

REVIEWER'S REPORT

Manuscript No.: IJAR- 59193

Title: Livestock farming in the face of the security crisis in the Yaadga Region: From extensive rangelands to enclaves of retreat.

Recommendation:

Accept as it is

Accept after Major revision.....

Accept after Minor revision

Do not accept (*Reasons below*)

Rating	Excel.	Good	Fair	Poor
Originality		✓		
Techn. Quality		✓		
Clarity			✓	
Significance			✓	

Reviewer Name: Dr. ANAPANA GOPAL

Reviewer's Comment for Publication.

General Comments

This manuscript examines the effects of the security crisis on livestock farming, pastoral mobility, livestock herd structure and livestock-market networks in the Yaadga region of northern Burkina Faso. The study focuses on the four provinces of Yatenga, Loroum, Passoré and Zandoma and uses a mixed-methods approach involving livestock value-chain actors, interviews, focus groups, documentary sources and GIS analysis.

The manuscript addresses a highly relevant topic. The attempt to conceptualize the transition from a historically mobile pastoral "network-space" toward fragmented and increasingly confined pastoral territories is potentially interesting. The manuscript also presents several potentially valuable empirical indicators, including the Retreat Sedentarization Index (RSI), Herd Miniaturization Index (HMI), Financial Asphyxiation Ratio, Biological Viability Threshold (BVT), Community Solidarity Index (CSI), and Income Diversification Rate (IDR).

However, the manuscript in its present form has **substantial methodological, quantitative, conceptual and editorial weaknesses**. The most important concerns are the inconsistency in the reported sample composition, insufficient definition and validation of the newly introduced indices, unclear calculation of spatial contraction rates, inconsistencies in dates and data sources, insufficient statistical analysis, and the use of several strong or value-laden expressions that require more objective scientific formulation.

The study has potential, but **Minor revision is required before it can be considered for publication.**

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1. Originality and Scientific Contribution

The manuscript has a potentially interesting conceptual contribution by linking:

- pastoral mobility;
- security-related territorial fragmentation;
- forced sedentarization;
- herd reduction;
- livestock-market disruption;
- peri-urban resource pressure;
- household survival strategies.

The theoretical framework combines territorialization/deterritorialization/reterritorialization, geopolitical fragmentation, spatial regulation, moral economy and survival-strategy approaches.

However, the manuscript needs to explain much more explicitly **what is empirically new**.

The authors should clarify:

1. What is already known about livestock mobility in northern Burkina Faso during the security crisis?
2. What is specifically new about the Yaadga case?
3. Which results are generated by the present field survey?
4. Which conclusions are derived from previous literature?
5. What methodological contribution is made by the proposed indices?

At present, the manuscript sometimes presents established theoretical concepts and newly created indicators at the same analytical level.

2. Minor Concern: Serious Inconsistency in the Sample Size

This is one of the most important issues requiring correction.

The abstract states that the research used **385 actors** in the livestock-meat value chain.

Section 2.2 states that the sample consists of:

- 100 producers;
- 100 traders;
- 60 butchers;
- 55 consumers;
- 10 administrative/customary authorities;
- 10 NGO representatives;
- 5 transporters;
- 5 livestock-feed vendors.

This totals **345 participants**, not 385.

Section 2.3 then states that the quantitative component consisted of **315 questionnaires**, while the qualitative component consisted of **55 interviews and 10 focus groups**.

Therefore, the manuscript currently presents several different sample structures:

- 385 actors;
- 345 actors in Section 2.2;
- 315 questionnaire respondents;
- 55 interviews;
- 10 focus groups.

The relationship among these numbers is unclear.

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The authors must provide a definitive sampling table showing:

Actor category Quantitative Interviews Focus groups Total

Producers

Traders

Butchers

Consumers

Authorities

NGOs

Transporters

Feed vendors

Total

This issue must be resolved before the quantitative results can be evaluated.

3. Sampling Method Requires Greater Detail

The manuscript uses purposive sampling with proportional quotas because an updated sampling frame was unavailable due to the conflict situation.

This is understandable in a conflict-affected setting, but the manuscript should clearly acknowledge that purposive quota sampling **does not establish statistical representativeness of the entire livestock population.**

The authors should explain:

- how quotas were determined;
- the population estimates used;
- how respondents were recruited;
- inclusion/exclusion criteria;
- whether displaced and host populations were sampled separately;
- response rate;
- geographical distribution of respondents;
- sex and age composition;
- duration of livestock activity;
- herd-size distribution.

