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Analysis of Herder-Farmer Conflict in the Benue-Nasarawa Corridor, Nigeria

[1]Ali Alhaji Ali, [2]Daniel Serki Ortserga and [3]Godwin Mbatsavbee Kwanga

[1,2,3]Department of Geography, Rev. Fr. Moses Orshio Adasu University, Makurdi, Nigeria

alhajialia5@mail.com

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Abstract: *Farmer-herder conflict in Nigeria's Middle Belt is well established as regionally concentrated, yet little empirical work has formally tested whether conflict intensity varies significantly within a bounded study area, or systematically weighed the relative contribution of ecological versus institutional drivers to that variation. This paper addresses both questions using conflict data from eight Local Government Areas (LGAs) in Benue and Nasarawa States, Nigeria, covering 2010-2024. Data was collected through well-structured questionnaire. Data was presented in tables and descriptive statistics such as percentages were used to explain the data. A Conflict Intensity Index (CII) and Standardised Weighted CII (SW-CII) were constructed for each LGA, and a Chi-Square test of independence was applied to test spatial distribution formally. Principal Component Analysis (PCA) was applied to thirty candidate conflict drivers to identify underlying major factors. Results show pronounced spatial variation: Guma recorded a CII of 9,177, approximately 43% above the next-highest LGA, with the spatial distribution confirmed statistically significant ($\chi^2 = 157.7$, $df = 7$, $p < 0.05$). PCA identified nine components explaining 70.70% of variance, with Environmental and Land Resource Pressure (29.72%) and Rural Insecurity and Livelihood Vulnerability (10.92%) as the two largest dimensions, alongside a distinct Governance and Institutional Failure component linked directly to grazing-route ambiguity following Benue's 2017 anti-grazing legislation. These findings indicate that the highest-intensity locations are those where ecological and institutional pressures converge, rather than being explained by either dimension alone. The paper concludes that security and development interventions should be explicitly hotspot-weighted and dual-track, addressing ecological and governance drivers simultaneously in the highest-intensity locations identified.*

Keywords: farmer, herder, conflict. Benue-Nasarawa corridor, Nigeria

INTRODUCTION

Farmer-herder conflict in Nigeria's Middle Belt is frequently described in aggregate terms as a regional crisis, a state-level emergency, a national security concern. What this aggregation obscures is that the conflict is not evenly distributed even within a single state, let alone across the Middle Belt as a whole. Understanding where conflict concentrates, and why it concentrates there rather than elsewhere, is a distinct empirical question from understanding that conflict exists at all and it is a question with direct implications for how security resources and development interventions should be allocated.

This paper addresses that question using spatial and statistical analysis of conflict incidents across eight Local Government Areas in Benue and Nasarawa States between 2010 and 2024. Existing literature on farmer–herder conflict has done substantial work identifying the Middle Belt broadly, and Benue specifically, as a hotspot of violence (Ioryue, 2024; Musa, Shabu, & Igbawua, 2016). What remains comparatively underdeveloped is a rigorous, LGA level spatial intensity analysis capable of distinguishing genuine outliers from a general pattern of elevated risk and a systematic statistical account of which underlying factors, among the many drivers cited across the literature, carry the greatest explanatory weight.

The theoretical grounding for this question draws on two complementary traditions. Homer-Dixon's (1999) resource scarcity and environmental security theory explains why ecological stress desertification, irregular rainfall, shrinking grazing land generates competition and, under sufficient pressure, violence. Blaikie & Brookfield's (1987) political ecology framework fills the resulting explanatory gap, arguing that environmental conflict is never purely ecological it is shaped by governance failures, land tenure disputes, and asymmetric institutional capacity, all of which vary meaningfully from one Local Government Area to the next. Read together, these frameworks predict precisely the kind of spatial unevenness this paper sets out to measure and explain.

