

PICS

NEWSLETTER

Volume 2 Issue 2 2016

Purdue Improved Crop Storage

PICS Technology Reaching Millions and Providing Business Opportunities

Dieudonné Baributsa, Purdue University, USA

“Magic bags” or “Miracle Bags”! These are the farmers’ excited words after seeing with their own eyes how well the PICS bags protected their grain against insect pests after several months of storage. Such enthusiasm is echoing across a swath of Africa during open-the-bag ceremonies (OBC) involving 760,796 farmers who participated in PICS demonstrations in 12,467 villages in Ethiopia, Tanzania, Uganda, Malawi, and Ghana during the 2015 harvest season. To reach these farmers, more than 1,373 extension agents had been trained in how to implement PICS village marketing activities.



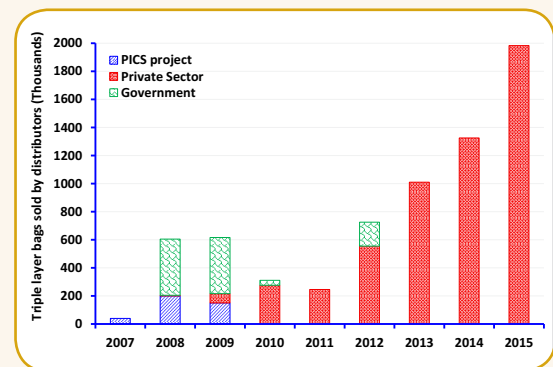
Mrs. Buze Like stands between her stocks of maize in 30 PICS bags kept in her house in Sidama, Ethiopia.

Women play a vital role in postharvest food storage, and so they have been eager to participate in PICS village activities – some 47% of participants in demonstrations were women. Women have been among the early adopters. Mrs. Buze Like, a widow, living in Huleteгна Bulaja village in Sidama, Ehtiopia, is representative. After attending a demonstration in her community, she purchased 30 PICS bags to store her maize. I had the opportunity to see Mrs. Like’s maize store while attending the OBC in her village. As a pilot farmer, she was thrilled to see her grain in excellent condition when she opened her bag during the OBC. By the same token, while attending an OBC in Iganga district in Uganda, Mr. Patrick Tibita shared his experience using PICS bags. He doubled his income thanks to being able to safely store his maize for 4 months without loss of quality and without using chemicals. It was remarkable to hear Mr. Tibita say that he had sold his cow and had cash he used to purchase 20 more PICS bags during the OBC.



Mr. Patrick Tibita, a farmer from a community near Iganga, buying 20 PICS bags during the Open-the-Bag Ceremony on June 23, 2016 .

The enthusiasm of farmers for the PICS technology has translated into increased sales – there was a 54% increase from the 2014 to the 2015 harvest season. About 2.0 million PICS bags were sold in 2015 in Africa and Asia bringing total sales to 7 million since 2007. Distributors in several countries including Mali, Niger, Nepal, Afghanistan and Cameroon continue to buy and sell PICS bags with no project support.



PICS Bags Sales from 2007 to 2015 in Sub-Saharan Africa and Asia.

In 2015, seven additional distributors were licensed to commercialize PICS bags in Ghana, Mali, Ethiopia, Malawi and Sierra Leone. Manufacturers and distributors are investing in increasing bag production capacity and in expanding vendor networks. Retailors with entrepreneurial skills are also benefiting from the PICS business opportunity. Working with Bell Industries, the PICS distributor in Kenya, Mr. Francis Mumo from Makueni sold 18,000 bags in early 2016. During a farmers gathering, Mr. Mumo always starts and ends his sales pitch by saying “This is the end of the weevils”. It may not be the end of weevils as we know it, but surely farmers and vendors are enjoying the benefits of the PICS technology!

“Miracle Bags” Changing Women’s Lives in Burkina Faso

Charlene McKoin, Bill & Melinda Gates Foundation, USA

In May, 2015, I traveled to the 6th annual Cowpea Fair in Lankoue, Sourou Province, Burkina Faso with Purdue Professors Larry Murdock and Dieudonne Baributsa. The purpose of the visit was to personally review the work, funded by the Bill & Melinda Gates Foundation (BMGF) of the Purdue Improved Crop Storage (PICS) project. The PICS project, started in 2007 and now in its third phase, is being implemented by Purdue University in East and West Africa.

