

# PICS

## NEWSLETTER

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## Purdue Improved Crop Storage

### Cowpeas: The Key to PICS Success in West Africa

Tahirou Abdoulaye, IITA - Nigeria

Today, the acronym PICS has become part of the language in most agricultural development circles. The majority of farmers in countries where PICS has been disseminated recognize the word and the bags. This cannot be said for many other agricultural technologies. It is a remarkable achievement for a project that started just over 10 years ago. This level of success in Africa can be attributed to the initial focus on cowpea and to the simple nature of the PICS technology.

In the West and Central Africa (WCA) region, the choice to use cowpea for the initial dissemination contributed to the future success of the PICS technology in three ways: (1) it transformed a crop which had been risky to store into an opportunity for many farmers to benefit from; (2) it offered an alternative to the use of chemical insecticides and; (3) it was easy to use. Cowpea is known for its “legendary” pest problem from the field to storage. Most farmers know that without protection, 100% losses are a real possibility for cowpea in a relatively short period of time. These storage difficulties coupled with generally low supply often led to large price increases in cowpea between harvest and the next planting season. This created an opportunity for intervention. Farmers know that if one can bring clean cowpea to the market in April/May, one can get two or three times the harvest time price. For example, figure 1 depicts current cowpea prices (April 2018) and harvest prices (October 2017) in selected high cowpea producing states in Nigeria. Even in relatively good years with all the storage technologies currently available, cowpea prices have increased by 40-70% since last harvest. Current prices will continue to rise until new



Cowpea, the bean that launched PICS technology.

harvest comes to market. The promotion of PICS bags came at the right time for farmers who needed safer storage options in order to take part in the price increase gains. Farmers responded massively (adoption figures – Bokar et al., 2016 or Baributsa et al., 2016).

In an attempt to address the post-harvest losses of cowpea, several value chain actors resorted to the use of chemical insecticides, which led to numerous cases of food poisoning and even deaths following consumption of cowpea treated incorrectly or with the wrong chemicals. Some of these cases involved school feeding programs. This contributed to public apprehension with names such as “killer beans” being used by local media. The introduction of PICS technology coincided with this situation. Farmers in West Africa clearly preferred not to use any chemicals in preserving their harvest (Kadjo et al., 2018).

Finally, and perhaps most importantly, is the simplicity of PICS. It is not just easy to use, it is relatively easy to explain the principles of the technology. The slogan “no air - no life” in reference to eliminating pests is quickly understood by farmers. The instructions for using the bags are straightforward. Anyone can hermetically seal a PICS bag with a few knots and some twine.

In summary, the initial crop, cowpea, for which PICS technology was first promoted, was indeed the right choice due to several factors including its high post-harvest losses, huge price increases from harvest to the lean season, importance of the crop in household economics as both a food and a cash crop, and, finally, its importance as a regional trade crop for which storage is critical.

Price of cowpea (Naira/kg) in 4 states of Nigeria in 2017/2018 (\$1 = 362 Naira)

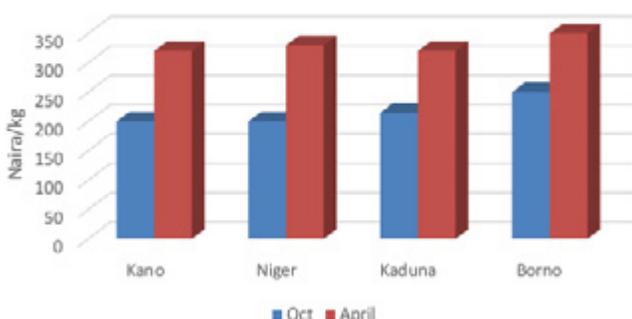


Figure 1

## Assessing Post-Harvest Management Practices in Haiti

Hannah E. Quellhorst, Taisha Venort, Dieudonné Baributsa, Purdue University - USA

### Background

Postharvest grain storage is a neglected sector of the value and supply chains in developing nations. Traditional storage methods are often ineffective and result in losses to insect pests and mycotoxin-producing molds. Haiti is heavily dependent on imports to feed its people, with approximately 50% of its food originating from the international market. The Cul-de-Sac Plains corridor is part of the greater Port-au-Prince area, where 80% of the country's economic activity takes place. While there is information available on postharvest losses and storage practices for fruit crops, there is little available on postharvest storage practices and postharvest losses associated with grains in the Cul-de-Sac Plains and across the country of Haiti.