This prediction has direct empirical stakes in the present study area. Benue's 2017 Open Grazing Prohibition Law altered herder movement patterns within the state, with qualitative evidence suggesting a subsequent shift of pastoral activity toward neighbouring Nasarawa (Tenuche & Ifatimehin, 2021) a policy-driven redistribution of pressure that political ecology, rather than resource scarcity theory alone, is better equipped to explain.

This paper pursues two related empirical tasks. First, it constructs a Conflict Intensity Index and a Standardised Weighted Conflict Intensity Index across the eight sampled LGAs, testing formally whether the observed spatial distribution of conflict incidents departs significantly from what would be expected under a null hypothesis of even distribution. Second, it applies Principal Component Analysis to a wide set of candidate drivers environmental, institutional, economic, and socio-cultural to identify which underlying dimensions carry the greatest explanatory weight, and

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whether the resulting structure aligns more closely with resource scarcity theory, political ecology, or some combination of both.

The contribution this paper offers is methodological as much as empirical. By combining spatial intensity indexing with statistical dimension reduction, this paper offers a replicable analytical approach one applicable beyond Benue and Nasarawa to other contested agro-pastoral landscapes across the Sahel and Middle Belt.

Study Area

Benue State is situated in the north-central geopolitical zone of Nigeria and serves as a critical agricultural hub in the region. Geographically, the state lies between latitudes 6°25'N and 8°8'N and longitudes 7°47'E and 10°0'E. It shares boundaries with Nasarawa State to the north, Taraba State to the east, Cross River State to the south, and Kogi State to the west. It also borders Enugu and Ebonyi States to the southwest and the Republic of Cameroon to the southeast, making it one of the few Nigerian states with international borders (Idoko, 2019). The River Benue, a prominent geographical feature after which the state is named, bisects the state and is essential for its agricultural and transportation activities.

Benue State covers a land area of approximately 34,059 square kilometers, making it one of Nigeria's largest states. The state's topography includes extensive plains, river valleys, and uplands, which support its agricultural dominance in producing crops such as yam, cassava, and soybeans. The diverse climatic conditions and fertile soil further reinforce Benue's reputation as the "Food Basket of the Nation" (Onah & Eze, 2018).

Nasarawa State is located in the north-central region of Nigeria, strategically positioned near the Federal Capital Territory (FCT). The state lies between latitudes 7°45'N and 9°25'N and longitudes 7°7'E and 9°37'E. It is bordered by Benue State to the south, Kogi State to the west, Kaduna State to the north, Plateau State to the northeast, and Taraba State to the east (Abah, 2021b). Its proximity to the FCT enhances its economic relevance, making it a transit and trade route between the northern and southern parts of the country.

The land area of Nasarawa State is approximately 27,117 square kilometers, making it smaller than Benue State but equally significant in terms of its natural resources and topographical diversity. The state is characterized by undulating hills, fertile plains, and valleys, which are favorable for agriculture and mining. Nasarawa is rich in mineral resources, such as solid minerals, which contribute significantly to its economic base (Umeh & Garba, 2020).

From the above, Benue and Nasarawa States are essential components of Nigeria's north-central geopolitical zone due to their strategic locations and sizes. While Benue State excels in agriculture with its expansive land and fertile soil, Nasarawa State's proximity to the FCT and its rich mineral deposits make it a vital economic player. (See Figure 1.)