The phrase “rigorous demographic distribution” should be supported by actual demographic data rather than stated descriptively.

4. Data Collection Dates Are Inconsistent

The manuscript states that qualitative data were collected in **April 2024**, whereas the quantitative survey was conducted in **October 2025**.

However, several results are described as covering conditions “from 2017 to present,” and one section states that on-foot droving declined from 65% before 2017 to 2% **“between 2017 and 2026.”**

This creates a temporal inconsistency because the methodology identifies the fieldwork as 2024 and 2025.

The authors should establish a clear timeline:

Pre-2017 → 2017–2023 → 2024 fieldwork → 2025 fieldwork → analysis/reference year

If 2026 information was actually collected, the methodology must state when and how it was collected.

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5. Definitions and Formulas for the New Indices Are Missing

The manuscript introduces several original indicators:

- Retreat Sedentarization Index (RSI);
- Herd Miniaturization Index (HMI);
- Transaction Dematerialization Index (TDI);
- Community Solidarity Index (CSI);
- Income Diversification Rate (IDR);
- Financial Asphyxiation Ratio;
- Biological Viability Threshold (BVT).

These indicators are central to the manuscript, yet their mathematical definitions are not adequately provided.

For each indicator, the authors should provide:

1. Formal definition;
2. Mathematical formula;
3. Variables;
4. Numerator and denominator;
5. Data source;
6. Unit;
7. Calculation procedure;
8. Interpretation;
9. Thresholds/categories;
10. Reliability or sensitivity analysis.

For example, the manuscript reports an **RSI of 59%**, but the exact calculation producing this value is not shown.

Similarly, the **Financial Asphyxiation Ratio of 0.72** requires a transparent formula and supporting cost/revenue data.

Without these details, the indicators cannot be independently reproduced.

6. Minor Concern: Spatial Contraction Rates Are Not Reproducible

Table 1 reports:

- Loroum: 99%;
- Yatenga: 66%;
- Zandoma: 75%;
- Passoré: 70%.

However, the underlying grazing radii are presented as ranges:

- Yatenga: 50–75 km → 2–25 km;
- Zandoma: 30–50 km → 7–10 km;
- Passoré: 30–40 km → 7–10 km.

It is not clear which values within these ranges were used to calculate the contraction percentages.

The authors should provide the exact values and formula.

For example:

Spatial Contraction Rate (%) = [(Historical grazing area/radius – Current grazing area/radius) / Historical grazing area/radius] × 100

The manuscript must clarify whether the calculation uses:

- minimum values;
- maximum values;

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- mean values;
- median values;
- polygon-based grazing areas;
- or respondent-estimated distances.

Using “grazing radius” also requires clarification because a radius is a linear measurement, whereas grazing territory is an area. If the study is describing spatial contraction of territory, **area-based analysis may be more appropriate than linear radius alone.**

7. Reliance on Perception-Based Historical Estimates Needs Clarification

Several historical values appear to be based on respondents' recollections, for example:

- grazing distances before 2017;
- historical market activity;
- transport patterns;
- previous livestock slaughter;
- historical herd sizes.

This introduces potential recall bias, especially for comparisons extending back several years.

The authors should distinguish:

documentary/administrative data

from

respondent-reported historical estimates.

Where possible, historical claims should be cross-checked against administrative records, market records, veterinary registers, satellite/GIS evidence or other independent sources.

8. GIS Methodology Is Insufficiently Detailed

The manuscript states that QGIS was used to map market closures, grazing contraction, fallow-land radii and new marketing corridors.

However, the GIS methodology requires substantially more information.

The authors should specify:

- QGIS version;
- spatial datasets;
- source institutions;
- spatial resolution;
- coordinate reference system;
- GPS/data collection procedure;
- market-location data;
- criteria for classifying markets as functional/closed;
- method for delineating grazing areas;
- method for measuring contraction;
- accuracy assessment.

Map 2 is potentially useful because it displays livestock-market status in 2025 and differentiates levels of disruption. However, the methodological basis for the categories “weakly disrupted,” “moderately disrupted” and “very strongly disrupted” should be explicitly defined.

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9. The Herd Miniaturization Analysis Needs Stronger Statistical Support

The manuscript reports that survival cores of 1–25 animals account for:

- 98% of residual herds in Loroum;
- 84% in Yatenga;
- 70% in Zandoma;

while Passoré retains 45% of large herds above 50 animals.

Chart 1 visually presents these categories.

However, the manuscript does not provide:

- sample size for each province;
- number of herders represented;
- confidence intervals;
- statistical comparison among provinces;
- significance tests;
- distribution of herd sizes.

