

PICS

NEWSLETTER

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Purdue Improved Crop Storage

PICS Ten Years On: Looking Back, Looking Forward

Larry Murdock & Dieudonné Baributsa, Purdue University

Our PICS program celebrates its 10th anniversary this year. We are thrilled that with every passing year PICS has grown stronger and stronger and its geographical reach ever greater. Early this year PICS bag sales passed ten million. This year's full numbers aren't in yet but we anticipate that the private sector will sell four million more PICS bags. Over these last ten years, we have trained more than five million farmers in 56,000 villages in Sub-Saharan Africa. We have published at least thirty PICS-related scientific papers that built a sound scientific foundation for PICS, and more publications are on the way. We have produced informational videos in multiple languages, radio, TV, and cell phone messages, extension bulletins, and training posters. We have helped build supply chains essential for getting PICS bags into the hands of those who need them.

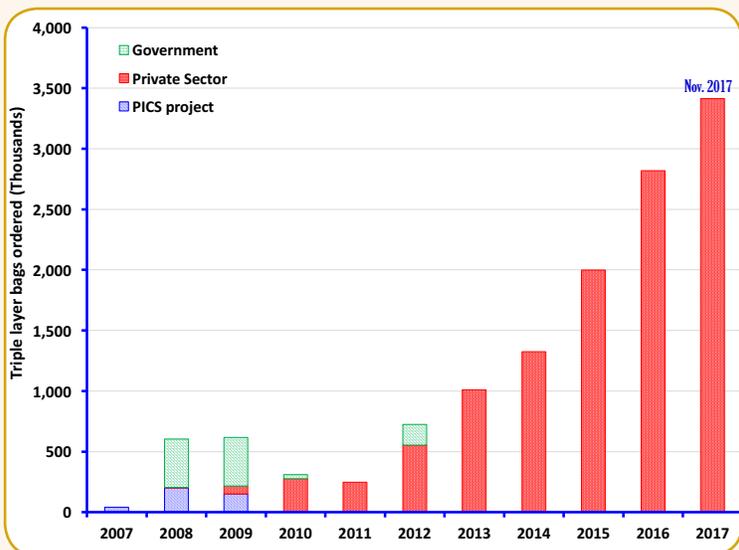


Chart illustrating PICS bags sales from 2007 through November of 2017.

We owe our existence to the Bill & Melinda Gates Foundation for support over these first ten years and to USAID's Bean/Cowpea CRSP before that. Happily, many other donors (e.g., USAID, UK Aid, Rockefeller), international research organizations (e.g., IITA, ICRISAT, ICIPE), humanitarian agencies (e.g., UN WFP, FAO, CRS) and national programs (e.g., INRAN, INERA, SARI, KARI) have joined forces with us and provided indispensable help.



Women employees at the PPTL factory assembling PICS bags in Tanga.

Given our 10th anniversary, we should pause and reflect on some of the big questions. One is this: Why has PICS been so successful? There are three main answers, and a lot of lesser but still important ones.

Why successful and optimistic? First success is achievable if you have (1) a truly excellent but simple technology -- the PICS bag -- and if you have (2) excellent and caring people from many different disciplines and backgrounds

who are bringing it to people in need. Equally important is (3) an implementation plan built on enduring humanitarian values, a plan that is practical and effective and can be implemented by caring people.



PICS consultants conducting a market demonstration in Ngai Market in Oyam district in Uganda.

In future issues, as a community, we need to share our thoughts about specific factors that have contributed to PICS success. We could fill an entire page with just the names of people who made significant contributions to PICS, our biggest worry is that we would leave out important people. One thing we are sure of: If you are reading this, you are surely one of them! Our thanks to YOU for helping make life better for millions of farmers, their families, and consumers! Stand by!

Pop Up Food Stores - Converting Shipping Containers into Community Stores in Uganda

Will Surman, Farmers Overseas Action Group - Uganda

A small food insecure village called Namalu, in the Karamoja region of northeastern Uganda, is taking back control of its food – and reducing food waste at the same time – thanks to a simple technology.