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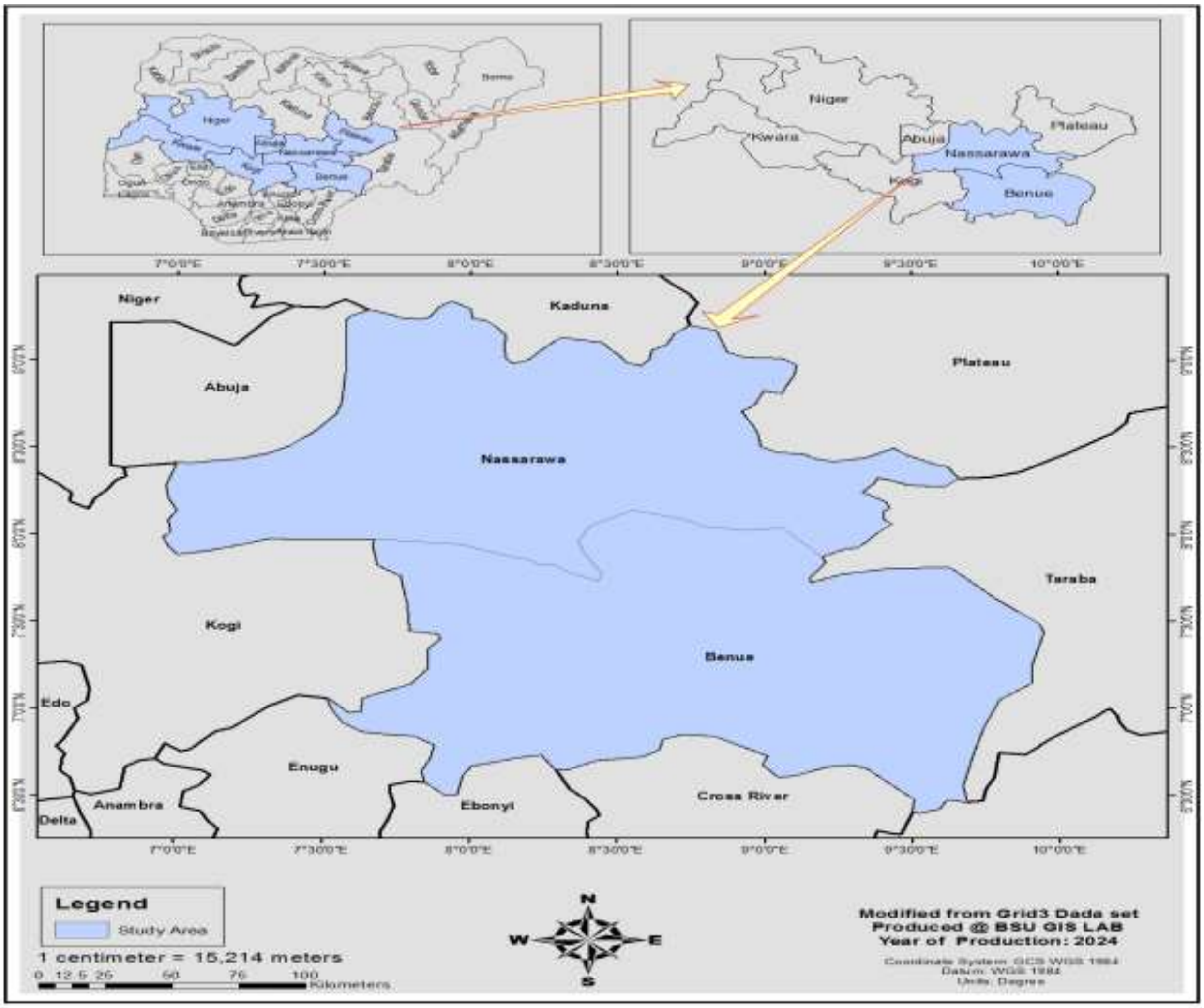

Figure 1: Benue and Nasarawa States
Source: Department of Geography, Rev. Fr. Moses Orshio Adasu University, Makurdi, GIS Laboratory (2024).

MATERIALS AND METHODS

Research Design

The study adopted a triangulated mixed-methods retrospective longitudinal design that covered a 14-year period. Data collection combined structured household surveys, focus group discussions, in-depth interviews, systematic field observation, and documentary sources to reconstruct trends and impacts across the period under review.

