

REVIEWER'S REPORT

Manuscript No.: IJAR- 59167

Title: SEGURANÇA ALIMENTAR E RESILIÊNCIA CLIMÁTICA NA AGRICULTURA URBANA: UMA ANÁLISE EMPÍRICA.

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 relationship between climate risks, urban/peri-urban agriculture, resilient infrastructure and food security in Beira, Mozambique. The study uses a mixed-methods case-study approach combining questionnaires administered to **384 households**, semi-structured interviews, direct observation, documentary analysis and GIS-based spatial analysis.

The topic is highly relevant, particularly for coastal African cities exposed to flooding, rapid urbanization and climate-related risks. The manuscript also attempts to integrate quantitative, qualitative and spatial evidence rather than relying on a single method. The reported findings indicate that 82.0% of surveyed households perceived a decline in agricultural production, floods were the most frequently identified cause of losses (50.9%), 66.1% reported periods of food shortage, and 75.8% perceived improvements in urban drainage.

The manuscript has potential value, but **minor methodological and data-presentation problems need to be addressed before publication**. In particular, the GIS methodology is insufficiently described, the sampling procedure and qualitative sample are not adequately reported, statistical results are incomplete, and there are serious numerical inconsistencies in Table 1. In addition, some conclusions about the effect of infrastructure on flooding and food security are stronger than the evidence presented.

1. Originality and Scientific Contribution

The manuscript addresses an important intersection of:

- climate-related flooding;
- urban and peri-urban agriculture;
- infrastructure resilience;
- land-use change;

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- household food security;
- urban adaptation.

The theoretical framework combines vulnerability, resilience, food-system and urban-agriculture perspectives using authors such as Adger, Holling, Sen, Pelling, IPCC, FAO and others.

However, the manuscript should make its **specific scientific contribution** much clearer.

At present, the theoretical discussion is extensive, but the novelty of the empirical analysis is not sufficiently distinguished from existing literature.

The authors should explicitly state:

1. What previous studies have established about Beira;
2. What empirical gap remains;
3. What this study adds;
4. Which findings are genuinely new;
5. How the mixed-methods and GIS approach improves upon previous studies.

2. Minor Concern: Sampling Procedure Is Insufficiently Described

The manuscript states that the quantitative sample consisted of **384 households**.

However, the methodology does not adequately explain how these 384 households were selected.

The authors should provide:

- total population from which the sample was drawn;
- sampling frame;
- sampling technique;
- inclusion/exclusion criteria;
- geographical distribution of respondents;
- number of respondents per neighbourhood;
- whether agricultural and non-agricultural households were included;
- basis for determining the sample size;
- response rate;
- treatment of incomplete questionnaires.

Although Cochran (1977) is included in the references, the manuscript does not clearly explain whether Cochran's formula was actually used to obtain the sample size.

This information is essential for assessing representativeness.

3. Qualitative Sample Is Not Reported

The manuscript states that semi-structured interviews were conducted and analyzed using NVivo.

However, the manuscript does not clearly state:

- total number of interviews;
- participant categories;
- number of farmers interviewed;
- number of municipal officials;
- number of technical personnel;
- number of community leaders;
- selection procedure;
- interview duration;

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- interview period;
- saturation criteria.

The quotations are identified as E1, E2, E4, E5, E6, E7 and E12, suggesting that at least 12 coded participants may have been involved, but the total sample and selection procedure are not explicitly stated.

This must be clarified.

4. Mixed-Methods Integration Needs to Be Demonstrated More Clearly

The manuscript repeatedly states that quantitative, qualitative and spatial methods were integrated through triangulation.

However, the actual integration is mostly narrative.

The authors should explain the specific mixed-methods design:

- convergent parallel;
- explanatory sequential;
- exploratory sequential;
- embedded design;
- or another approach.

More importantly, the manuscript should show **where the different datasets converge or diverge**.

A mixed-methods study is stronger when the authors explicitly demonstrate, for example:

Survey result → GIS result → interview evidence → integrated interpretation.

A table showing this triangulation would substantially improve the manuscript.

5. Minor Concern: GIS Methodology Is Inadequately Described

GIS is presented as an important component of the study, but the methodological description is too general.

The manuscript states that GIS was used to analyze agricultural areas, flood exposure and infrastructure.

However, it does not sufficiently report:

- GIS software;
- satellite imagery dates;
- spatial resolution;
- DEM source and resolution;
- land-use classification methodology;
- classification algorithm;
- accuracy assessment;
- flood-data source;
- inundation model;
- flood-depth data;
- drainage-network data;
- infrastructure dataset;
- coordinate reference system;
- spatial overlay procedure;
- criteria used to classify vulnerable areas.

