, indicating a shift from moderate to high income inequality among cattle traders. This change reflects that income became concentrated among a smaller group of traders who were either better able to navigate conflict-related disruptions or had access to safer and more reliable trade channels. Figure 2, the Lorenz curve of cattle traders' income, visually confirms this concentration, showing a more pronounced deviation from the line of equality during the conflict period. The trend highlights how violent and disruptive events exacerbate disparities in economic outcomes, with less-resilient traders suffering greater losses while a few actors maintain or even increase their relative share of income.

The result suggests that farmers/herders' conflict not only reduces overall income in the cattle trade but also amplifies economic inequality within the sector. Conflicts erode gains from investment, limit market access, and disproportionately affect small-scale traders, increasing vulnerability and inequality. These findings underscore the need for policy interventions and risk-mitigation measures such as improved security, conflict resolution mechanisms,

and support for small-scale traders to reduce income disparities and stabilize livelihoods in the cattle trade during conflict periods.

Table 5 Mean Income and Gini Coefficient Before and During Conflict

Indicator	Before Conflict	During Conflict
Mean Income (₦)	267,260	244,760
Gini Coefficient	0.35	0.52
Remark	Moderate inequality	High inequality; conflict concentrates income among fewer traders

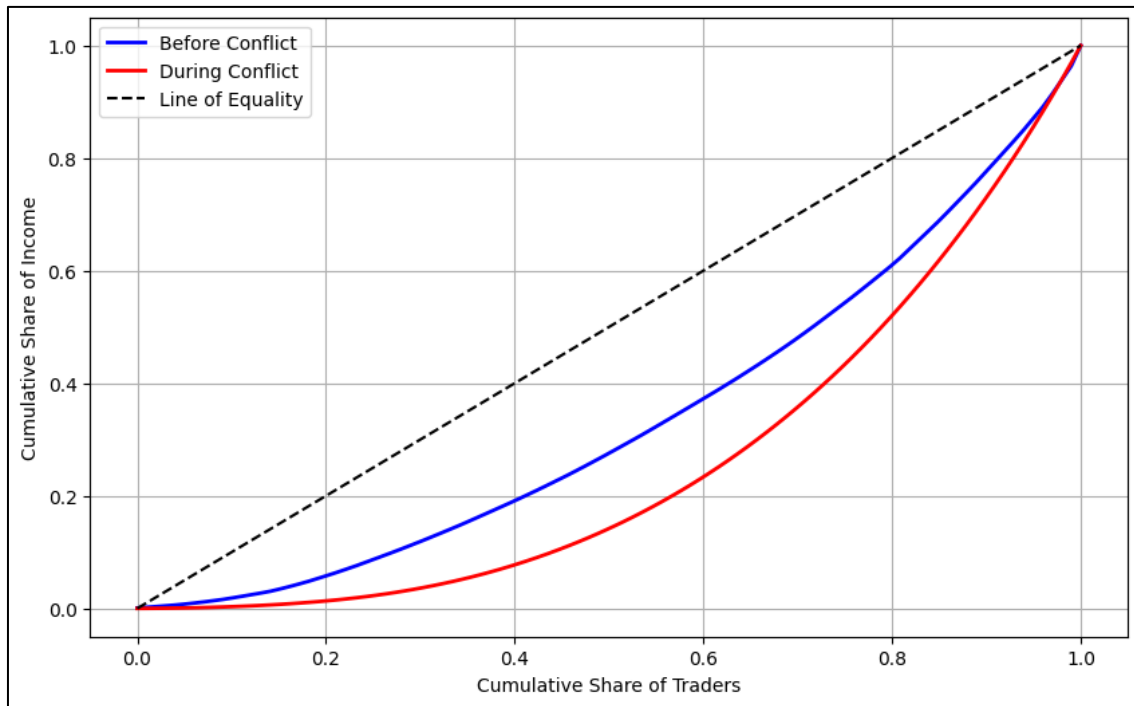


Figure 2 Lorenz Curve of Cattle Traders' Income

5.6. Relationship Between the Existence of Cattle Grazing Reserve and Cattle Trade

Table 6 presents the relationship between the existence of grazing reserves and key cattle trade indicators in Delta State, including role in trade, income, trade volume, and market accessibility. The correlation results show positive and statistically significant relationships across all indicators at $p < 0.01$. The existence of grazing reserves is most strongly associated with trade volume ($r = 0.354$), followed by role in trade ($r = 0.321$), income ($r = 0.289$), and market accessibility ($r = 0.276$). These findings suggest that the availability of designated grazing areas enhances the overall efficiency and performance of cattle trade activities by providing herders with secure locations for livestock management, reducing losses, and facilitating smoother transactions along the value chain.