### Field data collection

In August 2017, we conducted a survey to assess postharvest management practices used by the smallholder farmers in three departments (lower Artibonite, Ouest, and Centre) of the



Three enumerators are seen interviewing farmers in the Gantier area.

Cul-de-Sac Plains in Haiti. We interviewed farmers who were members of farmers' associations. Overall, we interviewed 214 farmers from at least 20 farmers' associations. The survey was conducted in Haitian Creole using 4 Haitian enumerators. Some of the data gathered included: (i) grains produced, (ii) storage and drying techniques, (iii) sources of losses during drying and storage. We utilized a data collection tool called Kobo Toolbox, and the application KoBo Collect was loaded onto Android tablets. This allowed us to store the data in the cloud while collecting data in the field.

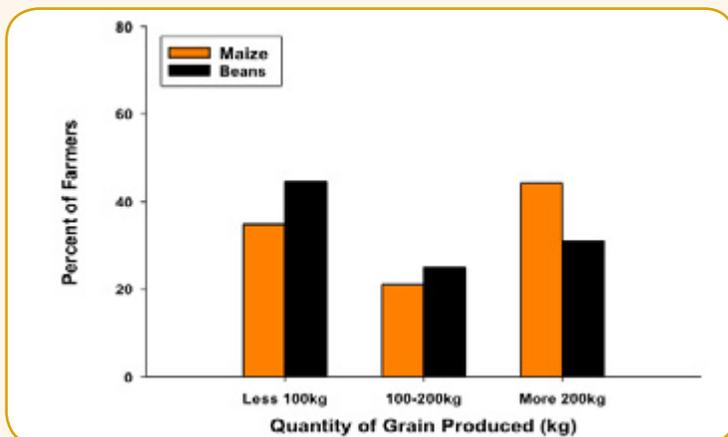


Figure 1

### Results

Maize and beans were the most important legume and cereal crops grown by the farmers. The average production for maize was 288 kg and 88 kg for beans (Figure 1). Farmers are producing relatively small amounts of grain. Drying before storage was a major challenge. Farmers in Haiti (98.5% of the respondents) rely on the sun to dry their crops. The most significant challenge during drying was rain (79.5%). Farmers dried their crops on the ground and on mats/tarpaulins. The major sources of grain losses during drying were insects, rodents, and decay.

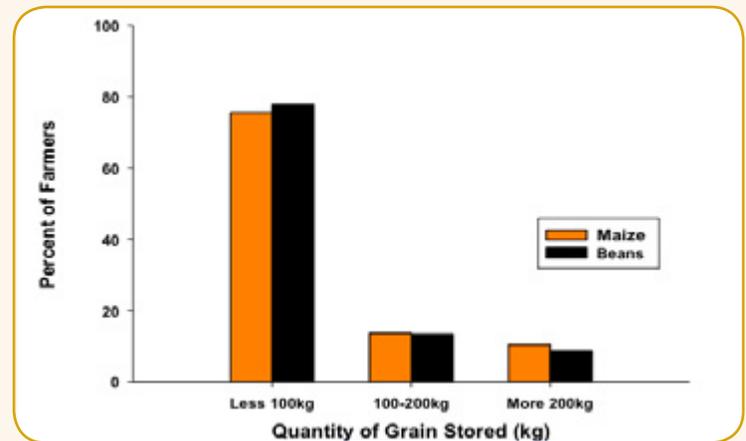


Figure 2

The great majority of farmers (93.0%) reported storing grain after harvest. Nearly 80% of the respondents reported storing less than 100 kg of these two grains (Figure 2). Nearly 70% and 86% of farmers reported storing their maize and beans for less than 6 months, respectively. The most common storage containers were sisal sacks (83.4%), followed by barrels/metal drums (41.2%). Rodents and insects were the two most reported causes of loss during grain storage (Figure 3).