A family rests against the community food store after selling their grain.

We have all seen 40-foot and 20-foot shipping containers hurtling up and down the roads in Africa, or piled high in a port and on the great container ships. They are also ideal as safe and secure 'pop-up' community food stores.

In 2016, we installed a 40-foot second-hand shipping container in Namalu. We then trained 300 local farmers in post-harvest handling and gave them each a tarpaulin to dry and clean their maize. Apart from improving their home-stored maize, these farmers also sell their high-quality maize to our implementing partner, a local NGO, who stores it in PICS bags inside the container. The bags are kept safe and dry in the container and the grain quality is maintained in the PICS bags.



Packers taking a break from filling the 40 foot container with PICS bags for safe keeping.

When the local market can no longer meet demand for maize, the community store is opened, and grain is sold at discounted prices to vulnerable people in the region.

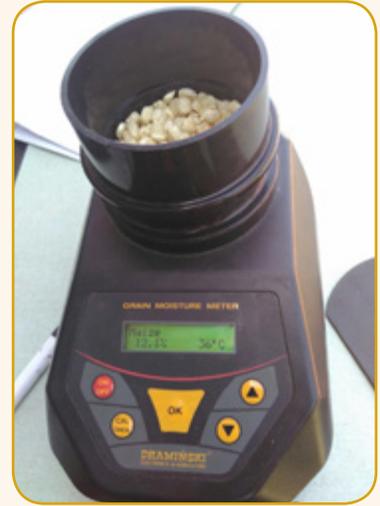
The farmers benefit by receiving training, a tarpaulin and a premium price for the grain that is stored in the

container. In addition, the community benefits from having a local store of food that can be sold to local people at discount prices. The implementing NGO benefits from maintaining an

income generating activity. The added benefit is prevention of food loss and reduction of dangerous aflatoxin levels through the use of PICS bags.

We call the containers 'pop-up' stores because they can be installed almost overnight. If the community wants to move the store, it is portable. If the scheme is successful it is easy to double capacity. Last year we sold 35 tons of maize to around 2,500 local people at below market

price to provide food to families when they needed it most – and we will continue to fill the community store every year.



Every bag is measured to ensure moisture levels meet strict limits.



A local farmer has brought her grain to store in the container.

Based on the success of our first food store we are now rolling the project out into new areas of Uganda and seeking funding. For each container installed, we will train around 300 farmers to improve their post-harvest handling and storage and the food store will provide food security to thousands of people.

To find out more about the project, or if you would like to partner with us, please contact williamtsurman@gmail.com.



Villagers in Namalu queuing outside the community store to buy grains that have been safely stored in PICS bags.

Malawi Sees Fivefold Increase in PICS Bag Usage

Isaac Masingati, AgDiv Malawi

For many years, effective storage of grains and legumes has been a major challenge for smallholder farmers in Sub-Saharan Africa. In Malawi, farmers and food dealers lose up to 30% of their grain and legumes during storage, which negatively impacts household food security and incomes. The introduction of the Purdue Improved Crop Storage (PICS) bag, a three-layer hermetically sealable bag that can reduce losses by 99%, is becoming instrumental in eliminating postharvest losses among smallholders.



A group of farmers pose with their PICS bags after a training in Mchinji.

The PICS bag has been available on the local market since 2014, and is gaining more ground with smallholder farmers, thanks to the efforts of the Feed the Future Malawi Agriculture Diversification Activity (AgDiv) in the upscaling of the technology in the 2016–2017 season. The USAID-funded AgDiv project is promoting the PICS bags as a way of building household resilience to food and financial shocks in a country where food insecurity and poverty are being increasingly exacerbated by climate change. In partnership with Purdue University, AgDiv is hoping to get one million Malawian smallholders to use PICS bags for storing all their grains and legumes by 2021.

With technical support provided by Professor Charles Woloshuk and Associate Professor Dieudonné Baributsa, extension professionals from the government, input suppliers, commercial farms, community-based cooperatives, donor projects



Two young girls following the steps for safe packaging in PICS bags. Here they are checking for holes by listening for air leaks.



