

REVIEWER'S REPORT

Manuscript No.: **IJAR- 59361**

Title: EFFECTS OF DOLOMITE AND ORGANIC SOIL AMENDMENTS ON SOIL ACIDITY AND MAIZE (ZEA MAYS L.) YIELD IN WESTERN BURKINA FASO.

Recommendation:

Accept as it is

Accept after Minor revision.....

Accept after Major 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 agricultural problem in western Burkina Faso, where soil acidity and nutrient depletion constrain maize productivity. The study evaluates different rates of dolomite, alone and in combination with compost, under maize cultivation at the INERA/Farako-Bâ research station. The topic is relevant and potentially valuable for sustainable soil fertility management.

The experimental work is potentially useful, particularly because the study includes seven treatments, four replications, soil chemical measurements, and maize grain and biomass yields. The results indicate improvements in soil pH, available potassium and calcium under dolomite/compost treatments, with T5 producing the highest reported grain yield of 2,499 kg ha⁻¹.

However, the manuscript has several **important methodological, statistical, data-consistency and interpretation problems** that should be addressed before publication. In particular, the experimental-design terminology, treatment description, yield calculation, statistical methodology, interpretation of the control treatment, temporal structure of the experiment, and some numerical values require clarification.

Minor Comments

1. Experimental Design Is Incorrectly Described

The manuscript states that a **"completely randomized Fisher block design"** was used with four replications.

These are different design concepts. The authors should clearly state whether the experiment was:

- a **Randomized Complete Block Design (RCBD)** with four blocks and seven treatments, or
- a completely randomized design.

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Given the description of blocks and block separation, the experiment appears to be an **RCBD**. The statistical model should be consistent with that design.

The model should also indicate whether block effects were included in the analysis.

2. Minor Inconsistency in Plot Area and Yield Calculation

The manuscript states that each elementary plot measured **20 m²**.

However, the grain-yield formula uses **25 m²** as the harvested area.

This is a serious methodological inconsistency.

The authors must explain:

- whether plots were actually 20 or 25 m²;
- whether a 25 m² net harvest area was used within a 20 m² plot, which would be impossible;
- whether the reported yield conversion formula contains a typographical error.

All reported yield values should be recalculated using the correct harvested area.

3. Control Treatment Is Mischaracterized

T1 is defined as:

200 kg ha⁻¹ NPK + 150 kg ha⁻¹ urea.

Therefore, T1 is a **mineral-fertilizer control**, not an untreated/no-fertilizer control.

Nevertheless, the Results state that T1 was “the control treatment” and describe it as having “received no fertilizer.”

This should be corrected throughout the manuscript.

If the study does not include an absolute unfertilized control, the authors should not imply that it does.

4. The Two-Year Experimental Structure Is Not Clearly Explained

The study was conducted during the rainy seasons of **2021 and 2022**.

However, the manuscript does not clearly explain:

- whether the same plots were used in both years;
- whether treatments were reapplied in both years;
- whether the experiment was repeated independently in 2021 and 2022;
- whether the reported means combine both years;
- whether year was included as a factor in the statistical model;
- whether year × treatment interaction was tested.

This is particularly important for soil properties and crop yield because climatic conditions differed between the two seasons: rainfall was 1,031.3 mm in 2021 and 1,283.4 mm in 2022.

The statistical treatment of the two years must therefore be explicitly described.

5. Initial Soil Characterization Requires More Detail

The initial soil is described as acidic, with pH 4.55, but the manuscript should provide a fuller baseline characterization.

The study reports initial carbon, organic matter, total N, P, K, available P, available K and Ca.

However, important parameters relevant to liming and soil acidity are absent, particularly:

- exchangeable Al;
- exchangeable acidity;

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- exchangeable Ca;
- exchangeable Mg;
- CEC;
- base saturation;
- potentially exchangeable H⁺.

Because the paper specifically investigates **soil acidity correction**, measurements of exchangeable acidity and/or Al would greatly strengthen the mechanistic interpretation.

6. Dolomite Characterization Is Incomplete

Table 1 provides the chemical composition of the dolomite, including CaO and MgO. However, the authors should provide more information about:

- particle size;
- fineness;
- neutralizing value;
- calcium carbonate equivalent (CCE), if available;
- source/batch information;
- application characteristics.

Dolomite effectiveness is strongly influenced by particle size and neutralizing capacity. Simply reporting CaO and MgO percentages is insufficient to compare amendment effectiveness.

7. Compost Characterization Is Missing

The compost was produced at the research station using maize residues and cow manure.

Yet there is no chemical characterization of the compost.

At minimum, the manuscript should report:

- moisture;
- organic carbon;
- total N;
- total P;
- total K;
- C:N ratio;
- pH;
- major cations;
- maturity/composting status.

Without this information, it is difficult to reproduce the study or understand the contribution of compost to soil nutrient changes.