Data Needs and Sources

The data needed for this research include; Records of number, dates, locations, and seasonal patterns of clashes in the eight sampled LGAs over the 14-year period; LGA-level counts and location identifiers for affected communities; indicators of hotspot persistence and duration of conflict exposure across the study period and data is sourced from Household surveys with location identifiers, in-depth interviews with community leaders, focus group discussions documenting spatial and temporal patterns, and corroborating administrative records (BESEMA, NASEMA, ACLED).

Study Population

The study population comprised all residents of the eight sampled Local Government Areas (LGAs) in Benue and Nasarawa States. These LGAs and their population sizes were (Table 2):
The combined population of the eight sampled LGAs was 1,871,200. The study population included farmers, herders, community leaders, and internally displaced persons (IDPs) (Appendix E).

Sample Size Determination

The combined population of the eight sampled LGAs was 1,871,200. The sample size was determined using Taro Yamane's (1967) formula for a known population: The formula is expressed as:

$$\text{n} = \frac{n}{1+N(e)2} \qquad (1)$$

Where:

N = the population

e = the margin of error (0.05). Substituting the values:

$$\text{n} = \frac{1{,}871{,}200}{1+1{,}871{,}200\ (0.05)2}$$

$$\text{n} = \frac{1{,}871{,}200}{1+\ 1{,}871200\ (0.0025)}$$

$$\text{n} = \frac{1{,}871{,}200}{4{,}679}$$

$$\text{n}= 399.915$$

The computed sample size was therefore approximately 400 respondents (rounded to the nearest whole respondent).
The data was collected through well-structured questionnaire, focus group discussion, observation and key informants' interviews

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Method of Data Presentation and Analysis

The data was presented in tables, Descriptive statistics were used to summarise survey and qualitative data. Frequency counts, percentages, and tabular presentations facilitated the identification of patterns in conflict occurrence, fatalities, injuries, displacement, affected communities, and service disruptions.

Inferential statistics were employed to test hypotheses and generalise findings beyond the sample. Chi-Square test was employed to test hypothesis, conflict intensity index and principal component analysis was done to identify the various components of the conflict drivers.

Conflict Intensity Indices (CII)

To measure severity and distribution of conflict, two indices were defined:
CII=Incidents+Fatalities+Injuries+Displaced Households+Affected Communities.
SW−CII=CII−Mean CII Standard Deviation of CII

i. Variables included: Incidents, fatalities, injuries, displaced households, affected communities.
ii. Purpose: CII provides a composite measure of severity; SW-CII standardises scores for comparison across LGAs.
iii. Application: These indices will identify high- and low-conflict areas, guiding policy prioritisation and interventions.

Procedure for Computing the Conflict Intensity Index (CII) and Standardised Weighted Conflict Intensity Index (SW-CII)

Step 1: Identify the component variables

For each Local Government Area (LGA) in the study area, five conflict-related variables were compiled from the 14-year (2010-2024) household survey and administrative record data: Number of incidents, Number of fatalities, Number of injuries, Number of displaced households, Number of affected communities

Step 2: Compute the raw Conflict Intensity Index (CII)

The CII is calculated as the unweighted sum of the five component variables for each LGA:
CII = Incidents + Fatalities + Injuries + Displaced Households + Affected Communities

Step 3: Compute the mean CII across all LGAs

Once every LGA's CII is calculated, compute the arithmetic mean across all eight LGAs:
Mean CII = (Σ CII of all LGAs) / Number of LGAs

Step 4: Compute the standard deviation of CII across all LGAs

Using the standard formula for population standard deviation:

$$\sigma = \frac{\sqrt{\Sigma(\mathrm{CII} - \overline{X}CII)^2}}{N} \tag{1}$$

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Step 5: Compute the Standardised Weighted Conflict Intensity Index (SW-CII)
Each LGA's SW-CII is then computed as a z-score, the LGA's deviation from the mean CII, expressed in standard deviation units:

$$\text{SW-CII} = \frac{\text{CII} - \overline{\text{X}}\text{CII}}{\sigma} \tag{2}$$

RESULTS

Spatial Distribution of Conflict Intensity

Table 1 presents the Conflict Intensity Index (CII) and Standardised Weighted Conflict Intensity Index (SW-CII) for each of the eight sampled LGAs across the 2010–2024 study period.