These details are necessary for reproducibility.

6. Serious Numerical Inconsistency in Table 1

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Table 1 requires careful correction before publication.

The table reports land-use areas and percentages for 1995, 2005, 2015 and 2023. There are clear inconsistencies between the reported area values and percentages. For example, for 2023 the table reports:

- Agricultural area = **2,175.47 ha**, corresponding to **35.74%**;
- Vegetation = 1,820.24 ha, 2.99%;
- Built-up = 12,656.12 ha, 20.79%;
- Wetlands = 24,623.83 ha, 40.47%;
- Total = 61,388.98 ha.

The four reported areas do **not** sum to 61,388.98 ha.

Furthermore, 2,175.47 ha does not correspond to 35.74% of 61,388.98 ha.

The same type of inconsistency appears in the 2005 and 2015 columns.

This is a **minor data-quality issue** and must be corrected by checking the original GIS calculations.

The authors should verify:

- area calculations;
- percentage calculations;
- total area;
- decimal placement;
- classification results;
- consistency between Table 1 and the maps.

7. Land-Use Change Interpretation Should Be Rechecked

The manuscript states that agricultural land increased substantially between 1995 and 2023 and that built-up areas expanded.

The general pattern may be plausible, but because the numerical values in Table 1 are inconsistent, the interpretation cannot currently be considered fully reliable.

The authors should recalculate the entire land-use-change analysis and report:

- absolute change in hectares;
- percentage change;
- annual rate of change;
- transition between land-use classes.

A land-use transition matrix would provide considerably stronger evidence than simply comparing four dates.

8. Food Security Measurement Is Too Limited

The manuscript states that **66.1% of households experienced periods of food shortage**.

This is an important finding, but food security is a multidimensional concept involving availability, access, utilization and stability.

The study appears to rely heavily on self-reported food shortages without presenting a validated household food-security indicator.

The authors should clarify:

- exact questionnaire questions;
- recall period;
- frequency of food shortage;
- household dietary information;
- food expenditure/access;

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- coping strategies;
- whether a validated instrument was used.

If no standardized food-security scale was used, the manuscript should avoid presenting the measure as a comprehensive assessment of household food security.

9. Causal Claims Regarding Infrastructure Should Be Reduced

The manuscript reports a significant negative association between the extent of dikes and flood depth ($p < 0.05$) and states that GIS analysis indicated a **35% reduction** in affected areas in protected zones.

This is potentially an important result.

However, the statistical analysis is insufficiently reported.

The authors should provide:

- correlation coefficient or regression coefficient;
- confidence interval;
- sample size;
- dependent variable;
- independent variable;
- model specification;
- control variables;
- statistical test used;
- assumptions;
- effect size.

Without these details, the reader cannot evaluate the reported association.

The manuscript itself appropriately acknowledges that elevation, distance from channels, terrain, precipitation, land use and drainage efficiency may also influence flood depth.

Therefore, the conclusion should consistently use “**associated with**” rather than “**caused**” unless the research design supports causal inference.

10. The Reported 35% Reduction Needs Methodological Explanation

The statement that protected areas experienced a **35% reduction in affected area** is potentially important, but the calculation is not explained.

The authors should specify:

- baseline period;
- comparison period;
- definition of “affected area”;
- GIS procedure used to calculate the reduction;
- whether the 35% refers to area, frequency, depth or duration;
- number of protected and unprotected areas;
- uncertainty around the estimate.

This should be supported by a table or statistical output.

11. Flood-Depth Analysis Needs More Detail

The manuscript reports that channel A3 experienced a mean reduction of **0.42 m** in flood levels following intervention and that flood duration decreased significantly.

However, the methodology does not explain:

- number of flood events;
- dates of events;

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- pre-intervention measurements;
- post-intervention measurements;
- measurement locations;
- measurement instruments;
- duration of monitoring;
- statistical test;
- variance;
- confidence interval.

The authors should provide these details.

Otherwise, the reader cannot determine whether the reported 0.42 m reduction represents a robust effect or a descriptive observation.

12. The Study Needs a Clear Definition of “Resilient Infrastructure”

The manuscript discusses drainage channels, dikes and other infrastructure as resilient infrastructure.

However, the operational definition is not sufficiently clear.

The authors should establish measurable indicators of infrastructure resilience, such as:

- drainage capacity;
- flood-depth reduction;
- reduction in inundation duration;
- infrastructure condition;
- maintenance frequency;
- service continuity;
- protection coverage;
- recovery time.