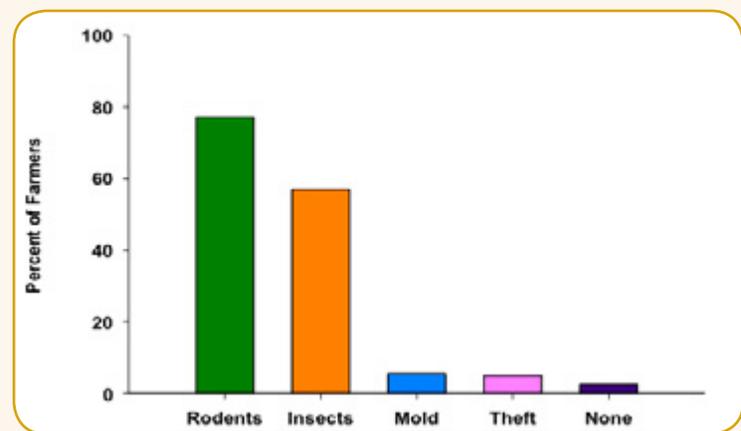


Figure 3

These results of this study provide preliminary insights into postharvest practices and potential interventions in Haiti. For instance, introducing hermetic bags such as the PICS could help mitigate postharvest storage losses.

## Partnering with the Farmer-to-Farmer Program in Colombia – A New Horizon for the PICS Project

Bradley Smith, Purdue University - USA

The PICS project has focused primarily on improving post-harvest storage practices in Africa and Asia with an emphasis on food security and income. These two topics are important throughout the world. A collaboration between Purdue University and the USAID-funded Farmer-to-Farmer (F2F) program works with individuals, cooperatives, and small agricultural businesses to effect positive, long-lasting changes that enable participants to extract more value from their growth and supply chains.



Coffee farm training in Granada, Colombia.

During the first week of November 2018, I traveled to Colombia to work with Jorge Clavijo, a researcher from the University of Llanos. Over the course of five days, we met with and trained approximately 50 Meta department individuals in the use of different techniques to improve their postharvest storage practices. Those we met with ranged from local women's groups and collectives to Fenalce, a large government-private cooperative that is active throughout Colombia.

Demonstrations focused primarily on assessment of grain moisture content, and also qualitative cultural practices to easy-to-use technology such as digital hygrometers. In addition, the PICS bagging technology was demonstrated at every training session. Each session was followed by a question and answer period.

Despite initial reluctance on the part of some of the trainees, the presentation of the PICS technology and explanation of its mechanisms demonstrated the potential of the bags to safely, effectively and economically store their crops for long periods of time. Depending upon the type of crop they had to store and the size of the farming operation, farmers were interested in the bags for different reasons:

- Cacao and coffee farmers were not interested in the bags for insect pest management, but more for the capability of the bags to trap the volatiles and aromas of their crops.
- Smallholder grain and cereal farmers in this area primarily grew maize, and were interested in PICS technology for long term storage of their grain for both human and farm animal consumption.
- Larger-scale farmers were interested in buying the bags in bulk for long term storage of crops.



Training in Vista Hermosa, with members and leadership of Fenalce, a government/private cereal and legume production cooperative.

After each training, the first question asked was inevitably, 'How much do these bags cost?' followed by, 'Where can we purchase these PICS bags?' Some farmers even inquired about how to import the bags themselves, from either African manufacturers or the Purdue Extension Education Store. Collaborating with the USAID F2F program has the potential to expose more smallholder farmers to technologies such as the PICS bags and the hygrometer. Such exposure could greatly improve the postharvest storage practices these smallholder farmers use as well as spread the word about the benefits of using PICS bags to people in need of it well beyond Africa and Asia.



Training in Puerto Lopez, for members of the Corporation Entre Pueblos.

