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REVIEWER'S REPORT

Manuscript No.: IJAR- 59105

Title: *ANALYSIS OF LIVESTOCK PRODUCTION SYSTEMS IN THE VILLAGES OF GOMBÃˆLEDOUGOU AND KOUMBIA IN THE SUDANESE REGION OF BURKINA FASO.*

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

The manuscript addresses an important topic concerning livestock production systems, grazing practices, veterinary services, resource constraints, gender roles, and the spatial differentiation of livestock farming in the Sudanese agropastoral zone of Burkina Faso. The comparative survey of **128 farms**, comprising 44 farms from Gombèlèdougou and 84 from Koumbia, provides potentially useful information on intra-zonal differences in livestock management and production constraints.

The manuscript contains useful field-level information and several statistically significant differences between the two villages. In particular, differences in goat, chicken and guinea-fowl numbers, grazing distance, grazing systems, use of grazing areas, participation in pastoral infrastructure management, veterinary-service use, and perceived production constraints are potentially valuable findings.

However, the manuscript requires **Minor revision** before it can be considered for publication. The principal concerns relate to methodological clarity, statistical analysis and interpretation, sampling justification, inconsistencies in reported p-values, insufficient description of the questionnaire and variables, overinterpretation of some associations, inadequate presentation of effect sizes and uncertainty, and substantial language/editorial problems.

1. Originality and Scientific Contribution

The manuscript identifies a potentially useful research gap: although livestock production systems in Burkina Faso have been studied at broader scales, intra-zonal variation between villages remains less documented.

The comparison between Gombèlèdougou and Koumbia is therefore relevant.

However, the authors should strengthen the statement of novelty.

The manuscript should explicitly explain:

- What is new compared with previous studies in western Burkina Faso.
- Why these two villages were specifically selected.

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- Whether the novelty concerns livestock composition, management practices, access to services, gender roles, production constraints, or the combination of these factors.
- How the findings advance existing knowledge beyond confirming previous observations.

At present, the manuscript sometimes presents findings mainly as confirmation of earlier literature.

2. Study Design and Sampling

The study used stratified random sampling, with village as the stratum, and the final sample consisted of 128 farms: 44 in Gombèlèdougou and 84 in Koumbia.

The sample-size calculation using Cochran's formula is appropriately described, with a theoretical minimum of approximately 96 farms.

However, several details require clarification.

Minor points:

1. The authors state that the sampling was proportional, but the basis for proportional allocation should be explicitly demonstrated.
2. The number of eligible livestock farms in each village should be reported.
3. The procedure used to randomly select individual farms should be described.
4. The inclusion and exclusion criteria should be specified.
5. It should be clarified whether one respondent represented one household/farm.
6. The survey dates should be reported.
7. The demographic characteristics of respondents should be presented.

The statement that the final sample "strengthen[s] the statistical robustness" simply because it exceeds the theoretical minimum should be moderated. Sample size alone does not establish statistical robustness if sampling bias or model assumptions are not addressed.

3. Study Area and Map

The study-area description provides useful information on rainfall, agricultural systems, livestock populations, soils, vegetation and resource pressure.

However, the geographic information requires careful checking.

For example, the coordinates given for Koumbia appear incorrectly formatted as:

12°42'207'' and 4°24'010''

and the coordinates of Gombèlèdougou also appear unusually formatted.

These should be checked against the original GIS/GPS data and presented consistently in decimal degrees or standard degrees-minutes-seconds.

Figure 1

The map is labelled **"Map of the municipality of Koumbia"**, but it also identifies Gombèlèdougou and surrounding areas. The title should therefore be revised to accurately describe the map.

The map should also include:

- north arrow;
- scale bar;
- coordinate system;
- clear administrative boundaries;
- study-village locations;
- major roads/watercourses;

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- readable place names.

The current map contains considerable visual information but the labels are relatively small.

4. Questionnaire and Data Collection

The manuscript states that a structured questionnaire was used to collect information on farm characteristics, production practices and constraints. Interviews lasted approximately 60–90 minutes and interviewers received training.

This is useful, but insufficient for reproducibility.

The authors should provide more information regarding:

- questionnaire development;
- pre-testing/pilot testing;
- language(s) used;
- translation procedures;
- respondent selection;
- informed consent;
- interviewer training;
- handling of incomplete responses;
- coding of categorical variables;
- whether questions allowed multiple responses.

The questionnaire itself could be provided as supplementary material.

5. Statistical Methodology

The manuscript uses Pearson's chi-square test for categorical variables and one-way ANOVA for quantitative variables.

The statistical approach needs further justification.

Because the comparison involves **only two villages**, one-way ANOVA is mathematically equivalent to a two-sample comparison under the usual assumptions.

The authors should explain why ANOVA was selected and report whether:

- normality was assessed;
- homogeneity of variance was assessed;
- outliers were examined.

This is particularly important because some livestock-number variables have very large standard deviations relative to their means. For example, cattle and goat counts show substantial variability.

If assumptions are violated, appropriate alternatives such as non-parametric tests or generalized models should be considered.