Since 2009, Dr. Clementine Dabire, a member of the PICS team and a researcher at the National Agricultural Research Institute of Burkina (INERA), has held a small women’s fair and prize ceremony to highlight female smallholder farmers storing cowpea in PICS hermetic storage bags. Clementine had invited me to visit the “small fair” that, by 2015, had become a gathering of thousands of women... and men... who now use PICS bags and other hermetic storage technologies for cowpea, as well as a variety of other important crops including, groundnut, soybean, sesame, hibiscus, bambara nut, maize, etc.



Women participating in the festivities during the 2015 Women's Fair.

A number of Burkina and Mali dignitaries participated in the Lankoue Cowpea Fair in 2015. These dignitaries, along with the foreign visitor contingent (the Purdue team and me) sat in the shade with our bottled water. But thousands of smallholder farmers and traders, male and female came, from the surrounding communities to stand under a blazing desert sun on a day that reached 112 degrees Fahrenheit. Such was the excitement the fair has generated over the last 6 years in Burkina Faso. There was great entertainment; dancers, singers, story tellers, and of course the prizes. At the end of the entertainment, we attended a makeshift market in the fairgrounds where hundreds of farmers had brought there stored commodities in PICS bags. For me, this was the highlight of the experience.

Walking through the rows of opened PICS bags, I inspected the stored grain for insect or mold damage, change in color, and smell. After viewing hundreds of bags, I did not find one with any of the above problems. Even more exciting was the consistent farmer feedback. Many women called the bags “Miracle Bags” and testified that with the ability to safely store their grains, they now had sufficient food for their families and improved livelihoods from selling surplus grain they can store and market when prices rise. Miracle Bags indeed! These hermetic storage bags change lives.

PICS Technology, A Solution to “Killer-Beans”

Abdoulaye Tahirou, IITA, Nigeria

Cowpea, called beans locally, is a popular staple in Nigeria. The use of toxic chemicals to preserve harvested beans has, in the past, led to many food poisonings and the “killer-beans” syndrome in Nigeria. The PICS hermetic bagging system is helping to stop this.



Farmers showing the quality of their grains 6 months after storage in Niger State, Nigeria.

Purdue University partnered with the International Institute of Tropical Agriculture (IITA) to promote PICS bags for grain storage in several countries in West and Central Africa. Under the PICS3 project being implemented in both Nigeria and Ghana, IITA has worked with several partners including government, extension and local NGOs. In Nigeria, in collaboration with Agricultural Development Programs in 21 states and a local NGO (PROGREEN), IITA reached about 61,181 farmers in 1,500 villages during the 2014/15 harvest season. In addition, demonstrations were conducted in 74 major grain markets in Nigeria. A total of 4,347 grain merchants participated. In Ghana, IITA in partnership with 4 local NGOs (PRONET, ADRA, PAS and READI) reached 65,646 grain farmers in 1,000 villages selected from five regions in Ghana (Brong Ahafo, Ashanti, Northern, Upper West, and Upper East).

continued on next page.



Farmers and Extension Agents during the Open-the-Bag Ceremony in Katsina State, Nigeria.

“Killer Beans” continued from page 2.

In addition, market demonstrations were organized in 30 selected markets with a total of 1,627 participants. Demonstrations were also held in secondary schools, churches, mosques and other locations. Radio jingles and live talk-shows contributed to increasing awareness of PICS bags among farmers. In addition, ICT/mobile phones were used to transfer PICS video clips to farmers via bluetooth during village demonstrations or village film video shows.

Farmers are drawing huge economic and health benefits from the use of the PICS bagging system. According to one of the farmers “the minds of my household members are at rest now because the threat of destruction of our harvested grains by insects is a thing of the past”. Another farmer proclaimed that ‘now my household can plan when we market our harvested grains, we do not need to rush to the market when the price is not very good’. Youth and unemployed graduates have not been left behind, either. They have been involved in selling PICS bags. “There is equal opportunity for gainful self employment for the youth and unemployed graduates in Nigeria in the marketing and distributing of PICS bags,” said Tahirou Abdoulaye during an agrabusiness training activity for youth.

An additional problem of using chemicals in cowpea storage is that it leads to trade restrictions. Recently, the European Union Food Safety Authority rejected beans exported from Nigeria because they were found to contain between 0.03 to 4.6mg per kilogram of harmful dichlorvos pesticide, when the acceptable maximum residue limit is 0.01mg per kilogram. To help address this issue, IITA organized a training and demonstration session for grain and legume exporters in Nigeria and for the staff of the Nigeria Export Promotion Council. Focus was the use of PICS bags to store grains which avoids the chemical problem because with PICS bags there is no need to use any storage chemical.