8. Statistical Analysis Needs Clarification

The manuscript states that XLSTAT was used and that Student-Newman-Keuls testing was conducted at the 5% level. However, it mentions both **XLSTAT 2016** and **XLSTAT 2014.5.03**.

This should be corrected.

More importantly, the authors should clearly specify the statistical model used for the RCBD.

For example, the manuscript should indicate whether:

$$Y_{ij} = \mu + \text{Treatment} + \text{Block} + \text{Error}$$

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was used, and whether year was incorporated where appropriate.

The paper should also report:

- degrees of freedom;
- F-values;
- exact P-values;
- coefficient of variation (CV%);
- assumptions of ANOVA;
- treatment $\times$ year interaction, if applicable.

9. Soil pH Data Require Careful Verification

The pH table contains several unusually large standard deviations, for example:

- T3: **6.35 $\pm$ 2.88**
- T4: **6.45 $\pm$ 2.88.**

For soil pH measurements around 6, an SD of 2.88 would indicate extremely large variation and should be carefully checked.

These values may represent transcription or formatting errors. The original raw data should be checked before publication.

10. Conclusion Refers to KCl pH, but the Results Do Not Clearly Present It

The conclusion states that the treatments significantly increased **soil water pH and KCl pH**.

However, the presented Results and Table 2 primarily report **pH-water**.

If KCl pH was measured, the corresponding data should be presented in the Results. If it was not measured, the reference to KCl pH should be removed from the conclusion.

11. Temporal Soil-pH Measurements Need Statistical Treatment

Figure 1 shows pH measurements at:

15, 30, 45, 60, 75 and 90 days after sowing.

Because these are repeated measurements over time, the authors should clarify whether:

- separate ANOVAs were performed at each date;
- repeated-measures ANOVA was used;
- mixed-effects modelling was used.

The manuscript currently discusses temporal patterns but does not clearly describe the statistical treatment of repeated observations.

12. Grain Yield Results Are Important but Need Stronger Analysis

The grain-yield results show:

- T1: 1,577 kg ha⁻¹
- T2: 1,809 kg ha⁻¹
- T3: 1,912 kg ha⁻¹
- T4: 1,740 kg ha⁻¹
- T5: 2,499 kg ha⁻¹
- T6: 2,061 kg ha⁻¹
- T7: 2,281 kg ha⁻¹.

Interestingly, the highest dolomite rate with compost, T7, did **not** produce the highest yield; T5 with only 1.5 t ha⁻¹ dolomite produced the highest yield.

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This is an important finding, but the manuscript should investigate it more carefully rather than simply attributing higher yield to increasing dolomite/compost application.

The authors should discuss whether there is:

- an optimum dolomite rate;
- a diminishing-return response;
- possible nutrient imbalance at higher rates;
- economic implications of the different amendment rates.

13. The Statement About Reducing Mineral Fertilizer Is Not Supported

The conclusion states that the effective combination of dolomite and compost could allow reduction in the **application rates and frequency of mineral fertilizer (dolomite)**.

Dolomite is itself a soil amendment/liming material rather than conventional mineral NPK fertilizer.

More importantly, the experiment did not appear to test reduced NPK or urea rates. All treatments received the same NPK and urea rates.

Therefore, the claim that the treatments could reduce mineral fertilizer requirements is not directly demonstrated by the experiment and should be removed or reformulated as a hypothesis for future research.

14. Economic Analysis Would Strengthen the Recommendation

The manuscript recommends T5 as an effective combination, but the treatment costs are not considered.

Because dolomite and compost are applied at different rates, an agronomic recommendation should ideally consider:

- cost of dolomite;
- cost of compost;
- transportation;
- application labour;
- yield benefit;
- net return;
- benefit-cost ratio.

T5 gives the highest yield, but whether it is economically optimal cannot be established from yield alone.

15. Mechanistic Claims Need Better Experimental Support

The Discussion attributes improvements to mechanisms such as:

- neutralization of acidity;
- replacement of Al by Ca and Mg;
- improved nutrient availability;
- reduced nutrient leaching;
- improved phosphorus availability.

These mechanisms are scientifically plausible, but several are not directly measured in the present study.

For example, the study does not appear to provide direct measurements of:

- exchangeable Al;
- Mg;

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- Al toxicity;
- cation-exchange capacity;
- nutrient uptake by maize.

The authors should distinguish between **observed effects** and **proposed mechanisms**.

16. Available Potassium Interpretation Needs Greater Caution

The manuscript reports significant differences in available K, with T5, T6 and T7 having relatively high values.

However, the explanation that increased Ca directly reduced K leaching and therefore increased soil K is not demonstrated by measurements of K leaching or soil water movement.

This should be presented as a possible explanation rather than a demonstrated causal mechanism.

17. The Literature Review Is Broad but Could Be More Focused

The introduction provides substantial background on maize production, soil fertility and acidity in Burkina Faso.