A PICS training event draws a large crowd.

and NGOs have thus far trained 59,288 smallholder farmers on the use and benefits of PICS bags. Each trained farmer was also provided with a sample of two 50kg PICS bags. Concurrently, AgDiv's subcontractor Farm Radio Trust mounted a nationwide PICS awareness raising campaign on 12 radio stations, reaching almost every corner of the country.



Women practice tying a PICS bag properly at a training event in Mchinji.

The result? A fivefold increase in the use of PICS bags compared to 2016 – totaling 246,497 (50kg) and 13,461 (100kg) bags. This essentially means that some 13,671 mt of stored farm produce will be safe from losses incurred by molds and insects, making households more food secure and enabling farmers to increase their income.



Villagers in Zomba taking part in a PICS bag training event.

Measuring the Moisture of Maize Before Storage in PICS Bags

Charles Woloshuk, Purdue University USA

In a 2016 PICS Newsletter [Vol 2 (2):5], we described a protocol for determining the moisture of maize with a low-cost digital hygrometer. The protocol is based on the principle that when maize is placed in a sealed container, a moisture equilibrium will occur between the kernels and the air between the kernels. The equilibrium relative humidity (ERH) can be measured with a hygrometer. Knowing the humidity and the temperature, one can estimate the actual grain moisture. More importantly, one can set an ERH value that tells the protocol user that their grain is dry enough for safe storage. We recommend a ERH value of 65% at temperatures between 21 to 35 Celsius, which would indicate grain moisture for maize around 13%. At this relative humidity and grain moisture, growth of fungi is inhibited, especially those that produce aflatoxin and fumonisin.



Read relative humidity after 15-30 minutes

→ If above 65%, too wet
OR
If below 65%, good for storage
OR
If below 60%, good for market

Reading a hygrometer for the proper relative humidity.

Since our last article in this PICS Newsletter, the PICS3 group and the group of Purdue's USAID innovations lab FPL have worked with partners in Kenya, Senegal, Uganda, and Malawi to evaluate the perceptions of farmers, extension agents, and grain buyers. We have also conducted studies to determine the willingness of farmers to purchase the hygrometer and engaged a few PICS bags distributors to determine if the hygrometers sales can use the PICS supply chain. We are also working with engineers to make improvements to the hygrometer.

Most farmers and grain handlers are pretty confident about their ability to assess when grain is dry enough for safe storage. Listening to the sound grain makes when shaken or dropped, biting the kernels to determine hardness, and plunging their hand into a sack of maize to feel for resistance are some of the common assessments used. It takes a bit of convincing that their method of assessment is not as good as the hygrometer method. At two training-of-trainers (TOT) workshops in Malawi (May 2016), we were able to change the minds of the participants. The PICS3 team joined with a group at the USAID Feed the Future (FtF) Agriculture Diversification (AgDiv) in Malawi in their effort to promote grain storage in PICS bags. Harvest was in progress so we were able to buy freshly dried maize at the market as well as collect maize still in the field. Using a commercial moisture meter, we determined that the maize

purchased at the market had a moisture content of 16.5% and the field harvested maize was 20%. Without knowing the actual moistures, all of the TOT participants were given samples and asked if they thought the maize was dry enough for safe storage. All of the participants said that the field harvest maize was too wet, and all were sure that the maize from the market was dry and safe for storage. As part of the training exercise, they used the hygrometer method to determine the ERH, which gave them a reading above 80% for the market maize. We also showed them the moisture value measured with the commercial moisture meter. Clearly, everyone became interested in the hygrometer and most wanted to know where they could buy one.



Charlie Woloshuk conducting a training on how to properly use hygrometers.

This story from Malawi provides some valuable discussion. The maize purchased at the market was in a 50-kg woven bag. Through our conversations with farmers we learned that they experience a loss of 3 to 5% loss in weight, which is not attributed to insect feeding. Many believe it is caused by fungi. Actually, this loss is shrinkage, loss of water, due to dry weather conditions that follows maize harvest. We predict that the 16.5% maize we purchased would continue to dry within the woven bag and reach 13% within a month or two. The farmers may lose weight value but the lower grain moisture would prevent fungal growth or aflatoxin accumulation.