Table 1. Conflict Intensity Index (CII) and Standardised Weighted CII (SW-CII) by LGA, 2010–2024

State	LGA	Incidents	Fatalities	Injuries	Displaced HH	Aff. Comm.	CII	SW-CII
Benue	Guma	210	249	526	8,078	114	9,177	2.017
Benue	Agatu	172	196	392	5,597	75	6,432	0.617
Benue	Logo	143	176	333	5,498	127	6,277	0.538
Benue	Makurdi	48	68	303	2,802	34	3,255	−1.003
Nasarawa	Obi	103	104	220	4,699	100	5,226	0.002
Nasarawa	Awe	128	170	315	4,393	85	5,091	−0.067
Nasarawa	Doma	92	99	175	2,977	77	3,420	−0.919
Nasarawa	**Keana**	**80**	**94**	**181**	**2,470**	**69**	**2,894**	**−1.187**

Source: Field survey, 2025

Table 1 presents the spatial variation of farmer–herder conflict intensity across eight sampled Local Government Areas (LGAs) in Benue and Nasarawa States between 2010 and 2024. The results reveal significant differences in the severity, frequency, and humanitarian consequences of conflict among the LGAs. The Conflict Intensity Index (CII), which combines conflict incidents, fatalities, injuries, displaced households, and affected communities, shows that conflict impacts were not evenly distributed across the study area. This finding supports the argument that farmer–herder conflicts in Nigeria are geographically concentrated, with certain locations experiencing repeated cycles of violence due to competition over land resources, water availability, and weak conflict management mechanisms (International Crisis Group, 2017; Eze et al., 2022).

The results indicate that Guma LGA recorded the highest conflict intensity, with a CII value of 9,177 and an SW-CII score of 2.017, making it the most severely affected LGA among the sampled locations. The extremely high intensity recorded in Guma reflects the persistent nature of farmer–herder violence in the area, characterised by frequent attacks, high fatalities, injuries, extensive displacement, and disruption of agricultural activities. This finding agrees with previous studies that identify Guma as one of the major hotspots of farmer–herder conflict in Benue State due to its strategic location within the Benue River Basin, its fertile agricultural land, and its position along traditional livestock movement routes (Egwu, 2016; Okoli & Lenshie, 2018). The dominance of Guma in conflict severity also corresponds with reports that parts of Benue State have experienced repeated attacks resulting in large-scale displacement and loss of livelihoods among farming communities (International Organization for Migration 2023).

The high conflict intensity in Guma can further be explained by the interaction between environmental and socio-economic pressures. Studies have shown that increasing pressure on land resources, climate variability, shrinking grazing spaces, and population growth have intensified competition between sedentary farmers and pastoral groups across Nigeria's Middle Belt region (Benjaminsen & Ba, 2021; Nwakanma & Boroh, 2022). In such areas, conflicts often become prolonged because repeated violence weakens local economies, destroys agricultural assets, reduces access to farmland, and creates cycles of displacement and insecurity.

Similarly, Agatu and Logo LGAs recorded high conflict intensity, with CII values of 6,432 and 6,277, and positive SW-CII values of 0.617 and 0.538, respectively. These results indicate that both LGAs experienced conflict levels above the overall average. The high ranking of Agatu corresponds with previous documentation of severe farmer–herder clashes in the area, particularly due to disputes over land ownership, grazing activities, and retaliatory attacks between communities and pastoral groups. Research by Okoli and Atelhe (2014) identified Agatu as one of the major conflict-prone areas in Benue State, where competition over agricultural land and livestock routes has contributed to repeated violent confrontations.