6. Multiple Statistical Comparisons

The manuscript performs a large number of statistical comparisons across:

- livestock species;
- grazing practices;
- watering;
- feeding;
- labor allocation;
- veterinary services;
- production constraints.

The manuscript does not discuss the problem of **multiple comparisons**.

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With many hypothesis tests, some statistically significant p-values may occur by chance.

Recommendation:

The authors should:

- report the total number of statistical comparisons;
- consider an appropriate multiple-testing correction where justified;
- at minimum, acknowledge the increased Type I error risk.

Effect sizes and confidence intervals would also make the findings more informative than p-values alone.

7. Important Inconsistency in Statistical Reporting

There are several apparent errors that must be corrected.

Example 1: Free-range grazing

The text states:

"free-range grazing predominates … with $p < 0.5$"

but the table reports **p = 0.023**.

This should clearly be corrected to **p = 0.023**.

Example 2: Watering difficulty

The abstract states that watering difficulties during the rainy season were 36.9% versus 4.5%, with **p < 0.001**.

The table reports $x^2 = 14.16$ and $p < 0.001$ in the relevant comparison, but the numerical relationship and variable definitions should be checked carefully against the raw dataset.

Example 3: Veterinary access

The text reports:

$x^2 = 7.59$; $p < 0.006$

whereas the table reports **p = 0.006**.

This should be standardized.

The authors should perform a complete cross-check between:

Abstract → Results text → Tables → Discussion → Conclusion

to ensure that every statistic is identical.

8. Table I: Livestock Composition

Table I provides useful quantitative comparisons between villages. Significant differences are reported for goats, chickens, guinea fowl, fodder sheds and maximum grazing distance.

However, the table should be improved.

Recommendations:

- Use consistent decimal notation.
- Replace mixed comma/decimal formatting with a single format.
- Specify whether values are **mean ± SD**.
- Include units.
- Use consistent species names.
- Explain whether "cattle for breeding" excludes draft cattle.
- Define "fodder shed."
- Provide confidence intervals or effect sizes where possible.

The very high variability in several livestock variables suggests that means alone may not adequately describe the distributions.

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9. Table II: Grazing and Feeding Practices

The table is informative and demonstrates several important differences between the villages. For example, free-range grazing is reported at 95.5% versus 76.2%, while grazing on plains during the rainy season is 25% versus 57.1%.

However, some terminology appears problematic.

For example:

- "slums" is unlikely to be the intended English term for a grazing environment.
- "low-lying areas" may be a better translation if that is what the original French term means.
- "Pasture + barn housing" should be defined operationally.

The authors should verify the original terminology and use scientifically appropriate English throughout.

10. Table III: Gender and Child Participation

The gender-disaggregated analysis is potentially interesting. The manuscript reports significant differences in the involvement of minor girls in food distribution and herding between the two villages.

However, this section requires particularly careful interpretation.

The manuscript states that the observed participation of minor girls **"could be attributed"** to isolation and shortage of skilled labor.

This is speculative because the study does not appear to have tested this causal relationship.

Recommendation:

Use more cautious wording such as:

"This difference may be associated with differences in household labor availability and village-level socioeconomic conditions; however, these factors were not directly tested in the present study."

The authors should also clarify:

- whether "minor" means below 18 years;
- whether child labor was explicitly investigated;
- whether respondents were reporting household practices or individual participation;
- whether multiple categories could be selected for the same activity.

11. Health Practices

The health-practice results are useful, particularly the differences in access to vaccination centres, use of state veterinary services and reliance on traditional caregivers.

However, the manuscript sometimes confuses **access**, **use**, and **availability**.

For example:

"greater access to the vaccination center"

does not necessarily mean greater utilization or better veterinary care.

These variables should be clearly distinguished.

Similarly, the statement that traditional care is "technically suboptimal" should either be supported by evidence or expressed more neutrally.

12. Production Constraints

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The production-constraint section is one of the stronger components of the manuscript.
The most frequently reported constraints include:

- insufficient forage: **95.3%**
- water-access difficulties: **84.4%**
- pasture degradation: **83.6%**
- high input costs: **79.7%**.

The figure on page 8 provides a useful visual representation of the perceived constraints.
However, the manuscript should clearly state whether respondents could select **multiple constraints**. If so, percentages should not be interpreted as mutually exclusive categories.
The authors should also distinguish between:

- perceived constraint;
- objectively measured constraint;
- seasonal constraint;
- structural constraint.

13. Interpretation of Significant Differences
Several interpretations go beyond what the statistical analysis directly demonstrates.
For example, the manuscript states that longer grazing distances in Gombèlèdougou **reflect increased pressure on local pastures**.
This is plausible, but grazing distance alone does not establish pasture pressure.
Similarly, greater participation in pastoral infrastructure management in Koumbia is interpreted as evidence of **"better collective organization."**
This interpretation requires additional indicators of collective organization.
Recommendation:
Distinguish clearly between:
Observed finding → interpretation → possible explanation.
Avoid presenting possible explanations as demonstrated causal mechanisms.