This would make the concept empirically measurable rather than primarily theoretical.

13. Climate Data and Historical Event Data Need Clarification

The manuscript discusses climate change, floods and droughts, but the methodology does not clearly identify the climate datasets used to quantify historical climatic conditions.

The authors should state whether they used:

- rainfall records;
- temperature records;
- flood records;
- satellite-derived rainfall;
- meteorological station data;
- disaster records;
- municipal records.

If the study primarily examines household perceptions rather than long-term climate observations, this should be explicitly acknowledged.

14. Distinguish Climate Change From Climate Variability

The manuscript frequently uses the expression “alterações climáticas” and connects observed agricultural losses with climate change.

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However, the empirical evidence presented appears largely cross-sectional and perception-based.

A decline in agricultural production associated with floods or droughts during the study period does not by itself establish a long-term climate-change trend.

The authors should distinguish among:

- climate variability;
- extreme weather events;
- observed climatic trends;
- climate-change attribution.

If no trend analysis or attribution analysis was performed, the manuscript should avoid implying that the observed household-level impacts are independently demonstrated consequences of anthropogenic climate change.

15. Urban Expansion and Agricultural Land Claims Need Stronger Evidence

The manuscript argues that urban expansion fragments agricultural areas and modifies drainage patterns.

This is an important interpretation, but the study should provide more quantitative evidence.

For example:

- agricultural land lost to built-up land;
- spatial expansion of built-up areas;
- fragmentation indices;
- distance of agricultural fields from urban areas;
- changes in drainage pathways.

A land-use transition matrix would significantly strengthen this section.

16. Food Shortages in January and February Need More Analysis

The manuscript states that food shortages were particularly concentrated in January and February.

This is an interesting finding, but the causal explanation is not fully established.

The authors should investigate whether the seasonal pattern corresponds to:

- agricultural harvest calendars;
- post-harvest depletion;
- rainfall seasonality;
- market prices;
- flooding;
- household income;
- food imports.

The current discussion moves relatively quickly from temporal association to climatic interpretation.

17. Household-Level Results Should Be Presented With Statistical Tables

The manuscript provides several percentages in the text:

- 82.0% production decline;
- 16.2% no relevant change;
- 1.8% production increase;
- 50.9% flood-related losses;
- 43.8% drought-related losses;

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- 66.1% food shortage;
- 75.8% perceived drainage improvement;
- 37% indirect impacts.

However, the manuscript would be substantially improved by presenting these results in properly formatted tables with:

- frequency (n);
- percentage (%);
- denominator;
- confidence intervals where appropriate.

This would make the quantitative component much more transparent.

18. Questionnaire Reliability Should Be Reported

Because a substantial part of the study relies on a household questionnaire, the manuscript should provide information about instrument development and reliability.

The authors should report, where applicable:

- questionnaire development;
- pilot testing;
- validity assessment;
- reliability statistics;
- translation procedure;
- interviewer training.

If multi-item scales were used, Cronbach's alpha or another appropriate reliability measure should be considered.

19. Ethical Approval Needs More Information

The manuscript states that informed consent, anonymity and confidentiality were respected.

However, there is no clear information about:

- ethics committee approval;
- institutional research approval;
- approval number/reference;
- date of approval.

For research involving human participants, the authors should provide the appropriate ethics information or explain why formal ethics approval was not required.

20. Maps Are Useful but Require Better Cartographic Presentation

The GIS maps are a valuable part of the manuscript.

The map on page 6 shows the spatial distribution of agricultural fields across Beira, with neighbourhoods including Nhangoma, Nhangau, Tchonja, Inhamizua and others.

The land-use maps on page 8 illustrate the four temporal land-use datasets.

The infrastructure map on page 10 identifies roads, coastal protection dikes, urban drainage, lagoons/basins and irrigated agricultural fields.

These maps are useful, but they should be improved by ensuring:

- consistent scale;
- north arrow;
- readable legend;
- clear coordinate information;

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- consistent symbology;
- data source;
- acquisition date;
- map projection;
- appropriate resolution;
- figure numbering and captions.

21. Before-and-After Infrastructure Figures Need Quantitative Support

The manuscript includes images of channels A1, A2 and A3 before and after rehabilitation.

These photographs provide useful visual evidence, but photographs alone cannot establish infrastructure effectiveness.

The authors should provide corresponding quantitative indicators, such as:

- channel width/depth;
- water level;
- flow capacity;
- inundation duration;
- affected area;
- number of affected households before/after intervention.

