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REVIEWER'S REPORT

Manuscript No.: IJAR-50368 Date: 22.02.2025

Title: ANALYSIS AND NUMERICAL MODELING OF SOLAR DRYERS IN AGRI-FOOD CHAINS: INVESTIGATION ON PINEAPPLE DRYING PROCESS

Recommendation:

Accept after minor revision……

Rating	Excel.	Good	Fair	Poor
Originality	✓			
Techn. Quality	✓			
Clarity		✓		
Significance		✓		

Reviewer Name:Dr.K.Arumuganainar **Date:** 22.02.2025

Reviewer's Comment for Publication.

(*To be published with the manuscript in the journal*)

The reviewer is requested to provide a brief comment (3-4 lines) highlighting the significance, strengths, or key insights of the manuscript. This comment will be Displayed in the journal publication alongside with the reviewers name.

This research paper makes a **valuable contribution** to the field of **solar drying technology** by addressing **pineapple drying gaps** through **numerical modeling**. While it is **methodologically strong**, incorporating **experimental validation, comparative efficiency analysis, and broader climatic testing** would significantly enhance its **practical applicability**.

Detailed Reviewer's Report

Review Report on the Research Paper

Title of the Paper:

Analysis and Numerical Modeling of Solar Dryers in Agri-Food Chains: Investigation on Pineapple Drying Process

1. Summary of the Paper

This research paper presents an in-depth analysis of **solar drying systems** with a focus on **pineapple drying**. The study emphasizes the importance of **mathematical and numerical modeling** to predict drying time and improve solar dryer designs. It critically examines existing models, identifies gaps in the literature, and proposes a **new heat balance model** specifically adapted for **Cotonou, Benin's** climatic conditions.

Key aspects covered include:

 Review of solar drying technologies and their advantages over traditional drying methods.
 Comparison of different solar dryer configurations and their efficiency.
 Analysis of existing mathematical models (Page, Wang & Singh, Two-Term Model).
 Evaluation of 1135 articles to identify gaps in pineapple drying studies.
 Development of a climate-adaptive drying model for better efficiency.

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2. Strengths of the Paper

✔ Relevance and Novelty:

- The study highlights a **critical research gap**—the lack of **pineapple drying models** tailored for **Cotonou's climate**.
- It proposes a **new heat balance model**, adding **practical significance** to the research.

✔ Comprehensive Literature Review:

- The review includes **101 selected papers** out of 1135 articles from major academic databases.
- The **systematic approach** ensures the study is well-grounded in previous research.

✔ **Use of Mathematical Modeling & Simulation:**

- Application of **numerical modeling** for solar drying optimization.
- Evaluation of existing **heat balance equations** to improve **dryer efficiency**.

✔ **Practical Applications:**

- The findings have **direct implications for food preservation**, reducing post-harvest losses.
- The study **bridges the gap between theoretical models and real-world applications** in agricultural drying.

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3. Weaknesses and Areas for Improvement

 Limited Experimental Validation:

- The study relies heavily on **mathematical and numerical modeling**, but **experimental validation is missing**.
- Future work should include **physical testing** of the proposed heat balance model.

 Comparative Performance Analysis of Dryers:

- While multiple dryer types are discussed, a **quantitative performance comparison (efficiency, drying time, energy consumption) is not detailed**.
- Adding **real-world efficiency comparisons** would enhance the paper's impact.

 Climatic Variability Considerations:

- The study focuses on **Cotonou, Benin**, but does not **compare with other similar climates** to generalize findings.

- Including results from different **geographical regions** would make the model **more widely applicable**.

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4. Future Research Directions Suggested in the Paper

 Developing a validated prototype of the proposed solar dryer model.
 Expanding modeling techniques by incorporating **Computational Fluid Dynamics (CFD)** simulations.

 AI & Machine Learning Integration to optimize drying parameters dynamically.
 Economic feasibility studies for scaling the proposed model in commercial food industries.

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5. Conclusion & Overall Assessment

This research paper makes a **valuable contribution** to the field of **solar drying technology** by addressing **pineapple drying gaps** through **numerical modeling**. While it is **methodologically strong**, incorporating **experimental validation, comparative efficiency analysis, and broader climatic testing** would significantly enhance its **practical applicability**.

 Overall Rating: 8.5/10 (Excellent but requires experimental validation).