The positive relationship between grazing reserves and income ($r = 0.289$) indicates that secure grazing areas contribute to higher earnings for actors in the cattle trade, likely through reduced livestock mortality, improved herd productivity, and increased availability of cattle for market sales. Similarly, grazing reserves positively influence trade volume ($r = 0.354$) and role in trade ($r = 0.321$), suggesting that the presence of organized grazing infrastructure allows more actors to actively participate in the cattle value chain and increases the quantity of cattle moving through markets. These results align with Otuisi, Ogisi, and Emaziye (2022) and Abubakari and Abdu Rauf (2024), who reported that access to secure grazing land reduces conflict with farmers, mitigates livestock losses, and enhances profitability in the livestock sector.

Furthermore, the relationship between grazing reserves and market accessibility ($r = 0.276$) highlights the role of structured grazing areas in improving linkages between herders and buyers. By reducing the need for herders to traverse conflict-prone farmland or remote routes, grazing reserves make markets more reachable and reduce transaction risks, ensuring more consistent supply and trade flow. This finding echoes Oluwaseyi, Odunayo, and Olumide (2024), who emphasized that well-planned grazing infrastructure strengthens the cattle trade by supporting herd management, improving access to markets, and enhancing the resilience of the livestock value chain against conflict-related disruptions. Table 6 demonstrates that the establishment of grazing reserves is a critical policy tool for promoting sustainable cattle trade, increasing income, and improving market efficiency in conflict-prone areas.

5.7. Test of Hypothesis (H0₂): There is no significant relationship between the perceived existence of cattle grazing reserve and cattle trade performance in Delta State.

Pearson correlation analysis revealed significant positive relationships between the existence of grazing reserves and key cattle trade indicators: role in trade ($r = 0.321$, $p < 0.01$), trade income ($r = 0.289$, $p < 0.01$), trade volume ($r = 0.354$, $p < 0.01$), and market accessibility ($r = 0.276$, $p < 0.01$). These results indicate that grazing reserves enhance cattle trade by improving trade roles, income, volume, and access to markets. Therefore, the null hypothesis is rejected, demonstrating that the presence of grazing reserves is significantly associated with cattle trade in Delta State.

Table 6 Relationship between existence of grazing reserves and cattle trade performance indicators

Variable	Grazing Reserve	Role in Trade	Income	Trade Volume	Market Accessibility
Grazing Reserve	1.000				
Role in Trade	0.321**	1.000			
Income	0.289**	0.415**	1.000		
Trade Volume	0.354**	0.463**	0.582**	1.000	
Market Accessibility	0.276**	0.338**	0.312**	0.368**	1.000

5.8. Relationship between Cattle Trade and Food Security in Delta State

Table 7 presents the relationship between cattle trade indicators and food security in Delta State, examining the roles of trade participation, income, trade volume, and market accessibility in influencing food availability, accessibility, and affordability. The results show positive and statistically significant correlations ($p < 0.01$) between cattle trade variables and all dimensions of food security. For instance, trade income is strongly associated with food availability ($r = 0.421$), accessibility ($r = 0.389$), and affordability ($r = 0.407$), indicating that higher earnings from cattle trade enhance the ability of traders and households to access, purchase, and utilize food. Similarly, the role of actors in the trade chain is positively correlated with food availability ($r = 0.398$) and affordability ($r = 0.371$), suggesting that greater participation in trade enables households to secure sufficient food resources.

Trade volume (heads per week) and market accessibility also demonstrate positive relationships with food security, with trade volume correlating with food availability ($r = 0.374$), accessibility ($r = 0.356$), and affordability ($r = 0.379$), while market accessibility correlates with food availability ($r = 0.336$), accessibility ($r = 0.317$), and affordability ($r = 0.329$). These findings suggest that more active and efficient trading—characterized by higher volumes and easier access to markets—directly contributes to better food security outcomes by ensuring a consistent supply of livestock products and related income for household consumption. This aligns with Abubakari and Abdu Rauf (2024), who highlighted that functional and well-structured livestock markets increase household food availability and enhance economic resilience in conflict-prone areas.