An attribute of storing maize in a PICS bag is that moisture level and weight are maintained. Placing the field harvested maize in the PICS bags would lead to its fermentation. The market-purchased maize was dry enough (16.5%) to not ferment in the PICS bag. However, our research indicates that germination would be reduced after a few months of storage. Therefore, the important message is that to assure grain viability and safe storage, maize stored in PICS bags should have a moisture content around 13%, which is less than 65% ERH as measured with our hygrometer.

The Global Community of Practice on Food Loss Reduction (CoP): Promotion of Sustainable Solutions to Reduce Post-harvest Losses

Mireille Totobesola-Barbier, Food and Agriculture Organization – Rome, Italy

The United Nations Rome-Based Agency FAO, IFAD and WFP have been implementing jointly the project '[Mainstreaming food loss reduction initiatives for smallholders in food deficit areas](#)' funded by the Swiss Development and Cooperation agency since 2014. A [Community of Practice on food loss reduction](#) (CoP) has been developed. It is an interactive platform that serves as a global integrator of knowledge to facilitate access to information, linkages, and exchanges amongst stakeholders from the public and the private sector. Food loss analyses on major grain supply chains were conducted in three pilot countries: Burkina Faso, the Democratic Republic of Congo (DRC), and Uganda. These analyses identified major causes of losses along selected supply chains and the critical loss points (CLP) on which interventions need to be focused. Storage at farm level and in warehouses are part of CLP identified. Proven innovative solutions such as hermetic storage technologies have been recommended amongst other options to decrease losses, combined with trainings and capacity building.

Implementation of pilots which included PICS bags in the contexts of Burkina Faso and in the DRC highlighted the need to adapt the models for introducing new technologies by engaging local or regional private sector actors. The solutions need to be accessible to smallholders and their organisations. In Burkina Faso, a local manufacturer supplied 5,000 PICS bags, whereas in DRC, 3,000 bags were sourced from a manufacturer in Tanzania. Mapping suppliers of solutions and equipment facilitates direct linkages between investors, support organisations, end users, and suppliers of PICS bags;



Women learning how to properly use PICS bags at a training in D.R. Congo.

thus the map on the following link is a valuable tool: https://picsnetwork.org/where-we-work/?tab_id=distributor.

A mapping tool updated on a regular basis on the CoP (<http://www.fao.org/food-loss-reduction/resources/map/en/>) has a broader scope covering projects and programmes on food loss reduction and post-harvest management activities. In order to promote a sustainable market-led approach for the scaling up of adoption of proven solutions, the project also engages equipment suppliers to enrich the mapping tool by providing information on the solutions that they offer (not only on storage technologies), contacts and websites, geographic locations to facilitate interactions with actors interested in their technologies. Registration on the CoP is free and quick on <http://www.fao.org/food-loss-reduction/register/en/>.

Farmers Hail PICS bags- The Final Answer to the Perennial Problem of Grain Storage Losses

Busani Ngwenya ADRA Zimbabwe Insiza District Project Coordinator

“As farmers, we used to experience severe post-harvest losses of our crop produce mainly due to pest infestations. It was very difficult for me to store my cowpeas because of their susceptibility to weevils and other pest infestations. We want to thank ADRA for the PICS bags because you won't even see a single weevil in the grain. This is quite encouraging because I know that my family has enough grain until the next harvest and we can retain some of the seeds to plant in the next cropping season.”

- Mlungisi Nkomo narrated how PICS bags have sustainably preserved his maize and cowpeas.

Mlungisi is a 47-year old lead farmer from Mbabala Village of Sidzibe ward, in Insiza District of Matebeleland South Province, Zimbabwe. He is amongst 7,381 farmers who were supported by the Adventist Development and Relief Agency (ADRA) un-

der the Zimbabwe El Niño Relief South (ZEN) Project. Each farmer received four PICS bags of 50kg capacity each. The ZEN Project was implemented from September 2016 to

continued on next page



A field agent speaks to a group of farmers during a PICS bag training event.