The text provides some quantitative information, but the linkage between each photograph and the numerical dataset should be made explicit.

22. Reference Consistency Problem

There is an apparent inconsistency concerning **Guerreiro et al.**

The text cites **Guerreiro et al. (2019)**, for example in the discussion of transport connectivity and infrastructure effects.

However, the reference list identifies the paper as **Guerreiro et al. (2018)**.

The authors should verify all in-text citations against the reference list and correct this inconsistency.

23. Some References Are Used for Claims Beyond Their Direct Evidence

The manuscript makes extensive use of minor theoretical sources such as IPCC, Adger, Sen, Pelling and Wisner et al.

These are appropriate foundational references.

However, the manuscript should distinguish between:

- theoretical framework;
- empirical evidence from Beira;
- evidence from other geographical contexts.

A theoretical citation should not be presented as direct empirical evidence for a Beira-specific result.

24. Discussion Is Too Repetitive

The theoretical framework and Discussion repeatedly restate similar concepts:

- exposure;
- vulnerability;
- infrastructure;
- resilience;
- food security;

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- adaptive capacity.

For example, the same relationship between infrastructure, exposure and vulnerability is explained in several sections.

The manuscript would benefit from reducing repetition and giving greater space to:

- quantitative findings;
- statistical evidence;
- comparison with previous empirical studies;
- limitations;
- practical implications.

25. Limitations Section Is Missing or Insufficient

A dedicated **Limitations** section should be added.

Important limitations include:

1. Cross-sectional household survey design.
2. Reliance on self-reported perceptions for several outcomes.
3. Unclear representativeness of the 384 households.
4. Limited information on qualitative sampling.
5. Incomplete GIS methodology.
6. Lack of detailed climate-event datasets.
7. Potential confounding variables affecting flood depth.
8. Difficulty establishing causality between infrastructure and reduced flooding.
9. Inconsistencies in the land-use table.
10. Limited direct measurement of household food security.

Acknowledging these limitations would improve scientific credibility.

26. Conclusions Should Be More Closely Linked to Evidence

The conclusion states that dikes and drainage interventions contribute to reducing flood exposure and that integrated territorial management is necessary.

The general implication is reasonable, but conclusions should distinguish between:

demonstrated findings

and

policy recommendations/inferences.

For example, the evidence supports an association between infrastructure and reduced exposure, but the study does not fully establish that infrastructure alone caused the reduction.

27. Language and Editorial Quality

The manuscript requires careful language editing in Portuguese.

Examples include:

- inconsistent use of hyphens;
- inconsistent headings;
- “Palavras - chave:-” formatting;
- inconsistent use of “infraestruturas” and related terms;
- inconsistent punctuation;
- repeated sentence structures;
- occasional overly long sentences.

The title and headings should also follow a consistent academic formatting style.

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The authors should perform a complete grammatical and stylistic revision before resubmission.

Strengths of the Manuscript

The manuscript has several important strengths:

1. **Highly relevant research topic** involving climate risk, food security and urban agriculture.
2. Focuses on **Beira, Mozambique**, a coastal city where flooding and drainage are important concerns.
3. Uses a **mixed-methods design**.
4. Includes a relatively substantial quantitative household sample of **384 households**.
5. Combines questionnaire, interviews, field observation, documentary evidence and GIS.
6. Attempts methodological triangulation.
7. Provides spatial analysis of agricultural fields and flood exposure.
8. Includes temporal land-use information from 1995, 2005, 2015 and 2023.
9. Includes infrastructure mapping.
10. Provides quantitative information on perceived agricultural losses and food shortages.
11. Includes qualitative quotations that help contextualize the quantitative findings.
12. Recognizes that infrastructure effectiveness depends on maintenance and wider territorial conditions.

Overall Recommendation

The manuscript addresses an important and timely research problem and has the potential to make a useful contribution to understanding the relationship between urban agriculture, flooding, infrastructure and food security in Beira. The combination of household surveys, qualitative interviews and GIS is potentially a strong feature of the study.

However, **the current version requires substantial methodological clarification and correction of important numerical inconsistencies before the findings can be considered reliable**. The most serious issue is Table 1, where the reported land-use areas do not correspond to the reported percentages or total area. The incomplete description of sampling, GIS procedures and statistical analysis also prevents full assessment and replication of the study.

The authors should substantially revise the manuscript, particularly the empirical methodology, quantitative analysis, GIS calculations, interpretation of infrastructure effects and presentation of evidence.

Final Decision: Minor Revision