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Mitigating Postharvest Losses: Ensuring Safe Cowpea Production in Nigeria

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SUMMARY

Post-harvest management plays a critical role in ensuring food security, particularly in Nigeria, where a significant portion of agricultural produce is lost due to poor handling, storage, and processing techniques. Cowpea (Vigna unguiculata), a major staple crop in Nigeria, is highly susceptible to post-harvest losses caused by pests, microbial infestations, and inadequate storage facilities. This article highlights the potential of employing improved storage techniques such as the use of hermetic bags, bio pesticides and proper drying methods to improve the shelf life of cowpea. These storage techniques are not limited to cowpea as it could be used in the storage of other durable agricultural produce. Post-harvest loss reduction significantly results in food availability and contribute to the nation's food securitythus, with the implementation of these post-harvest solutions from Nigerian Stored Products Research Institute, Nigeria can significantly reduce food losses, increase the availability of cowpea, and boost farmers' incomes, ultimately contributing to national food security. Additionally, the paper underscores the need for capacity building, research investment and policy support to promote sustainable post-harvest management practices. Through the case study of cowpea, this research provides insights into broader strategies that can be adopted for other crops in Nigeria, contributing to the overall goal of achieving food security in the country.

INTRODUCTION

One of Nigeria's most pressing concerns persists with ensuring food security, with the agricultural sector being essential to satisfying the nation's rising food demand. One of the biggest challenges facing humanity today is meeting the food needs of a world population that is growing at an accelerated rate. The world community has the difficulty of supplying safe and secure food supplies to bloated beings as the estimated global human population approaches 9.8 billion by 2030 (Tian *et al*., 2016; Pais *et al.*, 2020). To address this challenge, food production will need to expand by 56% (Ranganathan *et al.*, 2018). However, research has indicated that agricultural production globally will not be able to fulfil the expected demand for food production and supply (Hugo Valin *et al.*, 2018). According to estimates from the Food and Agriculture Organisation (FAO), postharvest losses result in the loss or waste of one-third of the food produced for human consumption worldwide. This amounts to 1.3 billion tonnes of food each year, or about US$1 trillion (FAO, 2011; Kumar and Kalita, 2017). However, attempts to attain sustainable food security remain hindered by post-harvest losses. The post-harvest phase of Nigerian agriculture results in a large loss of agricultural produce, particularly staple crops like cowpea (*Vigna unguiculata*), because of improper handling, inadequate storage facilities, pest infestations, and restricted access to innovative preservation technologies. These losses not only reduce the availability of food but also diminish farmer's incomes, weaken rural economies, and exacerbate food insecurity.

Cowpea is one of Nigeria's most important leguminous crops. West Africa is recognized as the primary cowpea-producing region in Sub-Saharan Africa (SSA), accounting for 80% of the total regional production, with Nigeria and Niger ranking first and second, respectively, for the past 14 years (Aboki and Yuguda, 2013; Huynh *et al.*, 2016). Moreover, Nigeria has led the world in cowpea production and consumption worldwide (Rivas *et al.*, 2016). Millions of smallholder farmers rely on cowpeas for their economic and nutritional well-being, and they play a significant role in their livelihoods (Bolarinwa *et al.*, 2021) and it's also highly valued for its nutritional benefits and role in the diet of millions of Nigerians. Hence, makes it an ideal grain legume for promoting food security in the country. Despite its economic importance, cowpea is particularly vulnerable to post-harvest losses, with pests like the cowpea weevil (*Callosobruchus maculatus*) posing a major threat to storage. Almost every stage of the cowpea's life cycle is frequently attacked by insect pests, which causes significant quantitative and qualitative losses in the form of seed perforation, weight, market value, and germination ability losses. These losses increase the cost of production and result in a low supply for consumers. Total losses could result from the attack, which begins prior to harvest and is worse during storage (Faroni & Sousa, 2006). Addressing these losses

through improved post-harvest management practices is crucial for boosting cowpea production and ensuring that more of the harvested crop reaches consumers in good condition.

Therefore in view of the aforementioned, why post-harvest management matters. Post-harvest management encompasses all the activities that occur from the time crops are harvested until they reach the consumer in good quality and quantity. In the context of cowpea and other staple crops, it includes proper handling after harvesting, transportation, storage and processing. The goal of an effective post-harvest system is to maintain the quality and quantity of the produce, minimizing losses and ensuring food remains safe and nutritious.

In Nigerian Stored Products Research Institute, we are dedicated to providing solutions that ensure post harvested produce is preserved efficiently, reducing these losses and improving food security for Nigeria.

