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REVIEWER'S REPORT

Manuscript No.: IJAR- 59163

Title: ***Agronomic performance of traditional rainfed lowland rice varieties in Lower Casamance (Southwestern Senegal).***

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 evaluates the agro-morphological and yield performance of 14 rice varieties, comprising 13 traditional/local ecotypes and one improved variety (ISRIZ 8), under rainfed lowland conditions at the ISRA Djibelor station in Lower Casamance, Senegal, during the 2024 rainy season. The experiment used a randomized complete block design with four replications and assessed growth, phenology, yield and yield components.
The topic is relevant to rice varietal conservation, climate-resilient agriculture, food security and utilization of traditional rice genetic resources. The manuscript provides useful comparative data, particularly for plant height, tillering, flowering, maturity, panicle length, grain number, thousand-grain weight, grain yield and sterility. The reported performance of several local ecotypes, particularly Oukout, Agathia, Lori and Niji, is potentially valuable for future breeding and varietal-selection programmes.
However, **substantial revision is required before publication**. The minor concerns relate to the interpretation of climate resilience, limited environmental testing, incomplete description of yield measurement and statistical analysis, inconsistencies in numerical reporting, figure/table presentation, and the strength of some conclusions relative to the experimental evidence.

1. Originality and Scientific Contribution
The manuscript addresses an important issue: the conservation and evaluation of traditional rice varieties that may be threatened by the increasing adoption of improved varieties. The study compares 13 local ecotypes with ISRIZ 8 under the same experimental conditions.
The work has potential scientific and practical value because some traditional varieties produced higher grain yields than the improved check under the tested conditions.

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However, the manuscript should explain more clearly what is novel compared with previous varietal evaluation studies in Casamance and Senegal.
The authors should clearly distinguish:

- newly generated experimental results;
- confirmation of previously reported characteristics;
- implications for breeding and conservation.

2. Minor Concern: "Climate Resilience" Is Not Directly Demonstrated
The manuscript repeatedly describes the traditional varieties as resilient to climatic stresses or climatic variations.
For example, the Abstract states that the traditional varieties deserve attention because of their "resilience to climatic stresses."
Similarly, the Conclusion states that local varieties showed interesting characteristics such as better resilience to climatic variations.
However, the experiment was conducted during **one rainy season (2024)** at a single research station. Moreover, rainfall during 2024 was reported as **1,645 mm**, compared with the 1991–2020 average of **1,373 mm**, meaning that the study year was wetter than the stated climatic normal.
Therefore, the experiment does not directly demonstrate resilience to drought, rainfall variability, heat stress, salinity, flooding or other climatic stresses.
Recommendation
The authors should either:

1. provide direct evidence supporting climate resilience; or
2. moderate the language and describe these varieties as **potentially valuable under variable climatic conditions**, based on their agronomic characteristics and previous literature.

A multi-year or multi-environment experiment would be necessary to demonstrate stability or climate resilience more convincingly.

3. Single-Site and Single-Year Experiment Limits Generalization
The study was conducted at the Djibelor ISRA station in Lower Casamance.
Although the experiment is well suited for initial varietal screening, the results should not be generalized to all Lower Casamance or all rainfed lowland environments without qualification.
The authors should acknowledge that:

- only one experimental location was used;
- only one growing season was evaluated;
- environmental variation among years was not tested;
- genotype × environment interaction was not evaluated.

This is particularly important because varietal performance can change considerably according to rainfall distribution, soil moisture, salinity, fertility and temperature.

4. Experimental Design Requires More Statistical Detail
The manuscript states that a randomized complete block design with four replications was used, with 14 varieties per block and 9 m^2 experimental plots.
This is appropriate for a varietal comparison, but the statistical model is insufficiently described.
The authors should provide:

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- the complete ANOVA model;
- treatment degrees of freedom;
- block degrees of freedom;
- error degrees of freedom;
- F-values;
- coefficient of variation (CV%);
- assumptions of ANOVA;
- whether residual normality and homogeneity of variance were tested.

