Applying Research with Extension: 22 years of Strengthening Cowpea Storage in Africa

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Abstract
Cowpea is the most important indigenous African grain. It is consumed on a daily basis as a staple of family food in both urban and rural West and Central Africa as well as being an important cash crop, as it will withstand the harsh growing conditions of West Africa. Here, growing on some 8 million hectares, this legume provides an important source of both protein and nutrition for the population. Cowpeas are also a critical economic driver. According to official statistics, nearly 300,000 metric tons of cowpeas were traded in West Africa in the 1990s.

During harvest, cowpea pods are often hand-picked. These pods act as a natural barrier to post-harvest insects. However, once threshed, the bean becomes extremely vulnerable to insects, particularly the grain weevil. The destruction caused by this insect during a period as short as 6 months of on-farm storage can result in up to 70% of the seeds being damaged and unfit for consumption. Because of this, farmers are forced to sell their crop during the harvest season when prices are lowest, as they lack a quality storage system for their cowpeas. Some farmers have chosen to treat the grain with harsh chemicals while other farmers have simply applied chemicals that were designed for other uses. In addition, low levels of literacy among farmers have often resulted in a lack of understanding of the proper use and application of chemical treatments, all of which have subsequently posed serious health and environmental problems.
Years of experimentation have sought to find an answer to the cowpea storage riddle. Work at Purdue University in association with its African partners identified a variety of cultural and experimental storage techniques. These include drum storage, ash storage, solar disinfestations and triple bag storage. Drum storage includes the use of storing the cowpea in a 60-liter metal drum. The drum is filled and sealed with peanut or cooking oil to insure an airtight seal. Filled drums were found to allow minimal losses to cowpea storage in a 6-month time period. However, good quality metal drums can be cost prohibitive and/or unavailable in various parts of Africa. One exception to that has been Senegal, where the drums are available at a low cost due to the nation’s coastal shipping industry. Ash storage has also been a common technique used to fight post-harvest insects. Research of this technique found that proportions of three volumes or more of cooking ash spread on four volumes of cowpeas could improve insect protection. Unfortunately, the ashes are only successful if the cowpea does not already contain weevil larvae when it is coated with the ash. Finally, solar disinfestation has been used by both farmers and researchers to protect cowpeas. Here either the natural heat of the sun or man-made prototype heaters are employed. They heat the grain to the point of exterminating all stages of the cowpea weevil. However, if the proper temperature is not achieved, the process could be futile. The final method, and the one that is the most preferred by farmers, is the triple bag storage system. By sealing the cowpeas in the bags, oxygen levels are inhibited, which arrests weevil infestations in the cowpeas. This method serves as the basic concept behind Purdue’s most recent cowpea storage program, the Purdue Improved Cowpea Storage (PICS) program.

The objective of this poster is to report on the culmination of the last 22 years of research and extension efforts at Purdue University to improve cowpea storage in Africa. This poster demonstrates how the ancient idea of hermetic grain storage has evolved and blended with modern materials. It illustrates how the model of research and extension has resulted in the success of utilizing grain storage to reduce hunger and poverty in Africa.

Since 1987, focused efforts have been placed on improving African cowpea storage with a non-chemical, simple, low-cost technology. These efforts have included an integrated approach in the use of entomology, food science, economics, and extension. Through extensive research and a small extension component of village trials, multiple storage techniques have been identified, with the triple bag system rising as the most effective and preferred. From that research, extension programming in the form of the PICS project is now disseminating this developed technology to African farmers.

More than two decades of interdisciplinary research and extension work has cumulated in the current PICS project, a 5-year extension project funded by the Bill and Melinda Gates Foundation that aims to extend the technology of the triple bag storage system to 3.4 million African households. Conservative estimates prescribe the savings of this technology to yield $255 million dollars annually, if utilized by 50% of the population in Africa. Direct benefits will include avoiding loss of cowpeas by the weevil. Benefits will also include on-site storage of cowpeas until market price is deemed attractive. Results could include higher incomes for African families, as well as increased levels of available food on the African family table.

This project exudes the power, potential, and results of combining research and extension efforts on a long-term basis to solve an important problem. Just as Africans will directly benefit, educational review of the topic by international extension professionals will be valuable for application in future projects.

**Keywords:** Cowpea, Hermetic storage, Research, and extension