Insights on Smallholder Farmers’ Storage Practices from the PICS3 Baseline Surveys

Jake Ricker-Gilbert, Purdue University, USA

Baseline survey data have now been collected in all six PICS3 countries of Ghana, Burkina Faso, Nigeria, Ethiopia, Uganda and Tanzania. Using these data along with data from Benin collected during PICS2, we put together a short report detailing our findings on smallholder farmers’ storage practices before they come in contact with the PICS technology ([available here](#)). These data will provide us with the ability to see how PICS has impacted peoples’ lives when we return to survey the same households again at the end of the project in 2019. We highlight some of the findings from the report below.

First, to better understand what drives storage loss in maize, we asked the smallholder farmers in our baseline surveys to report the major source of loss in storage. **Figure 1** shows that insects are the most reported source of loss in most countries¹. Over 80% of farmers in Tanzania and Ghana

report that insects are the major source of post-harvest loss (PHL) for maize, and over 75% of farmers in Benin report that insects are the major source of PHL for maize.

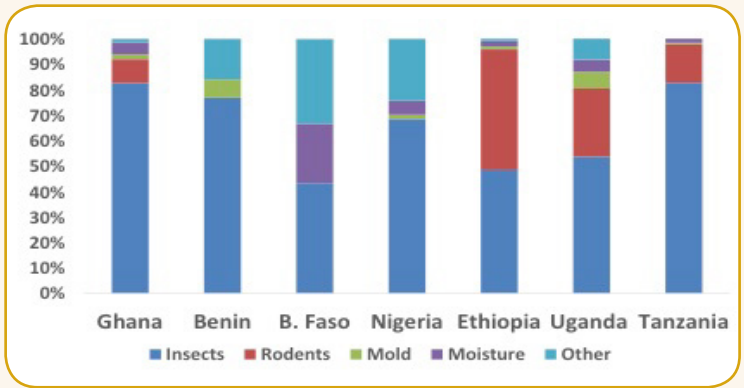


Figure 1: Major Sources of PHL in Maize Storage

¹ For Benin and Nigeria, farmers were not asked specifically about rodents, so these responses are grouped into the “Other” category.

Another clear finding from the baseline is that storage chemicals such as actellic are the main post-harvest insect protection technology that smallholders use. **Figure 2** shows that many smallholders apply storage chemicals to their crops — from a low of 5% for legumes in Burkina Faso and 12% for maize in Uganda, to a high of 77% for maize in Ethiopia. This suggests that PICS bags may be an appealing option for farmers to use as a replacement technology for storage chemicals.

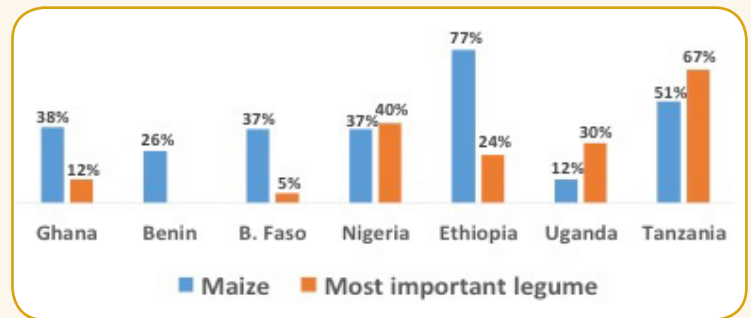


Figure 2: Percentage Applying Storage Chemicals

Figure 3 presents the technologies that farmers use to store their maize in the baseline countries. The most commonly used storage technology for maize is the woven bag, which is good for PICS because it indicates that bags are a culturally acceptable method for storing maize to many smallholders in Sub-Saharan Africa. Use of hermetic (airtight) storage technologies, like PICS bags, metal silos or cocoons are very low for maize throughout the countries sampled. This suggests that there is significant room for PICS to be adopted in the coming years as farmers learn about the benefits of the technology.

