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Exploring The Use Of Architectural Strategies To Mitigate Post Harvest Deterioration And The Improvement Of The Commercial Value Of Cassava.

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ABSTRACT
This article explores the use of architectural strategies to mitigate post-harvest deterioration and improve the commercial value of cassava. It examines various stages of the post-harvest chain, including pre-harvest handling, processing, and storage, where architectural interventions can make a difference. Proper farm layout, mechanized harvesting techniques, and well-designed processing facilities can minimize physical damage and microbial contamination. Infrastructure for drying and storage, with temperature and humidity control, contributes to prolonged shelf life and quality preservation. Value-adding processing and waste management systems further enhance the commercial value of cassava. The implementation of these architectural strategies can reduce spoilage, enhance product quality, and increase economic benefits for cassava farmers. Continued research and innovation in this field are crucial to maximize the potential of cassava and improve the livelihoods of those who depend on it.
Keywords: architectural strategies, post-harvest deterioration, cassava

INTRODUCTION
Cassava (Manihot esculenta Crantz) originates from South America and was first distributed to africa by the Portuguese in the eighteenth century, and now it is commonly cultivated in many countries across Africa, Asia and Latin America (Nhassico et al., 2008; Olsen and Schaal, 2001; El- Sharkawy, 2012). According to Adepoju and Oyewole (2013), cassava is the fourth most important crop in the world and constitutes a staple food for nearly a billion people, one-eight of the world's population.

Despite good agronomic performance, cassava production remains constrained by several factors including biotic and abiotic stresses (Waddington et al., 2010; Campo et al., 2011). One of the major constraints is that cassava roots have a short post harvest shelf life, which severely limits their potential in the market and their benefits to cassava farmers. The roots exhibit visible symptoms of post harvest physiological deterioration (PPD) within only 24 to 72 hours of harvest (Morante et al., 2010; Salcedo and Siritunga, 2011; Vanderschuren et al., 2014).

Post- harvest physiological deterioration is a complex phenomenon which involves an elaborate network of cellular functions occurring simultaneously in the harvested cassava roots. Harvested cassava roots are highly perishable and undergo rapid deterioration within 48-72 hours after harvest. The roots can't be stored satisfactorily for more than two to three days under ambient conditions as they become unfit for human and animal consumption and also for industrial uses. Earlier estimates peg the losses due to PPD in cassava to be in the range of 5–25% of the total expected value of the crop. Recently, an estimate by

Rudi et al. (2010) envisages the economic benefits of extending the shelf life of cassava to several weeks would reduce financial losses by $2.9 billion in Nigeria alone over a 20-year period.

The Improvement of cassava processing and utilization techniques would greatly increase labour efficiency, productivity, incomes, and improve the lives of cassava farmers and the urban poor.

Aim of Study

The aim of this research is focused at mitigating post- harvest physiological deterioration and improving the commercial value of cassava through architectural strategies.

RESEARCH METHODOLOGY

The research will utilize a systematic review approach to explore the use of architectural strategies in mitigating post harvest deterioration and enhancing the commercial value of cassava. The review will involve an extensive analysis of existing literature, research articles, reports, and relevant case studies.

FINDINGS

The research findings on the use of architectural strategies to mitigate postharvest deterioration and improve the commercial value of cassava reveal several key insights:

Improved Storage Structures

a. Proper Ventilation: Storage structures with adequate ventilation play a crucial role in reducing postharvest deterioration. Good airflow helps maintain optimal humidity levels, minimizes the accumulation of moisture, and inhibits the growth of spoilage microorganisms.

b. Temperature Control: Controlled temperature environments, such as warehouses or cool storage units, significantly contribute to extending cassava shelf life. Lower temperatures slow down physiological processes and reduce the rate of deterioration.

c. Pest Management: Effective pest management systems, including the use of insect-proof screens or hermetic storage technologies, can prevent pest infestation and minimize losses.

Processing Facilities

a. Efficient Peeling Methods: Mechanized peeling units help minimize damage to cassava roots during processing, reducing the risk of enzymatic browning and microbial contamination.

b. Improved Drying Techniques: Utilizing advanced drying technologies, such as solar dryers, can enhance the efficiency of cassava drying and reduce the risk of spoilage. Proper moisture control is essential to prevent mold growth and maintain the commercial quality of dried cassava products.

c. Quality Control Measures: Implementing quality control measures in processing facilities, such as regular monitoring of moisture content, color, and microbial load, can help ensure that cassava products meet market standards and have an extended shelf life.