14. Discussion Needs Greater Analytical Depth
The Discussion largely repeats the Results and then compares them with previous studies. For example, livestock composition and grazing differences are restated before being linked to previous literature.
The discussion would be stronger if organized around major findings:

1. Differences in livestock composition.
2. Grazing and feed-resource strategies.
3. Water and veterinary-service access.
4. Gender and household labor.
5. Production constraints.
6. Implications for livestock development.

For each theme, the authors should discuss:
What was found → why it may have occurred → agreement/disagreement with previous studies → implications → limitations.

15. Causal Language Should Be Reduced
Several statements imply causation without a causal study design.

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Examples include:

- pasture pressure "forcing" longer grazing distances;
- isolation causing greater involvement of minor girls;
- infrastructure availability producing differences in veterinary-service use;
- collective organization explaining participation differences.

The survey is essentially observational and cross-sectional.
Therefore, the manuscript should use:

- "may be associated with";
- "could reflect";
- "is consistent with";
- "may indicate"

rather than definitive causal language.

16. Geographic Generalization
The study examines only **two villages**.
Consequently, the results should not be generalized directly to the entire Sudanese region or western Burkina Faso without appropriate qualification.
The manuscript should explicitly acknowledge that:
findings represent the surveyed livestock-farming households in Gombèlèdougou and Koumbia and may not be representative of all livestock systems in the wider Sudanese region.
This limitation is particularly important when making policy recommendations.

17. Need for a Dedicated Limitations Section
A separate **"Study Limitations"** section should be added.
It should discuss:

- only two villages;
- cross-sectional survey design;
- self-reported information;
- possible recall bias;
- possible interviewer bias;
- seasonal timing of the survey;
- lack of direct measurements of pasture biomass;
- lack of quantitative livestock productivity measurements;
- lack of economic profitability analysis;
- lack of longitudinal data;
- potential statistical-assumption violations;
- multiple statistical testing.

This would considerably improve the scientific transparency of the manuscript.

18. Ethical Considerations
The research involved interviews with livestock farmers using a structured questionnaire. The manuscript should therefore clearly state the procedures followed for:

- informed consent;
- voluntary participation;
- confidentiality/anonymization;
- ethical approval or institutional authorization, where applicable.

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This information is currently not adequately presented in the manuscript.

19. References and Citation Quality

The reference list contains relevant literature on livestock systems, feed markets, veterinary issues, gender, climate-related livestock stress and livestock production in Burkina Faso.

However, the references require comprehensive editorial standardization.

Examples include:

- inconsistent spacing;
- inconsistent punctuation;
- inconsistent author formatting;
- inconsistent use of journal titles;
- DOI formatting inconsistencies;
- URLs presented inconsistently;
- French and English bibliographic styles mixed together.

Some references appear to be reports or institutional documents, which is acceptable, but their document type should be clear.

The authors should also ensure that **every citation in the text appears in the reference list and vice versa**.

20. Language and Editorial Quality

The manuscript requires substantial English-language editing.

Examples include:

- "Asurvey"
- "among128 farms"
- "western part of Burkina Faso"
- "Error! Reference source not found."
- "p < 0.5" where p = 0.023 appears intended
- "slums" for a grazing environment
- "avec" and "Depiste" remaining in the English text
- "Hommes adultes" and "Femmes adultes" remaining in Table III
- "food" used where "feed" appears intended
- inconsistent spacing around percentages and statistical symbols.

There are also numerous missing spaces and inconsistent punctuation throughout the manuscript.

A thorough professional English-language revision is strongly recommended.

21. Figures and Tables

The manuscript contains four major tables/figures, and the quantitative tables are useful.

However:

Table I

Needs improved formatting, units and statistical interpretation.

Table II

Needs terminology clarification and consistent formatting.

Table III

Needs careful clarification of social-group definitions and multiple-response structure.

Table IV

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Needs clarification of "access," "use," and "service availability."

Figure 2

The constraint bar chart is useful, but the figure should include:

- clear axis labels;
- a more informative figure caption;
- indication of whether percentages represent farms selecting each constraint;
- clarification that responses may be multiple-choice.

Figure 1

The map title and geographic coordinates require correction.

22. Strengths of the Manuscript

The manuscript has several positive features:

- Relevant topic for livestock development in Burkina Faso.
- Field-based primary survey involving **128 farms**.
- Direct comparison between two villages.
- Inclusion of livestock composition, grazing, feeding, veterinary services and constraints.
- Several statistically significant differences are clearly documented.
- Gender-related livestock labor is considered.
- Production constraints are presented quantitatively.
- The study attempts to connect local findings with the wider literature.
- The conclusions appropriately emphasize location-specific livestock development strategies.

Overall Recommendation

The manuscript contains **useful primary field data** and has the potential to make a meaningful contribution to understanding local variation in livestock production systems in western Burkina Faso. The comparative findings between Gombèlèdougou and Koumbia are potentially valuable, particularly regarding livestock composition, grazing practices, veterinary-service access, water constraints and production limitations.

Nevertheless, significant revisions are necessary to ensure that the statistical analyses are appropriately justified, the reported results are internally consistent, interpretations remain within the limits of the study design, and the methodology is sufficiently reproducible.

Final Decision: Minor Revision