

REVIEWER'S REPORT

Manuscript No.: IJAR- 54487

Date: 25/10/2025

Title: OPTIMAL ENERGY MANAGEMENT STRATEGY OF DC MICRO-GRID FOR MODERN AGRICULTURE: CASE OF MANDIANA PREFECTURE, REPUBLIC OF GUINEA

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. Umeshkumar Hiralal Chavan

Detailed Reviewer's Report:

General Comments:

The work integrates solar photovoltaic panels (SPP), a battery energy storage system (BESS), and a DC motor-driven water pump system. MATLAB/Simulink simulations are used to validate system performance and energy flow dynamics.

Overall, the manuscript is relevant, timely, and contributes meaningfully to renewable energy applications in rural agricultural electrification. The topic aligns well with current global research priorities in sustainable energy systems and smart agriculture.

Strengths

- **Novelty and Relevance:**

The study's focus on applying a DC microgrid system in a real-world context (Mandiana Prefecture) for agricultural irrigation and rural electrification is original and locally impactful.

- **Methodological Approach:**

The use of mathematical modeling and MATLAB/Simulink simulations demonstrates solid technical understanding. The inclusion of algorithms for energy flow management adds value.

- **Practical Implications:**

The results highlight the potential for photovoltaic and battery hybrid systems to enhance food security and improve rural living standards — a significant contribution for developing regions.

- **Clarity of Results:**

The figures (especially 6–12) clearly illustrate simulation outcomes, battery state of charge, and switch control behavior, effectively validating the proposed energy management algorithm.

Weaknesses and Suggested Minor Revisions

While the paper is well-structured, a few minor revisions are recommended to enhance clarity and technical rigor:

1.Language and Grammar:

- The manuscript contains several grammatical and syntactic errors (e.g., “we keep working,” “the battery runs out faster than on B&D parts”).
- A light proofreading by a native or professional English editor is strongly advised.

2.Figures and Captions:

- Figures 2–12 should have clearer, higher-resolution images and complete captions describing the variables and parameters.
- Ensure all figures are referenced in the main text sequentially.

3.Algorithm Explanation:

- The energy management algorithm (Figure 4) should be more explicitly described — including a short pseudocode or decision table to clarify control logic.

4.Simulation Parameters:

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- More detailed explanation of simulation assumptions (solar irradiance profile, temperature variation, time steps) would improve reproducibility.

5.Units and Notations:

- Some equations have typographical inconsistencies (e.g., missing units, misplaced exponents).
- Ensure equations (1)–(11) are properly formatted and symbol definitions are consistent.

References:

- While the reference list is extensive, a few entries are inconsistently formatted. Standardize the citation style (APA/IEEE).
- Consider including more recent references (post-2021) to strengthen the literature review.

Contribution and Significance

The paper contributes to the design and optimization of renewable-based microgrids tailored for rural agricultural contexts in West Africa. It offers valuable insight into the integration of solar energy and storage for both irrigation and household electrification — a model that can be replicated in similar regions. Its significance is high for policymakers, rural development planners, and engineers focused on off-grid systems.

Recommendation: Accept with minor revisions