## Growing a PICS Business – Georgina’s Story

*Bernadette Majebele, PICS3 Project - Tanzania*

Georgina Pius Mbawala first heard about PICS bag technology in 2015 during a workshop organized by the Catholic Relief Services (CRS)/Caritas project in Ruvuma Region of Tanzania. Georgina’s family had experienced difficulties in storing their grain without the use of chemicals, thus PICS bags were of great interest to her. She and her husband received two PICS bags from CRS and were eager to try them out. They stored 200kg of their family-grown maize in the bags. When they opened the PICS bags after three months of storage, they discovered the maize was in excellent condition and free of insects. At that point, Georgina realized the potential of the PICS bags and began pursuing a new goal to become a PICS bag vendor in the town of Songea.

Songea, located in the Ruvuma Region of Tanzania, is a particularly high maize-producing area. The opportunity for selling the bags was huge given the major challenges of pests during storage. Georgina made initial contacts with the manager of the local factory responsible for the PICS project. She shared with him her idea of becoming a PICS bag vendor in Songea. In August of 2015, Georgina ordered 200 PICS bags worth Tshs 720,000 (US \$315) using her savings. Since the PICS technology was so new in the area it was at first very difficult to sell the bags. Most farmers did not believe in the efficacy of the technology in protecting against insects without using chemicals. Farmers complained about the price as the tendency was to compare the PICS bag to the regular woven bags. Despite these difficulties, Georgina managed to sell all 200 bags, motivating her to continue with her passion to grow her PICS bag business.



Georgia Pius Mbawala.

In early 2016, she and her husband decided to use their family savings from agricultural sales as well as a small portion of their salaries to invest in the PICS bag business. In June of that year, at the onset of the harvest season, Georgina ordered 2000 bags from PPTL (PICS manufacturer in Tanzania). She started promoting PICS to whoever she met or talked to. She even took advantage of church gatherings to tell people about the PICS bag technology. She soon sold the 2000 bags and then replenished her stock with another 2000 bags and then ordered an additional 1600. As the harvest season was coming to the end, the last bags went slowly but she sold them all. She closed the season with sales of 5600 PICS bags.

The 2017 season was the most successful year for Georgina’s PICS bag business. She had an opportunity to meet the director of PPTL, Mr. Suraj Devani, who encouraged her to invest more in the PICS bag business. Devani helped finance Georgina by extending credit to her for purchasing 5000 PICS bags, of which she paid 75% and PPTL provided 25% credit. He even provided support for radio advertising on a local station, Radio JOGOO FM. She began marketing the PICS bags in villages and particularly to farmer groups. Georgina dedicated herself to the PICS business throughout the season and sold 24,000 bags! Her sales contributed 3% of the total sales of PPTL in the 2017 season.

Georgina’s family has greatly benefited from the PICS bag business. Her family has been able to raise capital for the 2018 season. At the same time, Georgina and her husband have been able to use a small portion of their PICS profits to invest in agriculture once again. Georgina is planning to increase her sales volume by purchasing a lot of 10,000 PICS bags for the first time. She will open two new outlets with the objective to sell 40,000 PICS bags during the 2018 season.



## Helping Smallholders Make the Most of Maize through Loans and Storage Technology:

### Evidence from Tanzania

Jacob Ricker-Gilbert & Hira Channa, Purdue University - USA

#### Background

Improving staple crop production is widely viewed as crucial for increasing food security and reducing poverty in sub-Saharan Africa (SSA). However, it is essential to recognize that food security does not simply end at harvest. Smallholder farm households in SSA who cultivate maize and other grains face two major post-harvest challenges. First, during storage, insect pests cause tremendous post-harvest-loss of up to

30% after six months, which means that the household has less grain to sell and consume later in the year. Second, grain prices are almost always lower at harvest than they are later in the season. Unfortunately, due to credit constraints and the need for cash to meet immediate expenses such as paying school fees and repaying loans for inputs, many farmers sell at harvest to meet their immediate financial needs.



Traditional storage structures for maize in Mbeya and Ileje district. Referred to as 'vehenge'.

#### Project Design

With Funding from USAID's Office of Disaster Assistance (OFDA) we designed and implemented a project in southern Tanzania during 2017 and 2018 to identify strategies that can help address the issues of credit at harvest and post-harvest loss.

The activities were conducted in collaboration with Purdue University, International Institute of Tropical Agriculture (IITA) and PHERETAJO-a local NGO responsible for the registration and training of VICOBAS (local name for credit groups) in the Mbeya and Songwe regions.