Overall, the results underscore the interdependence between livestock trade and food security in Delta State. Cattle trade not only provides income for herders, traders, and associated actors but also facilitates access to food through increased purchasing power and improved market supply. Iliya & Achoja (2024) had similar finding in their study. The disruptions in cattle trade due to conflict negatively affect both the supply of food and household food security. Therefore, strengthening cattle trade through better infrastructure, access to markets, and conflict mitigation can serve as a critical strategy for enhancing food availability, accessibility, and affordability in the region.

5.9. Test of Hypothesis (H₀₂): The existence of cattle grazing reserves has no significant relationship with cattle trade performance in Delta State.

Correlation analysis indicated a significant positive relationship between the presence of grazing reserves and cattle trade indicators, including role in trade ($r = 0.321$, $p < 0.01$), trade income ($r = 0.289$, $p < 0.01$), trade volume ($r = 0.354$, $p < 0.01$), and market accessibility ($r = 0.276$, $p < 0.01$). Therefore, the null hypothesis is rejected, suggesting that grazing reserves positively influence cattle trade in the state.

Table 7 Relationship between Cattle Trade and Food Security in Delta State

Variables	Cattle Trade Role	Trade Income (₦)	Trade Volume (Heads/Week)	Market Accessibility	Food Availability	Food Accessibility	Food Affordability
Cattle Trade Role	1.000						
Trade Income (₦)	0.652*	1.000					
Trade Volume (Heads/Week)	0.523*	0.614**	1.000				
Market Accessibility	0.485*	0.502**	0.467**	1.000			
Food Availability	0.398*	0.421**	0.374**	0.336**	1.000		
Food Accessibility	0.362*	0.389**	0.356**	0.317**	0.648**	1.000	
Food Affordability	0.371*	0.407**	0.379**	0.329**	0.587**	0.624**	1.000

6. Conclusion

This study has demonstrated that farmers–herders conflict constitutes a pervasive and multidimensional challenge to agricultural livelihoods, cattle trade operations, and food security in Delta State, Nigeria. The conflict has disrupted productive activities, weakened market systems, constrained investment decisions, and intensified vulnerability among farming and herding households. Beyond its immediate effects on production and income, the conflict has also altered market structures and exacerbated inequality within the cattle trade, thereby undermining equitable economic participation. The findings further underscore the interconnectedness between conflict dynamics, institutional arrangements, and livelihood outcomes. Weak governance structures, inadequate grazing infrastructure, and limited access to conflict mitigation mechanisms have compounded the adverse effects of the conflict. Consequently, households have been compelled to adopt coping strategies that are often short-term and insufficient to guarantee sustainable food security or income stability. The study concludes that sustainable resolution of farmers/herders conflict is essential for restoring agricultural productivity, improving market efficiency, enhancing food security, and promoting inclusive rural development in Delta State. Addressing the conflict requires coordinated policy interventions that integrate security, institutional reform, livelihood diversification, and market development within a comprehensive agricultural and rural development framework.

Recommendations

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

- In view of the significant decline in income of herders and marketers during conflict periods, government and development agencies should design targeted livelihood support programmes for cattle value chain actors. These should include income stabilization schemes, soft loans, and risk-sharing mechanisms such as agricultural insurance to cushion income losses associated with conflict.

- Given the high level of market concentration and increased income inequality in cattle trade during conflict, regulatory authorities and market associations should encourage inclusive market participation. This can be achieved through improved market access, transparent pricing mechanisms, and support for small-scale traders.

Considering the significant positive relationship between the existence of grazing reserves and cattle trade performance, the study recommends that government should establish and properly manage functional grazing reserves and promote ranching systems to enhance trade efficiency and reduce conflict-induced disruptions.

Compliance with ethical standards

Acknowledgments

We hereby acknowledge all the authors whose works were consulted in the process of conducting this research. We particularly appreciate the efforts of all the professors in the Department of Agricultural Economics, Delta State University, Abraka, Nigeria, for correcting the manuscript. The authors wish to thank Dr. Enimu Solomon and Dr. Oyita Governor.

Disclosure of conflict of interest

No conflict of interest to be disclosed.