The authors should provide the underlying frequencies and sample sizes.

10. Market-Supply Decline Requires Verification

The manuscript states that the closure of markets caused an **86% contraction of local livestock supply**, based on the “unanimous account of the traders interviewed.” This is an important claim, but “unanimous account” is not equivalent to an objectively measured 86% decline.

The authors should clarify:

- number of traders providing this estimate;
- exact question asked;
- baseline value;
- current value;
- whether administrative market records exist;
- whether the 86% figure is calculated or perceived.

The wording should be revised if the value is perception-based, for example:

“Respondents estimated an approximately 86% reduction...”

rather than presenting it as an independently measured decline.

11. Livestock-Market Closure Timeline Needs Supporting Evidence

The manuscript identifies several market closures:

- Sollé in 2020;
- Thiou, Titao, Bidi and Kaïn in 2021;
- Youba on 9 December 2022.

These are important factual claims and should be supported by documentary sources, official records or clearly identified field evidence.

The authors should provide a table containing:

Market Province Previous function Closure date Source Current status

This would substantially strengthen the analysis.

12. Transport Analysis Needs More Evidence

The manuscript states that on-foot droving in Loroum fell from **65% before 2017 to 2% during 2017–2026**, with replacement by trucks, tricycles and motorcycles.

However, the methodology does not explain how these percentages were calculated.

The authors should provide:

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- sample size;
- transport categories;
- historical baseline;
- current survey period;
- frequency counts;
- statistical comparison.

The use of “between 2017 and 2026” should also be reconciled with the reported fieldwork dates.

13. Water-Cost Analysis Needs Better Quantification

The manuscript reports that 90% of animal watering shifted to paid urban distribution networks and that 75% of these depend on ONEA standpipes. It also reports water costs of 50–100 F CFA per jerrycan.

This is potentially valuable evidence.

However, the authors should provide:

- average water requirement per animal;
- cost per animal per day;
- cost per herd per month;
- variation among locations;
- comparison with pre-crisis costs;
- proportion of total production expenditure represented by water.

This would provide a stronger basis for the Financial Asphyxiation Ratio.

14. Financial Asphyxiation Ratio Requires Full Economic Analysis

The manuscript reports a Financial Asphyxiation Ratio of **0.72**, interpreted as 72% of the final sale price being absorbed by landless maintenance costs.

This is potentially one of the manuscript's most interesting indicators, but the evidence supporting it is not presented.

The authors should provide a complete cost structure including:

- feed;
- water;
- veterinary expenses;
- transportation;
- labour;
- market fees;
- mortality;
- security costs;
- other operating costs;
- animal sale price.

The denominator and numerator must be clearly defined.

A sensitivity analysis would also be useful because feed and water prices may vary considerably between locations and seasons.

15. Biological Viability Threshold Requires Biological Justification

The manuscript proposes a **Biological Viability Threshold of five breeding ewes per displaced household**, below which autonomous reproduction becomes impossible.

This is a strong biological claim and requires considerably more justification.

The authors should explain:

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- why five ewes is the threshold;
- reproductive rate assumed;
- mortality rate;
- offspring survival;
- household consumption;
- sales/removals;
- breeding interval;
- sex ratio;
- time period used.

If this is an empirical threshold derived from the dataset, the derivation should be shown. If it is a theoretical threshold, appropriate biological literature should support it.

16. Slaughterhouse Data Require Source Clarification

Chart 2 presents cattle and small-ruminant slaughter numbers for 2019, 2021, 2022 and 2023.

The text states that cattle slaughter fell from 8,612 in 2021 to 6,313 in 2023, while the dairy sector declined by more than 99%.

However, the chart is labelled **“Source: Field data, 2024”**, despite presenting historical annual values.

The authors should explain whether these numbers were:

- collected from slaughterhouse records;
- reported by officials;
- reconstructed through interviews;
- extracted from administrative databases.

If official records were used, they should be cited as such.

17. Important Discrepancy Between Text and Chart 2

The manuscript describes cattle slaughter as:

8,612 in 2021 → 7,160 in 2022 → 6,313 in 2023.

Chart 2 appears to show these values, together with a 2019 baseline of 1,643 cattle.

The authors should explain why 2019 is described as the “normal” baseline and why 2021 is called a “liquidation peak.”

A methodological explanation of how these years were selected would improve the analysis.

18. Dairy-Sector Claim Requires Evidence

The statement that daily milk collection fell from **2,000 litres before 2015 to 5–10 litres today**, representing a decline of more than 99%, is striking.