Traditional storage structures for maize in Mbeya and Ileje district. Referred to as 'vehenge'.



Maize stored using pesticide available in markets in Ileje district.

Participating VICOBAS were randomly selected into one of three groups:

- 1) **PICS (Group 1):** This group received training on the use of an improved storage technology called the Purdue Improved Crop Storage (PICS) bag. One PICS bag holds 100 kilograms of shelled maize and when closed properly creates an airtight seal that kills insect pests in storage. Ten individuals in each of these VICOBAS were randomly selected to receive 2 PICS bags each.
- 2) **PICS + Credit (Group 2):** This group received training on the use of the PICS bags and 10 randomly selected individuals received 2 PICS bags and were offered a loan at the time of harvest worth approximately US \$40. The collateral for the loan was 180 kg of maize stored in two PICS bags. The two bags of maize are stored at a central location, which is either a village office or the home of one of the group leaders.
- 3) **Control (Group 3):** This group did not receive any trainings, bags or loans. 10 randomly selected individuals from this group were selected and surveyed. We compare outcome from the control group with those from Groups 1 and 2 to measure the benefits of the project.

Another unique aspect of this intervention is the collection of high frequency "journal" data from respondents on maize consumption, sales, purchases and associated storage pesticide use. This type of data will allow for a detailed representation of the impact of the treatments on maize consumption and transaction patterns.

In total over 1,590 households are participating in the project. We are interested in knowing the extent to which par-

participation affected maize consumption, sales, purchases and use of storage chemicals among smallholders. We also want to know about loan repayment and how people used the loans. Ultimately, we hope to understand the viability of scaling up these interventions to reach more beneficiaries.

### Intermediate Results

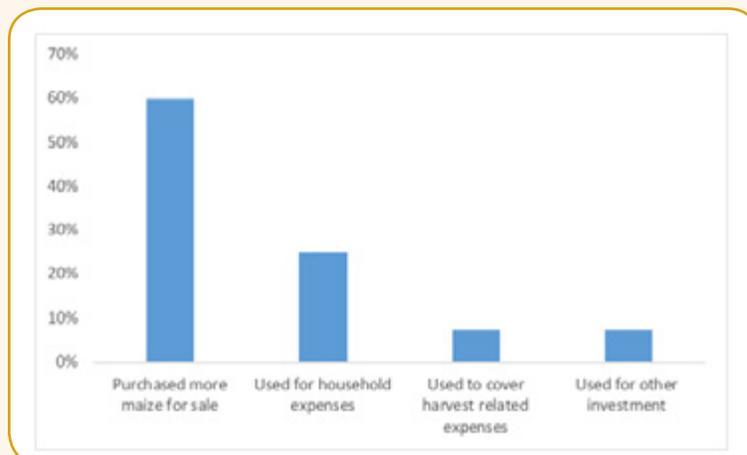
Uptake was high for both the 'PICS+Credit' treatment and 'PICS' treatment groups. 98% of the sample to whom the bag was offered accepted and 81% of the sample to whom the loan was offered accepted the loans. Anecdotal evidence suggests that bags have been popular and many respondents in each of the three groups have purchased more bags.



Planting for the next season.

The loan was utilized primarily (60%) for the purchase of more maize for storage for consumption/sale in a later period. Other respondents utilized the loan for household ex-

penses (primarily the payment of school fees) while others utilized the loan for covering household or harvest-related expenses. A relatively smaller percentage used the loan for livestock purchases or investment in non-agriculture related businesses. (Figure 1).



Loan utilization.

The loan intervention has helped highlight the risks associated with any credit product. Maize prices did not rise this year in Tanzania, contrary to the pattern from previous years. The lack of price rise resulted in many of the groups asking for extensions in repayment, which were granted by the implementing partner Pheretajo. As of February 1, 2018 Pheretajo has been successful in collecting almost 30% of the loans and return dates are being renegotiated with each of the remaining groups.