October 2017 in response to an official appeal for humanitarian assistance by the Zimbabwean government following a devastating El Niño-induced drought, which left more than 2.8 million people food insecure. The ZEN project sought to ensure that vulnerable households in Gwanda, Umzingwane, Insiza and Bulilima districts have improved food security and recovery capacity. The project was

funded by the USAID's Office of Foreign Disaster Assistance (OFDA) and implemented through a consortium of three organizations: Catholic Relief Services (lead partner), ADRA and Caritas Bulawayo. One of the ZEN project's strategies was to promote and distribute the PICS bag to improve grain storage systems and ensure that farmers have enough grain to consume during the lean season and are in a position to retain quality seed to plant in the subsequent cropping season.

ADRA Zimbabwe facilitated distribution of 29,824 PICS bags to 7,381 farmers in three districts under the ZEN Project. Each farmer received four bags while 75 lead farmers received eight bags. Farmers like Mlungisi Nkomo consider the PICS bags as the solution to the perennial problem of grain loss due to pest infestations. According to the Food and Agricultural Organisation (FAO), in Zimbabwe, pre- and post-harvest crop losses account for 20 - 40% of the yield losses in cereals and pulses. PICS bags therefore provide a simple low-cost method of reducing post-harvest losses of stored grain due to damage by pests.

However, PICS bags are not readily available in Zimbabwe, hence the need to develop a supply chain to make the technology accessible to all farmers and provide opportunities to local businesses. ADRA Zimbabwe is very keen on pursuing connections with regional accredited



Inside a storage area, this man prepares to tie the three layers of his PICS bag.



Farmers proudly showing off their weevil-free grains.

"Normally, if I store grain without any chemical it will not even reach two months before it is affected by weevils and other forms of pests. Sometimes even if you apply chemicals, pests would still damage the grain after some time. I am really surprised to see that my cowpeas and maize are still in very good condition without any chemical treatment. I like the PICS bags because I consume my food without even worrying about the harmful and side effects of chemicals because we didn't apply any. I have seen that it is also easy for my family to budget because the grain is stored in 50kg bags unlike in our traditional granaries where it is very difficult to gauge the level of consumption and the amount of grain that we have at any given time. This technology enables even the poor households who cannot afford the costs of constructing a modern improved granary to store their produce. I applaud the ZEN project for this initiative because even in the past when I had bumper harvest, I would sell the bulk of the produce out of desperation because I knew that even if I tried storing the grain for consumption during the lean seasons, the bulk of it would be damaged by the weevils."

- Mlungisi emphasized

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PICS bag distributors to make the bags available throughout the country including rolling out the initiative to other districts, which were not targeted by the ZEN project.

UPCOMING EVENTS



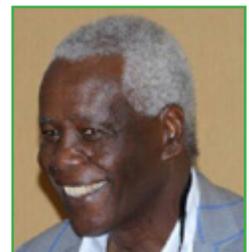
**Innovations in Agriculture:
Scaling Up to Reach Millions**
September 25-27, 2018
West Lafayette, Indiana, USA
purdue.ag/scaleup

Third Purdue Improved Crop Storage Supply Chain Workshop

March 12-14, 2018; Nairobi, Kenya

The PICS3 project and partners are organizing the “Third PICS Supply Chain Workshop” (March 12-14, 2018; Nairobi, Kenya). The main goal of the workshop is to assess progress in developing effective distribution networks to increase PICS bags availability to meet the demand by farmers. Participants will include manufacturers, distributors, vendors, partners who are funding and/or promoting PICS bags, and PICS3 project business and media consultants. Workshop participants will share their experiences and new approaches to improve efficiency in the PICS distribution network.

From all of us here at PICS:



**Happy
Holidays**



*Merry Christmas and a Very
Happy New Year!*



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