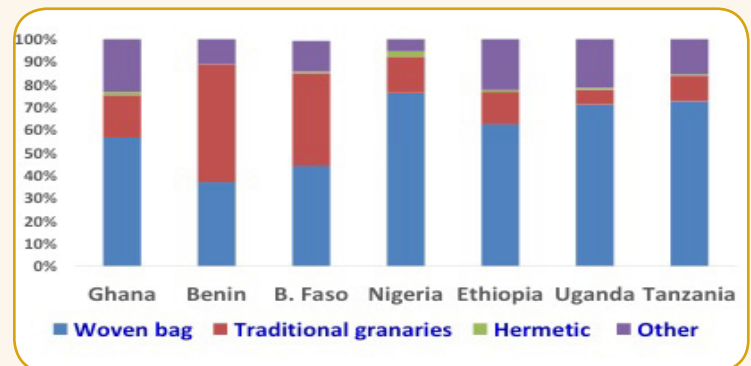


Figure 3: Storage Technologies Used for Maize

Sasakawa Global 2000 Ethiopia Promoting PICS bag in Thousands of Villages

Aberash Tsehay, Sasakawa Global 2000, Ethiopia

In Ethiopia, grain crops are produced by subsistence farmers who store their produce in traditional storage facilities. Postharvest crop losses in Ethiopia, which are often reported to fall in the range of 20 to 30% annually, are among the major challenges farmers face. Damage during storage is mainly caused by insect pests and fungal pathogens. To avoid these losses smallholder farmers often sell their grain at a very low price soon after harvest, when grain is abundant and cheap. Weeks and months later, needing food for their families, they are forced to buy now-scarce grain at a much higher price. Apart from causing quantitative losses, pests in stored grain contribute to aflatoxin contamination as well as chemical poisoning due to insecticide misuse.

In the face of these challenges and with the aim of addressing the problems confronted by farmers who want to store their grain after harvest, Sasakawa Global-2000 Ethiopia (SG2000 Ethiopia) in collaboration with various organizations initiated a need-based intervention involving the use of hermetic grain storage technologies suitable for rural households. With the exception of a few demonstrations conducted on metal silos in collaboration with CIMMYT and on Super Grain Bags with GrainPro, not much work with hermetic storage had been done in Ethiopia prior to 2013.



PICS bag demonstration at Hawasa Zuria, Southern Nations, Nationalities, and Peoples' Region, Ethiopia.

Towards the end of 2013, SG2000 Ethiopia began working with Purdue University to get a local manufacturer for PICS bags established in Ethiopia; that year, for the first time, 5,000 PICS bags were manufactured in country. Subsequently, in 2014, SG2000 Ethiopia conducted the first training for extension staff (Trainings of Trainers -- ToT) on the proper use of PICS bags. This ToT was facilitated thanks to collaboration with Purdue University under the leadership of Dr. Dieudonne Baributsa. Following the ToT, SG2000 Ethiopia established 100 demonstrations of PICS bags using limited resources from its core funder, the Nippon Foundation. These demonstrations were conducted in farmer training centers and farmer households.

Beginning in September 2015, SG2000 Ethiopia started implementation of the PICS3 project after signing a one-year agreement with Purdue University. Plan of the project was

to implement PICS bags in 2,200 villages. However, due to high demand and requests from government partner organizations, especially the Regional Agriculture and Natural Resource Bureaus, 3,155 villages have now been reached by SG2000 Ethiopia. Those villages are located in 31 Woredas (districts) of 5 regional states (Amhara, Benishangul Gumuz, Oromia, SNNP and Tigray). In 2015, 415 extension staff members participated in ToTs organized by SG2000 Ethiopia. These trained extension staff subsequently conducted demonstrations of PICS bags in Ethiopian villages, reaching a total of 145,591 farmers. Over the past two seasons, SG2000 Ethiopia has conducted demonstrations and created awareness of PICS bags among 165,636 farmers.



Mrs. Mulu, bought additional PICS, grain filled and made ready for stacking, at Beggi Woreda Oromia Region, Ethiopia.

Although Open-the-Bag Ceremonies have not yet been conducted at the time of writing, some farmers have already started adopting the technology. Many individual farmers attending pre-awareness sessions and demonstrations became convinced of the effectiveness of the technology, bought up to 35 PICS bags each, and have begun to use them to store their grain. In addition to the demonstrations conducted under the PICS3 project during the 2015 and 2016 harvest seasons, SG2000 Ethiopia conducted demonstrations using project funds from the Nippon Foundation, WFP-P4P, and CIMMYT reaching 20,045 farmers in 955 villages. Since Ethiopia has a vast geographical area and the grain storage problem is widespread, there is still much more to be done to support farmers across the country.

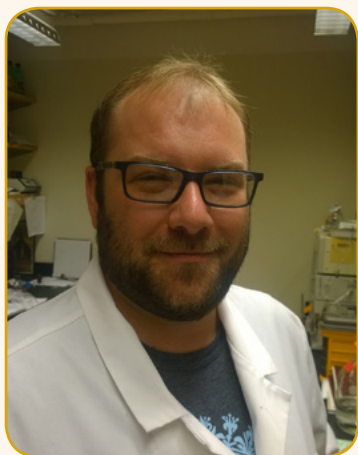


A woman farmer learning how to check the bag, at a demonstration in Dembecha Woreda, Amhara Region, Ethiopia.