The manuscript only states that ANOVA was performed using XLSTAT and Tukey's test was used at the 5% level.
A more complete statistical description is necessary for reproducibility.

5. Block Effect Should Be Reported

Because the experiment used a randomized complete block design, the statistical results should indicate whether the block effect was significant.
The manuscript reports p-values for variety effects but does not present block effects.
The authors should provide either:

- a complete ANOVA table; or
- a supplementary statistical table containing treatment, block and error sources of variation.

6. Yield Measurement Method Is Insufficiently Described

Grain yield is the most important agronomic result, yet the methodology does not adequately explain how grain yield was determined.
The manuscript should specify:

- harvest area within each 9 m^2 plot;
- whether border rows were excluded;
- number of plants harvested;
- method of threshing;
- grain cleaning procedure;
- grain moisture at weighing;
- whether yield was corrected to a standard moisture content;
- formula used to convert plot yield to kg ha^{-1}.

This information is essential because yield values are central to the conclusions.

7. Yield Values and Units Need Careful Checking

The Abstract reports:
"4.895 ± 483 kg/ha"
for Oukout and similar formatting for other varieties.
The intended value appears to be **4,895 ± 483 kg ha^{-1}**, as shown in Table 1.
The authors should standardize numerical notation throughout the manuscript.
For example:

- 4,895 kg ha^{-1} rather than 4.895 kg ha^{-1};
- 4,691 kg ha^{-1} rather than 4.691 kg ha^{-1};
- consistent decimal separators;
- consistent use of kg ha^{-1}.

This is particularly important because "4.895 kg/ha" and "4,895 kg/ha" represent dramatically different quantities.

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8. Percentage Yield Increases Should Be Recalculated and Explained
The Abstract states that Oukout, Agathia and Lori increased yield by **45%, 39% and 27%**, respectively, compared with ISRIZ 8.
These calculations should be explicitly shown or checked.
Using the reported mean values:

- Oukout: 4,895 vs. ISRIZ 8: 3,376 kg ha^{-1}
- Agathia: 4,691 vs. 3,376 kg ha^{-1}
- Lori: 4,275 vs. 3,376 kg ha^{-1}

The manuscript should state whether these percentages represent:
(Local variety − ISRIZ 8) / ISRIZ 8 × 100
and ensure that the rounded values are correct.

9. Interpretation of "Best" Varieties Should Be More Careful
The manuscript identifies Oukout, Agathia, Lori and Niji as the most productive varieties.
However, Table 1 shows overlapping Tukey group letters for several varieties. For example, Oukout is designated "C," while Agathia is "BC," and Lori and Niji are "ABC."
Therefore, numerical ranking of mean yield should not automatically be interpreted as statistically significant superiority.
The authors should carefully distinguish:

- highest numerical mean;
- statistically different mean;
- statistically similar group.

Statements such as "most productive" should be supported by the Tukey grouping.

10. Yield Stability Cannot Be Established
The study reports substantial variation around several yield means, for example:

- Agathia: 4691 ± 677 kg ha^{-1};
- Niji: 4060 ± 472 kg ha^{-1};
- Lori: 4275 ± 401 kg ha^{-1};
- Bonty-Oukout: 2456 ± 1103 kg ha^{-1};
- Alisor: 2701 ± 1104 kg ha^{-1}.

Because only one season and one location were studied, the manuscript should not imply yield stability across environments.
If the ± values represent standard deviation or standard error, this should be explicitly stated.

11. Plant Height Interpretation Needs Moderation
Plant height differed significantly among varieties, with Diary, Fouleme, Niji and Yangolale among the taller varieties.
The manuscript states that plant height is important for lodging resistance.
However, greater plant height does not necessarily mean better lodging resistance. Lodging is affected by additional characteristics such as:

- culm strength;
- internode length;
- stem diameter;
- panicle weight;

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- plant architecture;
- wind and rainfall conditions.

Therefore, the discussion should avoid directly linking plant height to lodging resistance unless lodging was actually measured.

12. Tillering Data Require Better Explanation

The manuscript reports significant varietal differences in tillering, with Oukout recording approximately 380 tillers m^{-2} and Bonty-Oukout approximately 125 tillers m^{-2}.