The situation in Logo LGA also reflects broader patterns of conflict concentration in border and rural agricultural communities. According to Egwu (2016), many communities in Benue State experience heightened vulnerability because farming populations depend heavily on land resources, while pastoral groups increasingly move into areas affected by climate-induced reductions in grazing resources. The high number of displaced households recorded in Logo further demonstrates the humanitarian consequences of prolonged conflict, as displacement disrupts farming activities, reduces household income, and increases dependence on humanitarian assistance.

Makurdi LGA presents an interesting contrast, recording a relatively low CII value of 3,255 but a negative SW-CII value of −1.003. Although Makurdi experienced notable incidents and displacement, its standardised score indicates that its conflict intensity was relatively lower when compared with other LGAs after considering all indicators simultaneously. This demonstrates the importance of using standardised measures rather than relying solely on absolute figures. Urban centres such as Makurdi may record high displacement numbers because they serve as destinations for internally displaced persons (IDPs) from surrounding rural communities, rather than being the primary locations where conflict occurs. This observation agrees with humanitarian studies showing that urban areas often experience secondary impacts of conflict through population influx, pressure on infrastructure, and increased demand for social services (UNHCR, 2022).

The Nasarawa LGAs (Obi, Awe, Doma, and Keana) recorded moderate to lower conflict intensity compared with the Benue LGAs. Obi recorded a CII of 5,226 with an SW-CII of 0.002, suggesting conflict severity close to the overall average. Awe followed with a CII of 5,091 and SW-CII of −0.067. These findings indicate that although these LGAs experienced farmer–herder tensions and displacement, the magnitude was comparatively lower than the major hotspots in Benue State. This supports earlier studies that identify Nasarawa as a conflict-affected but relatively less intense area compared with neighbouring Benue, partly because of differences in settlement patterns, land-use systems, and conflict dynamics (Olayoku, 2014; Mercy Corps, 2020).

Doma and Keana recorded the lowest conflict intensity values, with SW-CII scores of −0.919 and −1.187, respectively. The negative standardised scores indicate that these LGAs experienced conflict impacts significantly below the average level of the sampled areas. However, lower intensity does not imply the absence of conflict; rather, it indicates relatively fewer incidents, fatalities, injuries, and displacement compared with other locations. Studies have noted that conflict occurrence in the Middle Belt varies spatially due to differences in population density, agricultural importance, pastoral mobility routes, local governance structures, and community-level conflict resolution mechanisms (Benjaminsen & Ba, 2021).

Overall, the spatial pattern revealed by the CII and SW-CII demonstrates that farmer–herder conflicts in the study area are highly uneven, with Benue LGAs, particularly Guma, Agatu, and Logo, experiencing the greatest severity. The findings support existing literature that identifies Benue State as one of Nigeria's major farmer–herder conflict hotspots due to the intersection of agricultural expansion, pastoral mobility pressures, environmental change, and weak resource governance systems (ICG, 2017; Okoli & Lenshie, 2018). The use of SW-CII further provides a more accurate understanding of conflict severity by accounting for variations among LGAs and preventing overestimation based solely on raw numbers.

Therefore, the results suggest that conflict management interventions should adopt a location-specific approach, prioritising highly affected LGAs such as Guma, Agatu, and Logo through improved security measures, strengthened land-use governance, farmer–herder dialogue mechanisms, restoration of livelihoods, and targeted humanitarian support for displaced households.

Testing for Spatial Variation

i. **H_{01}:** There is no significant spatial variation in the occurrence of farmer-herder conflict across Benue and Nasarawa States.

Table 2 presents the Chi-Square test of independence applied to observed incident frequencies across the eight LGAs.