Simple and Cheap Temperature/Humidity Device Helps Determine Grain Moisture Content

Timothy Tubbs & Charles Woloshuk, Purdue University, USA

As part of the ongoing PICS research conducted by Purdue University, Mr. Timothy Tubbs (M.S. student in Department of Botany and Plant Pathology under the mentorship of Charles Woloshuk) is conducting various experiments to discover how different conditions within a PICS bag during storage effects the grains stored within. He also studies the production and effects of aflatoxins, a toxic substance produced by certain fungi (mold) which can be dangerous to humans.



Mr. Timothy Tubbs



A moisture meter.

Over the past two years, Tim has conducted research to develop a low-cost method for measuring grain moisture content before storage. The idea was to determine grain moisture by measuring the temperature and humidity within the inter-kernel spaces. Five commercially available devices were tested for their accuracy over a range of temperatures and humidity. Tim discovered that a device costing less than \$1.50 fit the bill. A simple protocol for measuring grain moisture content was developed. To assess moisture content, the user places a handful of maize in a sealable plastic sandwich bag with the digital temperature/humidity device. The device is embedded in the grain and the air in the bag is pushed out before sealing. The actual grain moisture is obtained from an equilibrium moisture content (EMC) chart with the temperature and humidity readings. Research results indicated that a moisture reading can be determined in 15 to 30 minutes. Only the humidity reading is required to help the user decide whether the grain is dry enough for storage. If the humidity is above 65%, the maize is still too wet and more drying is needed. If the humidity is below 65%, the maize is ready for storage. The moisture meter will be evaluated this summer and fall in several African countries.

Tim also investigated the effect of opening and closing PICS bags on grain quality as subsistence farmers periodically remove maize from their storage bags for consumption. If the maize moisture is below 15%, there is little risk of quality deterioration by fungi and aflatoxin accumulation. Tim's research asked what are the effects of routine opening of PICS bags when the grain is above the safe moisture level. He placed maize with moisture contents of 15%, 16%, 18% and 20% in PICS bags and opened them weekly for 30 min under humid conditions (85% RH). He measured oxygen


content in the bags before opening and after closing the bags. He also measured fungal growth, aflatoxin, and seed germination after 8 and 24 weeks. His results indicated that prolonged opening of PICS bags, containing maize above 15% moisture, will in time lead to poor quality grain. A manuscript has been submitted for publication.


PICS Network Website Launched

Holly Fletcher-Timmons, Purdue University

We are happy to announce the launch of our new website: PICSNetwork.org. The website highlights all of the PICS projects, current and past, on a map that shows locations of the different projects across Africa and Asia. In addition, we have included many resources including links to videos, training posters (currently available in 14 different languages), publications, etc. Visit our website to learn more the PICS Program. For information on where to buy PICS bags [click here](#) and select "Distributors" on the right side of the screen.

Honors & Awards

 The PICS Team was awarded the Purdue Team Award in May, 2016. [Purdue TEAM Award](#)

 Dr. Tahirou Abdoulaye from International Institute of Tropical Agriculture (IITA) Nigeria received the [2016 Purdue University College of Agriculture's Distinguished Agriculture Alumni Award](#).

 Dr. Ibrahim Baoua from the University of Maradi, Niger received the "Meritorious Achievement Award" from the Feed the Future Innovation Lab for Collaborative Research on Grain Legumes at the Pan-African Grain Legume & World Cowpea Conference in Zambia in March 2016.

Upcoming Events

AUGUST

- PICS short term training for West Africa, Burkina Faso

SEPTEMBER

- [ICE - 2016 XXV International Congress of Entomology, Orlando, Florida, USA; PICS Symposium Tuesday, the 27th](#)

NOVEMBER

- PICS short term training for East Africa, Uganda

Community Voices



[Mrs. Shaba's Story](#)



From the Editor:
If you have a PICS story for possible publication in our newsletter, please contact us at PICSinfo@purdue.edu



Purdue University | Department of Entomology
901 West State Street | West Lafayette, Indiana, USA

It is the policy of the Purdue University School of Agriculture that all persons shall have equal opportunity and access to the programs and facilities without regard to race, color, sex, religion, national origin, age, marital status, parental status, sexual orientation, or disability. Purdue University is an equal opportunity/equal access Affirmative Action employer.