Such a substantial decline requires:

- original data source;
- baseline year;
- current measurement year;
- number of collection points;
- geographical coverage;
- statistical or administrative documentation.

The word “today” should be replaced by an exact year.

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19. Food-Security and Household Welfare Effects Need More Direct Evidence

The manuscript argues that livestock losses, forced destocking and reduced mobility have pushed households toward cereals, informal employment and other livelihood strategies.

This is plausible, but household food-security outcomes are not systematically measured.

If the manuscript wants to make claims about food security, it should consider reporting indicators such as:

- food-consumption frequency;
- household dietary diversity;
- food expenditure;
- coping strategies;
- months of adequate food provisioning;
- livelihood diversification.

Otherwise, conclusions should remain focused on livestock livelihoods and reported coping strategies.

20. Income Diversification Rate Requires Definition

The manuscript reports an **Income Diversification Rate of 77%**, meaning that more than three-quarters of pastoral households no longer depend exclusively on livestock. However, the exact calculation is not given.

The authors should clarify whether IDR means:

- percentage of households with at least one non-livestock income source;
- percentage of total income generated outside livestock;
- number of livelihood activities per household;
- Simpson/Shannon diversification index;
- another measure.

The current wording is insufficient for reproducibility.

21. Community Solidarity Index Needs Operationalization

The manuscript reports a **Community Solidarity Index of 50%**, based on practices such as animal lending and entrustment.

The authors should explain:

- how solidarity was measured;
- which behaviours were included;
- how the 50% value was calculated;
- whether multiple forms of solidarity were weighted equally;
- whether the index was validated.

This is particularly important because “community solidarity” is a multidimensional social concept.

22. Discussion Relies Too Heavily on Theoretical Interpretation

The Discussion section contains extensive theoretical interpretation using many classical concepts.

However, much of the Discussion consists of linking individual findings to one theoretical author after another.

The manuscript would be stronger if the Discussion were reorganized around Minor empirical findings:

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1. Mobility contraction;
2. Forced sedentarization;
3. Herd reduction;
4. Market restructuring;
5. Economic consequences;
6. Coping and solidarity;
7. Implications for pastoral policy.

For each theme, the authors should compare their findings with **recent empirical studies from Burkina Faso and the wider Sahel**, rather than relying predominantly on older theoretical literature.

23. Avoid Overstatement of Causality

Several statements imply direct causal relationships, for example that insecurity “has caused” particular economic, ecological or biological transformations.

Because the research is largely observational and relies partly on purposive sampling and retrospective reporting, the authors should distinguish:

- observed association;
- respondent attribution;
- documentary evidence;
- researcher interpretation;
- demonstrated causation.

The language should be appropriately cautious.

24. Scientific Terminology Should Be Made More Neutral

Several expressions are rhetorically strong and may reduce the academic neutrality of the manuscript.

Examples include:

- “geographical strangulation”;
- “pathological decapitalization”;
- “financial trap”;
- “artificial landless intensification”;
- “humanitarian life-support”;
- “spatial death”;
- “proletarianization”;
- “asphyxiation.”

Some of these may be useful as conceptual metaphors, but they should be clearly defined and used sparingly.

For a scientific article, the authors should generally prefer measurable terminology such as:

- spatial contraction;
- livelihood asset depletion;
- increased production costs;
- reduced herd capital;
- restricted mobility;
- increased dependence on purchased inputs.

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25. Conflict-Sensitive Terminology Requires Care

The manuscript identifies particular communities and describes conflict-related territorial control and displacement. The study should ensure that terminology does not unintentionally stigmatize particular ethnic or livelihood groups.

The discussion itself acknowledges concerns about the stigmatization of Fulani herders.

The authors should maintain careful distinction between:

- pastoral identity;
- livelihood practices;
- internally displaced status;
- armed-group affiliation;
- conflict exposure.

No ethnic or occupational group should be implicitly associated with armed actors without direct evidence.

26. Map Presentation Is Useful but Requires Improvement

Map 1 provides a useful geographical overview of the Yaadga region, the four provinces, survey locations and major roads.

Map 2 presents the status of livestock markets in 2025 and the degree of disruption across communes.

The maps would benefit from:

- larger labels;
- clearer legend;
- consistent symbology;
- data-source information;
- coordinate reference system;
- explanation of classification thresholds;
- improved resolution.

For Map 2 specifically, the criteria for “weakly,” “moderately” and “very strongly” disrupted communes should be provided in the Methods.