However, the manuscript should clarify whether "number of tillers" means:

- total tillers;
- productive tillers;
- fertile tillers;
- tillers at a specified growth stage.

For yield interpretation, productive tillers per unit area are generally more informative than total tiller number.

13. Phenological Measurements Need Methodological Definition

The manuscript reports:

- 50% flowering;
- 80% physiological maturity.

The authors should define exactly how these stages were determined.

For example:

- Was 50% flowering based on 50% of plants or 50% of panicles?
- How was 80% physiological maturity determined?
- Was maturity based on visual grain characteristics or another criterion?

Clear definitions are necessary for reproducibility.

14. Discussion of Water Stress Is Not Adequately Supported

The manuscript suggests that some varieties experienced delayed growth due to water stress and temperature changes toward the end of the crop cycle.

However, the experiment does not appear to include:

- soil moisture measurements;
- water-level monitoring;
- temperature measurements;
- drought treatment;
- water-stress indicators.

Furthermore, 2024 rainfall was above the 1991–2020 normal.

Therefore, the statement about water stress should be presented as a possible explanation rather than a demonstrated causal mechanism.

15. Rainfall Figure Should Be Improved

Figure 2 compares monthly rainfall during 2024 with the 1991–2020 climatic normal.

The figure is useful, but the presentation needs improvement.

The authors should provide:

- clear y-axis scale;
- units;
- readable month labels;

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- legend with sufficiently large font;
- explanation of missing/off-season months;
- source of rainfall data.

The text should also explain which specific months differed substantially from the climatic normal and how these differences relate to crop development.

16. Figure 3–6 Presentation Needs Improvement

The figures contain useful varietal comparisons, but several presentation problems are evident.

For example, Figure 3 presents plant height with variety codes, while the corresponding legend requires the reader to repeatedly map V1–V14 to variety names.

For readability, the authors should consider:

- using abbreviated variety names directly on the x-axis;
- increasing font size;
- avoiding crowded labels;
- clearly explaining error bars;
- defining the meaning of superscript letters;
- maintaining consistent ordering of varieties across figures.

The same issue occurs in Figures 4–6.

17. Figure 5 Contains Important Phenological Information but Needs Better Formatting

Figure 5 presents flowering and maturity data and indicates highly significant varietal differences.

However, the graph would benefit from:

- clear units;
- consistent y-axis labels;
- larger variety labels;
- clearer statistical grouping;
- explanation of error bars;
- consistent variety order.

The manuscript should also ensure that values discussed in the text correspond exactly to the plotted means.

18. Grain Sterility Interpretation

The manuscript reports no significant difference in grain sterility rate, with **P = 0.726**.

This is correctly presented as non-significant.

However, the Discussion should explain that differences in the numerical means—for example, ISRIZ 8 at 13.6% versus Lori at 6.4%—should not be interpreted as statistically meaningful under the current experiment.

This distinction is important.

19. Thousand-Grain Weight Requires Better Interpretation

Thousand-grain weight differed significantly among varieties, with Niji and Lori having the highest values and Bilkissa the lowest.

The authors should discuss how thousand-grain weight relates to grain yield in this experiment.

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For example, Oukout had the highest yield but did not have the highest thousand-grain weight, suggesting that yield was influenced by several components, particularly panicle number and/or grains per panicle.
This would provide a stronger agronomic interpretation.

20. Grain Number per Panicle Should Be Integrated With Yield
Agathia and Niji recorded the highest numbers of grains per panicle, while ISRIZ 8 recorded the lowest.
This is an important finding and should be more strongly integrated into the yield discussion.
The authors should explain whether the high grain number in Agathia and Niji contributed to their relatively high grain yield.
A correlation analysis among:

- tiller number;
- panicle length;
- grains per panicle;
- thousand-grain weight;
- sterility;
- grain yield

could substantially strengthen the paper, if raw data are available.