However, the manuscript could better establish the specific research gap.

The authors should focus the literature review around:

1. soil acidity in western Burkina Faso;
2. consequences of acidity for maize;
3. dolomite/liming effects;
4. compost effects;
5. combined dolomite + organic amendment strategies;
6. previous studies in Burkina Faso;
7. remaining knowledge gap.

This would make the justification for the present experiment more compelling.

18. Some Terminology and Language Require Revision

There are numerous language and terminology issues, including:

- “corn” and “maize” being used interchangeably;
- “corn growing cycle” rather than consistently using “maize growing season”;
- “water pH” without clearly defining the analytical terminology;
- “JAS” and “DAS” used inconsistently;
- “Signification HS” in tables;
- French and English terminology mixed in places.

The manuscript requires professional English-language editing before publication.

19. Reference List Needs Careful Technical Editing

The reference list is extensive and contains relevant soil-science literature, but formatting is inconsistent.

Examples include:

- inconsistent author formatting;
- inconsistent journal-title presentation;
- inconsistent DOI formatting;
- incomplete bibliographic information;
- inconsistent use of French and English titles;

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- possible mismatch between cited years and reference years.

All references should be checked against the journal's reference style.

20. Discussion Should Better Address the Unexpected Yield Pattern

T4 (4.5 t ha⁻¹ dolomite alone) produced only 1,740 kg ha⁻¹, while T3 (3 t ha⁻¹) produced 1,912 kg ha⁻¹. T5, with 1.5 t ha⁻¹ dolomite plus compost, produced the highest yield.

This suggests that **more dolomite does not necessarily translate into greater yield**.

This should be a central part of the discussion because it is agronomically important. The manuscript should avoid presenting the results as a simple dose-response relationship.

Minor Comments

1. Use ***Zea mays L.*** consistently and italicize the scientific name.
2. Use one spelling consistently: **maize**, rather than alternating with "corn."
3. Define all abbreviations at first appearance: NPK, DAS, C/N, K-ass, Ca-avail, etc.
4. Use consistent decimal notation throughout the manuscript.
5. Use consistent units: preferably **kg ha⁻¹** and **mg kg⁻¹**.
6. Correct typographical errors such as "Results shows" to "Results show."
7. Improve the captions of Figures 1 and Tables 2–4.
8. Figure 1 should include error bars if appropriate and explain what the error bars represent.
9. The table should clearly indicate whether values are mean ± SD, SE, or another measure.
10. "Pr > F" should be consistently reported as **P-value** or according to journal style.
11. "HS" and "NS" should be defined in the table footnote.
12. The initial soil should not be treated as a statistical treatment in the same way as the experimental treatments unless the analytical design supports such a comparison.
13. The manuscript should clarify whether soil samples were collected from each individual plot or composited across treatments.
14. Sampling procedures at harvest should provide the exact number and location of soil cores per plot.
15. Yield assessment should specify whether border rows were excluded.
16. Grain moisture at weighing should be standardized or corrected to a specified moisture basis.
17. Biomass yield should clearly state whether it refers to above-ground dry biomass or fresh biomass.
18. The manuscript should report rainfall distribution during the crop-growth periods, not only seasonal totals.
19. Consider reporting the agronomic efficiency or relative yield increase over the mineral-fertilizer control.
20. The conclusion should avoid recommendations extending beyond the experimental evidence.

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Suggested Tables/Figures for Improvement

The manuscript would benefit from:

1. **Experimental design diagram** showing four blocks and seven treatments.
2. **Complete soil baseline characterization table.**
3. **Chemical characterization of compost and dolomite.**
4. **Treatment × year results table**, if both years were independently analysed.
5. **Treatment-wise pH trajectory with error bars.**
6. **Treatment-wise grain and biomass yield comparison.**
7. **Economic analysis of dolomite + compost combinations.**
8. A response curve showing maize yield against dolomite rate under both mineral-fertilizer-only and compost-amended conditions.

Overall Evaluation

The study has a relevant research question, a field-based experimental approach, appropriate treatment contrasts, and potentially useful findings for management of acidic soils in western Burkina Faso. The results indicate that combining compost with dolomite can improve soil pH and selected nutrient parameters and can increase maize productivity under the conditions tested.

Nevertheless, several issues currently prevent the manuscript from being considered scientifically robust. The most critical are the 20 vs 25 m² yield-calculation inconsistency, incorrect/ambiguous control description, unclear two-year statistical structure, inadequate experimental-design terminology, questionable pH variability values, incomplete soil-acidity characterization, inconsistent statistical software description, and conclusions that extend beyond the measured variables.

Final Decision

MINOR REVISION

The manuscript has publication potential, but the authors should undertake substantial revision of the methodology, statistical analysis, data presentation, interpretation and language before the work can be considered for acceptance. In particular, the raw experimental records should be checked carefully and the yield calculations, pH data and two-year analysis should be corrected and transparently reported.