Table 2. Chi-Square Test of Independence for Spatial Variation of Conflict Incidents

LGA	Observed (O)	Expected (E)	(O − E)² / E
Guma	210	122	63.5
Agatu	172	122	20.5
Logo	143	122	3.6
Makurdi	48	122	44.9
Obi	103	122	3.0
Awe	128	122	0.3
Doma	92	122	7.4
Keana	80	122	14.5
Total	**976**		**χ^2 = 157.7**

Source: Field survey, 2025

Data presented in Table 2 showed Chi-square Test of Independence for Spatial Variation of Conflict Incidence with 976 total incidents and an expected frequency of 122 per LGA under the null hypothesis, the computed chi-square statistic is 157.7. At 7 degrees of freedom and $\alpha = 0.05$, the critical value is 14.07. Since 157.7 substantially exceeds this threshold, the null hypothesis is rejected: conflict incidents are not evenly distributed across the study area.

The formal rejection of the spatial-distribution null hypothesis ($\chi^2 = 157.7$, df = 7) provides statistical confirmation of a pattern existing literature has largely described qualitatively. Madu and Nwankwo's (2021) analysis mapped uneven vulnerability to climate change and conflict across Nigeria, and the Internal Displacement Monitoring Centre (2023) identified Benue and Nasarawa as epicentres but neither formally tested whether the observed distribution departs statistically from an even-distribution baseline within a bounded set of LGAs.

Underlying Structure of Conflict Drivers

Principal Component Analysis was applied to thirty candidate driver variables. Nine components with eigenvalues exceeding 1.0 were retained, collectively explaining 70.70% of total variance (Table 3).

Table 3. Summary of Retained Principal Components

Component	Dominant Theme	Eigenvalue	% Variance	Cumulative %
1	Environmental and Land Resource Pressure	6.915	29.72	29.72
2	Rural Insecurity and Livelihood Vulnerability	3.676	10.92	40.64
3	Agricultural Land-use Conflicts	1.747	5.82	46.46
4	Governance and Institutional Failure	1.599	5.33	51.79
5	Resource Competition and Environmental Degradation	1.311	4.37	56.16
6	Conflict Resolution and Compensation Deficits	1.194	3.98	60.11
7	Violence Escalation and Revenge Dynamics	1.132	3.77	63.88
8	Political Manipulation and Elite Influence	1.043	3.48	67.36
9	**Socio-cultural and Demographic Pressures**	**1.002**	**3.34**	**70.70**

Source: Field survey, 2025

Data presented in Table 3 showed summary of retained principal components. The first component alone accounts for nearly 30% of total variance, with its highest-loading variables desertification pushing herders into farming communities (0.693), climate change and irregular rainfall (0.647), and competition for fertile land (0.614) aligning closely with resource scarcity theory. Component 4, Governance and Institutional Failure, loads most strongly on the absence of clearly defined grazing routes (-0.384), connecting directly to the anti-grazing law dynamic discussed in this paper's introduction.

Components 1 and 2 together account for 40.64% of cumulative variance, with Component 1 dominated by ecological variables and Component 2 by weak security presence an ordering consistent with Njoku, et al (2024) argument that ecological stress in the Mid-Benue Trough becomes destructive specifically when combined with weak institutions. The presence of Component 4 loading specifically on grazing-route ambiguity connects directly to Tenuche and Ifatimehin's (2021) documentation of Benue's 2017 law and its displacement of pastoral activity toward Nasarawa.

CONCLUSION

This paper set out to determine where farmer–herder conflict concentrates most severely within Benue and Nasarawa States, and which underlying drivers best explain that concentration. Conflict intensity is not evenly distributed: the chi-square test formally confirms significant spatial variation ($\chi^2 = 157.7$, df = 7), with Guma standing as a statistical outlier. This unevenness is best explained by the empirical convergence of ecological and institutional pressure, with

Environmental and Land Resource Pressure as the largest driver dimension and Governance and Institutional Failure emerging as a distinct, significant component.

Security and development resource allocation should be explicitly hotspot-weighted; interventions in the highest-intensity LGAs should be dual-track, addressing ecological and institutional drivers simultaneously; the absence of clearly defined grazing routes should be treated as a distinct policy failure; and spatial and statistical monitoring, using the replicable approach demonstrated here, should be institutionalised as an ongoing tool for the wider Middle Belt and Sahel corridor.

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