Innovative Storage Solutions:

A Game-Changer for Farmers. **:** Proper Storage is one of the most crucial aspects of the post-harvest system and one of the biggest challenges in post-harvest management. For cowpea, storage pests such as the cowpea weevil (*Callosobruchus maculatus*) are a major threat. Traditional storage methods like woven sacks, do little to protect crops from pests and humidity. They often expose produce to moisture, pests and contaminants. However, in response, NSPRI has developed and introduced a range of innovative storage solutions that help farmers preserve their crops for longer periods while maintaining quality. These includes;

Hermetic Bags: These are airtight storage systems that protect crops from insects and moisture, which are Purdue Improved Crop Storage (PICS), the Zerofly (ZF) bag. These airtight bags restrict oxygen from reaching inside, which stops mould and insects from growing. The air inside the bags is gradually made richer in carbon dioxide by the slow-respiring grains and insects because the bags are sealed so tightly. Many nations have effectively employed these bags to prevent insects' damage to stored harvests and lower post-harvest losses. Comparing PICS bags and ZeroFly® Hermetic bags with conventional storage techniques reveals a number of benefits. First of all, they create a sealed atmosphere that effectively manages insect infestation, minimising the need for chemical pesticides (Kouskolekas, 2021).

NSPRI Jute Bags: Specially designed for moisture retention and protection against pests, ideal for dry season crops. The Nigerian Stored Products Research Institute's (NSPRI) research findings regarding the use of jute bags lined with polythene. This is an economical choice because it is easily accessible and reasonably priced. Furthermore, by adding an additional layer of resistance against pests, the polythene lining lessens the need for chemical pesticides. For farmers who want to reduce the amount of chemicals they use in their farming techniques, this is especially crucial (Okonkwo, *et al.,* 2017). To guarantee air tightness, the bag is properly closed or tied after being loaded with grains.

NSPRI Hermetic Steel Drum (NHSD) and Inert Atmosphere Silo (IAS): This is a rigid hermetic storage system because the components were made of solid, long-lasting materials that could withstand constant usage and still retain the required rigidity. Furthermore, the airtight seal is produced by a dependable and efficient sealing mechanism. It guarantees the longevity and quality of the objects that are stored by sustaining a controlled environment and preventing the entry of contaminants. So long as the seal of airtightness is preserved. Grain stored in it is safe for over a year and can be used for home, commercial, and retail purposes.

NSPRI diatomaceous earth (DEs): Dusts have shown to be quite useful for preserving grains, including cowpeas. By physically eroding their epicuticular wax coat through absorption or abrasion, inert dust causes the insects to lose a lot of water, get desiccated, and eventually die (Obeng-Ofori, 2010).

Through these solutions, farmers can significantly reduce post-harvest losses, allowing for better returns and improved livelihoods.

Best Practices for Reducing Post-Harvest losses.

Effective post-harvest management starts with awareness. Here are some best practices farmers can implement to reduce losses.

Timely Harvesting: Crops should be harvested at the right maturity to prevent spoilage during storage.

Proper drying: Before storage, ensure grains and legumes are adequately dried to reduce moisture content, which can cause mold and decay.

Clean storage facilities: Regularly clean and disinfect storage units to prevent pest infestations
Use of hermetic storage: Airtight containers prevent oxygen flow, eliminating the need for chemical preservatives and reducing pest attacks.
Implementing these simple but effective measures can make a huge difference in the quality and longevity of stored products.

Technology Spotlight: Hermetic Storage Systems

Hermetic storage systems have revolutionized the way we store grains. By creating an airtight environment, these systems significantly reduce oxygen levels, effectively controlling pests without the use of chemicals. NSPRI's hermetic storage bags and containers are designed to maintain the quality of grains for months, helping farmers store their harvest without fear of loss or infestation by pests. Research conducted by NSPRI shows that hermetic storage can preserve up to 98% of stored grains for over a year, making it a must-have solution for farmers across Nigeria.

NSPRI's Community Outreach (Empowering farmers).

As part of our ongoing commitment to post-harvest management, NSPRI has been actively involved in community outreach programs. Over the past year, which are:

- Farmers across Nigeria have been trained on best practices for post-harvest handling.
- Distributed hermetic storage bags to smallholder farmers in rural areas, helping them preserve their harvests
- Partnered with local cooperatives to facilitate access to storage technology, ensuring that even the smallest farms can benefit from advanced solutions.
- Our outreach programs are designed to empower farmers with the knowledge and tools they need to reduce losses, increase profits, and contribute to Nigeria's food security.

CONCLUSION

Post-harvest management plays a pivotal role in ensuring food security by preserving the quality of food and reducing waste. Also, At NSPRI, we believe it is the key to unlocking Nigeria's agricultural potential. Through innovative storage technologies, farmer education and community outreach, therefore we are working to ensure that there is reduction in food losses.

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