### PICS Third Supply Chain Workshop

Holly Fletcher-Timmons, Purdue University - USA

The Third PICS Supply Chain Workshop was held at the Crowne Plaza Hotel in Nairobi, Kenya from March 12th through 14th, 2018. In attendance were over 65 individuals from 14 countries across Africa, Nepal, the USA, the United Kingdom. The workshop goal was to assess progress in developing distribution networks to increase PICS bags availability to meet



farmer demand. The workshop offered the opportunity to discuss, network and share PICS experiences from around the world. Special thanks to PICS Global for sponsoring lunch and breaks, and to Bell Industries Ltd for sponsoring the workshop dinner.



Third Supply Chain Workshop participant group photo.

## The “YIYÉ” Association: Empowering Women to Improve the Cowpea Value Chain

Dr. Clémentine Dabiré/Binso, IRERA - Burkina Faso

YiYÉ is a women’s association created to improve food security and nutrition in Burkina Faso and beyond. Participating women chose the name YiYÉ, which means “being entrepreneurial.” I laid the foundation for YiYÉ in 2009 with support from the Purdue Improved Cowpea Storage (PICS1) project. Dr. Baributsa and I had noticed that women were underrepresented in PICS demonstration activities. To increase their participation, we came up with the idea of cowpea storage competitions. These led to the first formal cowpea storage competition organized by YiYÉ, held in the city of Tougan in 2013, with only 29 women participating. Shortly thereafter, the High Commissioner of Sourou Province signed official documents formalizing YiYÉ. Today, YiYÉ has 4,580 women members organized in 247 groups in Burkina Faso and in Bankass, Mali.



Salimata GUIRÉ, YiYÉ focal point at Gomboro explaining to the visitors the interest of the Association for them at the field visit of Lago, on August 17th, 2017.

Under its three-year action plan, YiYÉ provides professional training to its members including (i) crop and seed production, (ii) postharvest management, (iii) food processing, (iv) use of small-scale equipment, and (v) crop marketing. YiYÉ currently has 10 hectares of land set aside for producing certified seed each year and 10 ha for producing foundation seed, all done in partnership with INERA. Since 2013, YiYÉ members have produced 62 tons of foundation and certified seed, and stored more than 2,400 tons of cowpea grain in PICS bags. Thanks to its role in engaging women and integrating them into the cowpea value chain, YiYÉ has received the support of

the Government’s extension services and projects as well as from local and international development partners. Crucial support in expanding YiYÉ’s activities to more women and new areas has been forthcoming as well.

Women are now empowered and are enjoying the benefits of belonging to YiYÉ. For example, take the case of Mariam



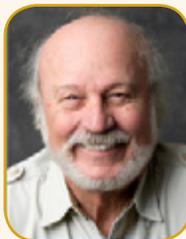
Sanata DJIRÉ, cereals and PICS bag seller since the beginning of the PICS project in 2007, in her store at Tougan.

Zerbo from Djouroum, Thanks to YiYÉ she was enabled to attend a young producer workshop in Abuja, Nigeria, in March 2016. Mariam knows that without YiYÉ’s contribution, she would have never left her village to visit another country! Another lady, Salimata Djiré, a farmer who never went to school, acknowledged the impact of YiYÉ in her life:

“Thanks for introducing PICS in my community. I can now secure clean and pesticide-free grain to feed my family throughout the year, and I am no longer in a hurry to sell off.”

While these are great success stories, the association still needs support to grow its membership. YiYÉ strives to be an association empowering women to produce and better organize the marketing of quality grain, thereby increasing food security and enhancing incomes and the quality of life for women in Burkina Faso and beyond.

## CONGRATULATIONS TO DR. LARRY MURDOCK



[Dr. Larry Murdock has received Purdue University’s highest career achievement recognition for a faculty member, the Morrill Award.](#)

This award recognizes outstanding career achievements including excellence in all facets of the profession: demonstration of synergies between roles as teachers, scholars and his/her engagement mission, as evidenced by the impact or potential impact of his/her work on society.

## UPCOMING EVENTS

SCALE UP  
conference

**Innovations in Agriculture:  
Scaling Up to Reach Millions  
September 25-27, 2018  
West Lafayette, Indiana, USA  
[purdue.ag/scaleup](http://purdue.ag/scaleup)**

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