21. Comparison With ISRIZ 8 Should Be More Balanced
The manuscript uses ISRIZ 8 as the improved comparison variety.
However, the discussion should recognize that varietal performance is trait-specific.
ISRIZ 8 showed:

- earlier flowering;
- earlier physiological maturity;
- lower grains per panicle;
- relatively high sterility;
- intermediate grain yield.

Therefore, the conclusion should not imply that traditional varieties universally outperform the improved variety.
Rather, the findings demonstrate that several local varieties had favorable performance for particular traits under the specific 2024 experimental conditions.

22. Conservation and Breeding Claims Should Be Moderated
The manuscript concludes that local varieties may play an important role in breeding programmes.
This is reasonable as a potential implication, but the study does not include:

- genetic characterization;
- trait heritability;
- stability analysis;
- stress screening;
- disease resistance screening;
- quality analysis.

Therefore, the authors should use terms such as **"potential genetic resources"** or **"candidate materials for further evaluation"** rather than implying that their breeding value has already been established.

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23. Need Additional Agronomic Information

Several management details should be clarified:

- transplanting date;
- seedling age at transplanting;
- exact harvest date;
- water-management conditions;
- plot dimensions;
- number of hills per plot;
- whether all plots received identical water conditions;
- soil fertility characteristics;
- whether compost was applied uniformly;
- whether Green OK composition was known;
- whether pest and disease incidence was recorded.

The manuscript reports compost, foliar fertilizer, weeding and neem application, which is useful, but the exact experimental management schedule should be presented systematically.

24. Terminology: "Traditional Varieties," "Local Ecotypes," and "Landraces"

The manuscript alternates among terms such as:

- traditional varieties;
- local ecotypes;
- improved variety.

The authors should define these terms and use them consistently.

If the materials are farmer-maintained landraces, "landrace" may be more scientifically precise than "ecotype," unless there is a specific ecological/genetic basis for using "ecotype."

25. References Require Careful Checking

The reference list contains useful sources concerning rice production and varietal performance in Senegal and West Africa.

However, several references require editorial verification.

Examples include:

- inconsistent bibliographic formatting;
- incomplete journal information;
- inconsistent use of page numbers;
- thesis/report references with incomplete publication details;
- inconsistent DOI formatting;
- possible mismatch between publication year and citation year.

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

26. Language and Editorial Quality

The manuscript requires comprehensive English-language editing.

Examples of problems include:

- missing spaces: "varietiesthreatened";
- missing spaces between sentences;
- "plant height"/"height of plant" inconsistency;

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- "number of tiller" instead of "number of tillers";
- "grainsterility";
- "Yieldand components";
- "1000grains Weight";
- inconsistent punctuation;
- inconsistent use of "variety" and "varieties";
- inconsistent decimal formatting.

The manuscript should undergo professional language editing before publication.

Strengths of the Manuscript

The manuscript has several important strengths:

1. Relevant topic for food security and rice genetic-resource conservation.
2. Evaluation of **14 rice varieties**, including 13 local ecotypes and one improved check.
3. Use of a randomized complete block design with four replications.
4. Evaluation under actual lowland field conditions.
5. Multiple agronomic, phenological and yield-related traits were measured.
6. Significant varietal differences were identified for several important traits.
7. The study identifies several local varieties with relatively high grain yield.
8. Phenological differences among varieties provide useful information for crop-calendar planning.
9. The study contributes information from Lower Casamance, an important rice-growing region.
10. The data may provide a useful basis for subsequent multi-environment and breeding studies.

Overall Recommendation

The manuscript presents useful experimental information on the agronomic performance of traditional rice varieties from Lower Casamance and has potential value for rice genetic-resource conservation and future varietal improvement. The identification of Oukout, Agathia, Lori and Niji as high-yielding materials under the tested 2024 conditions is particularly noteworthy, while ISRIZ 8 and some traditional varieties showed advantages in earliness.

Nevertheless, the current manuscript **overstates the evidence for climate resilience and broad varietal superiority** because the experiment was conducted at one location during one rainy season. Important methodological details concerning yield measurement, statistical analysis and interpretation also need improvement.

Final Decision: Minor Revision