27. Tables and Charts Need Better Statistical Presentation

Table 1 and Charts 1–2 provide useful descriptive information.

However, the manuscript should provide:

- sample size;
- frequency values;
- percentages;
- confidence intervals where appropriate;
- statistical significance;
- exact data sources;
- methodology used to calculate each percentage.

The current presentation is primarily descriptive.

28. Statistical Analysis Is Limited

The manuscript introduces many numerical indicators but provides almost no inferential statistics.

The authors should consider appropriate statistical tests to compare provinces and actor groups.

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Depending on the structure of the data, possible analyses could include:

- chi-square tests;
- t-tests or non-parametric alternatives;
- ANOVA/Kruskal-Wallis;
- correlation analysis;
- logistic regression;
- generalized linear models.

The appropriate method should be determined by the data distribution and research questions.

At minimum, the authors should provide uncertainty estimates and sample sizes for major percentages.

29. Ethical Procedures Need Greater Detail

The manuscript reports anonymization and verbal informed consent, particularly because insecurity creates risks for respondents.

This is appropriate, but the authors should clarify:

- ethics committee/institutional approval;
- whether verbal consent was documented;
- how identifying information was protected;
- how interview recordings/notes were stored;
- whether participants could withdraw;
- how conflict-sensitive information was handled.

Because the research concerns an active security crisis, ethical safeguards are particularly important.

30. Reference and Citation Inconsistencies

Several citation inconsistencies require correction.

For example:

- **MRAH (2020)** is cited in the Introduction, but the reference list shown does not appear to contain the corresponding entry.
- **Rétaillé (2023)** is cited in the theoretical discussion, but a corresponding reference is not visible in the reference list.
- **Magrin (2020)** is cited in the Discussion, while the reference list contains Magrin (2013).
- **Ancey (1997)** is cited in the Discussion, whereas the reference list gives **Ancey (1977)**.

All in-text citations must be checked carefully against the bibliography.

31. References Need Updating

The reference list contains many classical works, which are useful for theoretical framing. However, the empirical topic concerns a rapidly changing security and pastoral context.

The authors should add recent peer-reviewed literature on:

- pastoral mobility in Burkina Faso;
- conflict and livestock systems;
- internally displaced pastoralists;
- Sahelian livestock markets;
- climate-security interactions;

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- pastoral land governance;
- livestock adaptation under insecurity.

The theoretical foundation should remain, but it should be complemented with contemporary empirical evidence.

32. Conclusion Should Be More Evidence-Based

The conclusion effectively summarizes the manuscript's central argument, including the 99% contraction in Loroum, 59% sedentarization, 74% defensive destocking, 0.72 Financial Asphyxiation Ratio, BVT of five breeding ewes, CSI and IDR.

However, because several of these indicators are insufficiently defined or supported, the conclusion currently presents them with more certainty than the methodology permits.

The revised conclusion should:

- retain only validated results;
- distinguish measured from estimated values;
- avoid causal overstatement;
- identify the principal limitations;
- provide practical policy implications supported by the findings.

Strengths of the Manuscript

The manuscript has several notable strengths:

1. **Important and timely topic** concerning livestock livelihoods under conflict.
2. Focus on the **Yaadga region**, allowing analysis across a North–South security gradient.
3. Attempts a **mixed-methods approach**.
4. Includes several actor categories across the livestock-meat value chain.
5. Incorporates qualitative interviews and focus groups.
6. Uses GIS to visualize spatial changes.
7. Provides province-level comparison of grazing-space contraction.
8. Examines both production and downstream market effects.
9. Attempts to quantify livelihood adaptation through original indicators.
10. Includes Map 1 and Map 2 to provide spatial context.
11. Chart 1 clearly illustrates differences in herd-size structure among provinces.
12. The manuscript attempts to connect empirical observations with established theories of territoriality, moral economy and pastoral resilience.

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Overall Recommendation

The manuscript addresses an important problem and has a potentially valuable empirical contribution. The North–South spatial framework, the combination of field surveys and GIS, and the attempt to quantify changes in pastoral mobility, herd size and livestock marketing are promising.

Nevertheless, the **current manuscript requires substantial revision before the results can be considered sufficiently robust and reproducible**. The sample-size inconsistencies and lack of transparent formulas for the proposed indices are particularly serious. In addition, several quantitative claims need stronger documentation, and the manuscript would benefit from a more neutral scientific style and clearer separation between empirical evidence and theoretical interpretation.

Final Decision: Minor Revision