References

- [1] Abbass, I. M. (2012). No retreat no surrender: Conflict for survival between Fulani pastoralists and farmers in northern Nigeria. *European Scientific Journal*, 8(1), 331–346.
- [2] Adisa, R. S. (2012). Land use conflict between farmers and herdsman – Implications for agricultural and rural development in Nigeria. *Rural Development*, 1(1), 25–33.
- [3] Audu, S. D. (2013). Conflicts among Farmers and Pastoralists in Northern Nigeria Induced by Climate Change: A Case Study. *Arabian Journal of Business and Management Review*, 2(1), 110–118.
- [4] Audu, S. D. (2013). The menace of Fulani herdsman in Nigeria: A threat to national security. *International Journal of Innovative Research and Studies*, 2(9), 1–15.
- [5] Audu, S. D. (2018). Conflicts among farmers and pastoralists in northern Nigeria induced by climate change: Governmental and non-governmental organizations' interventions. *African Journal of Conflict Resolution*, 18(2), 53–79.
- [6] Benjaminsen, T. A., & Ba, B. (2009). Farmer–herder conflicts, pastoral marginalization and corruption: A case study from the inland Niger delta of Mali. *Geographical Journal*, 175(1), 71–81.
- [7] Benjaminsen, T. A., Alinon, K., Buhaug, H., & Buseth, J. T. (2012). Does Climate Change Drive Land-use Conflicts in the Sahel? *Journal of Peace Research*, 49(1), 97–111.
- [8] Benjaminsen, T. A., Aune, J. B., & Sidibé, D. (2012). Agricultural change, livelihoods and desertification in the Sahel. *Global Environmental Change*, 22(2), 295–304.
- [9] Benjaminsen, T. A., et al. (2009). Does climate change drive land-use conflicts in the Sahel? *Journal of Peace Research*, 46(6), 673–690.
- [10] Dollard, J., Doob, L. W., Miller, N. E., Mowrer, O. H., & Sears, R. R. (1939). *Frustration and Aggression*. Yale University Press.
- [11] Egwu, S. (2014). The Political Economy of Rural Banditry in Contemporary Nigeria. *Sociology and Anthropology*, 2(4), 185–195.
- [12] Egwu, S. (2014). The political economy of rural banditry in contemporary Nigeria. In M. J. Kuna & J. Ibrahim (Eds.), *Rural Banditry and Conflicts in Northern Nigeria* (pp. 154–165). Centre for Democracy and Development.
- [13] FAO. (2020). *Livestock data for Nigeria*. Food and Agriculture Organization of the United Nations. Retrieved from <https://www.fao.org>
- [14] Homer-Dixon, T. F. (1999). *Environment, Scarcity, and Violence*. Princeton University Press.

- [15] Human Rights Watch. (2017). Nigeria: Farmers and herders clash. Retrieved from <https://www.hrw.org>
- [16] Iliya, U.J & Achoja, F.O. (2024), Effects of banditry security risk on livelihood of cattle herders in Katsina State, Nigeria. *Magna Scientia Advanced Research and Reviews*, 2024, 10(01), 223–242.
- [17] International Crisis Group (2018). *Herders against farmers: Nigeria's expanding deadly conflict*. Africa Report No. 262. Brussels: ICG.
- [18] International Crisis Group. (2017). Herders against Farmers: Nigeria's Expanding Deadly Conflict.
- [19] International Crisis Group. (2018). *Stopping Nigeria's Spiraling Farmer-Herder Violence*. Report No. 262.
- [20] International Crisis Group. (2021). Ending Nigeria's Herder-Farmer Crisis: The Livestock Reform Plan. *Crisis Group Africa Report*, No. 302.
- [21] National Population Commission. (2020). *Population data of Delta State*.
- [22] Okoli, A. C., & Atelhe, G. A. (2014). *Nomads Against Natives: A Political Ecology of Herder/Farmer Conflicts in Nasarawa State, Nigeria*. American International Journal of Contemporary Research, 4(2), 76–88.
- [23] Okoli, A. C., & Igboeli, M. C. (2014). The political ecology of the herdsman/farmers conflict in Nigeria. *International Journal of Human and Social Science Invention*, 3(4), 30–39.
- [24] Silas, A., Gambo, A., & Hassan, M. (2023). *Impact of Farmer–Pastoralist Conflict on Crop Output in Adamawa State, Nigeria*. [Journal/Institution Name].