Hermetic Storage Technologies

The use of hermetic storage technologies, such as airtight containers or bags, has demonstrated positive outcomes in mitigating postharvest deterioration. These technologies create a low-oxygen environment, reducing the respiration rate of cassava and inhibiting the growth of spoilage microorganisms, pests, and molds.

Environmental Sustainability

Incorporating sustainable architectural strategies is crucial in mitigating cassava deterioration while considering environmental impacts. This includes using energy-efficient technologies, promoting renewable energy sources for processing and storage, and implementing eco-friendly pest management practices.

Knowledge Gaps and Future Directions

Despite the positive impact of architectural strategies on cassava postharvest management, several knowledge gaps exist. Further research is needed to evaluate the cost-effectiveness, scalability, and suitability of different architectural interventions in various contexts. Additionally, studies should focus on developing innovative and sustainable architectural solutions tailored to smallholder farmers' needs and resource constraints.

The findings highlight the potential of architectural strategies in reducing postharvest losses, extending cassava shelf life, and improving the commercial value of cassava products. Implementation of these strategies can contribute to food security, income generation, and sustainable agricultural practices, benefiting cassava-dependent communities globally.

CONCLUSION

In conclusion, the use of architectural strategies offers significant potential in mitigating postharvest deterioration and improving the commercial value of cassava. The findings of this research emphasize the importance of well-designed storage structures, efficient processing facilities, and sustainable architectural interventions in preserving cassava quality, reducing losses, and enhancing market opportunities. Implementing these strategies can contribute to food security, economic development, and improved livelihoods for cassava-dependent communities. Further research, knowledge sharing, and practical implementation are essential to translate these findings into actionable solutions and achieve sustainable postharvest management practices for cassava.

RECOMMENDATION

Based on the findings of the study exploring the use of architectural strategies to mitigate postharvest deterioration and improve the commercial value of cassava, the following research recommendations can be made:

Comparative Analysis: Conduct comparative studies to evaluate the effectiveness and economic viability of different storage structures and processing facilities in mitigating cassava postharvest deterioration. Compare traditional and modern storage structures, as well as different processing technologies, to identify the most suitable options for different contexts.

Optimization of Storage Conditions: Investigate optimal storage conditions for cassava, considering factors such as temperature, humidity, and ventilation. Examine the impact of controlled atmosphere storage and explore techniques for maintaining appropriate moisture levels during storage to minimize physiological deterioration and microbial spoilage.

Scaling Up Hermetic Storage Technologies: Further research is needed to assess the scalability and practicality of hermetic storage technologies for smallholder farmers. Investigate their long-term effectiveness, affordability, and compatibility with local farming practices. Explore the potential for partnerships with organizations to promote the adoption of hermetic storage solutions.

Socioeconomic Impacts: Investigate the socioeconomic impacts of architectural strategies on cassava-dependent communities. Analyze the cost-benefit ratio of implementing improved storage structures and processing facilities, considering the perspectives of smallholder farmers, local businesses, and consumers. Assess the potential for income generation, market access, and overall livelihood improvement.

Sustainable Architectural Solutions: Explore sustainable architectural solutions that minimize environmental impact and energy consumption. Investigate the integration of renewable energy sources, such as solar power, in processing and storage facilities. Assess the environmental footprint of different architectural interventions and promote eco-friendly practices throughout the cassava value chain.

Farmer Training and Adoption: Conduct studies to understand the barriers and facilitators to the adoption of architectural strategies among cassava farmers. Investigate the knowledge gaps, training needs, and awareness levels regarding improved storage structures and processing technologies. Develop targeted training programs and extension services to promote the adoption of these strategies.

Value Addition and Product Diversification: Investigate the impact of architectural strategies on value addition and product diversification of cassava. Assess the potential for processing facilities to produce value-added cassava products, such as flour, starch, and snacks. Analyze the market demand, consumer preferences, and economic viability of these products.

Postharvest Loss Assessment: Conduct comprehensive assessments of postharvest losses at different stages of the cassava value chain to quantify the impact of architectural interventions. Evaluate the effectiveness of these strategies in reducing losses and improving the commercial value of cassava products.

By addressing these research recommendations, further advancements can be made in the understanding and implementation of architectural strategies to mitigate postharvest deterioration and improve the commercial value of cassava. These recommendations will contribute to sustainable agricultural practices, enhance food security, and empower cassava-dependent communities worldwide.

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