

Purdue Improved Crop Storage (PICS)

Purdue Research Foundation



Technology

Purdue Improved Crop Storage (PICS) is a crop storage system designed to prevent insects from destroying stored grains. The system consists of a triple-layer bag made of 80-micron thick, high-density materials that uses a hermetic, i.e., airtight, seal. The bags are more cost-effective than other hermetic containers, such as metal or plastic drums. The bags are also easy to use and avoid the need for storage insecticides.

Researchers

Purdue University researchers Dr. Larry Murdock, Professor, Department of Entomology, and Dr. James (Jess) Lowenberg-DeBoer, Associate Dean and Director of International Programs in Agriculture and Professor, Department of Agricultural Economics, developed the PICS system, which was originally designed for the storage of cowpeas (or black-eyed peas), a key food crop grown by millions of farmers in Africa.

Funding

In 2007, Purdue University launched the Purdue Improved Cowpea Storage (PICS) project, a five-year initiative

supported by an \$11.4 million grant from the Bill & Melinda Gates Foundation (Gates Foundation) with the goal of having 50 percent of cowpeas in West and Central Africa stored with hermetic method by 2012. Bill Gates spoke at a recent convocation of the Association of Public and Land-Grant Universities. While displaying a PICS bag, he told the audience that the three-layered, polyethylene and polypropylene bag costs less than \$2, but is increasing the income of farmers in Central and West Africa by 25 percent. "This bag is actually helping lift 10 million people out of poverty," he told his audience.

Additional research is being conducted on using PICS bags for other crops grown in Africa. The Gates Foundation has provided a \$1.1 million in funding for the PICS2 project.

The Problem

The majority of cowpea growers are women who grow cowpeas along with other crops to feed their families and to generate income. Men growers generally grow cowpeas as a sole crop to sell at market, not to feed their families. Cowpea has great potential to help feed Africa's growing populations.

Insects damage cowpeas before and after harvest. The major pest is the cowpea weevil. A single cowpea weevil female can have as many as 100 offspring in one month resulting in a heavy infestation within two or three months of storage. Each year, up to 50 percent of cowpeas in Africa are lost after harvest because of infestations by cowpea weevils. As a result, farmers often sell their cowpeas at harvest when prices are at their lowest instead of storing the cowpeas and risking loss. Damaged grain is heavily discounted at market.

PICS Project

Purdue University and partner organizations have led efforts to develop and implement hermetic storage technology, focusing on low resource farmers in developing nations of sub-Saharan Africa. Through extension services, demonstrations and training on how to use the PICS bags have been performed in more than 31,000 West African villages. Farmers are often skeptical at first, so several bags are filled with cowpeas during the demonstration. After four to six months, a bag opening ceremony is held. When the farmers see the perfectly stored, undamaged cowpeas, they are convinced that PICS will work for them.

With the small investment of about \$2 per bag, farmers can earn \$25 to \$50 more per bag of cowpeas stored, which is important given a United Nations report states that 45 percent of the population lives on less than \$1 per day. It is estimated that their annual incomes can increase by an average of \$150 by using the PICS bags. Over a five-year period, more than 1.75 million bags were sold in West and Central Africa. PICS bags are used on a large scale in 10 African countries – Benin, Burkina Faso, Cameroon, Ghana, Mali, Niger, Nigeria, Senegal, Chad, and Togo. They have also been used in Rwanda, Afghanistan, Burundi, Ethiopia, India, Kenya, Laos, Malawi, Tanzania, Uganda, Zambia, and Zimbabwe.

The PICS team is entering a new phase of raising awareness of the bags and developing a supply chain for their distribution in African countries where they are not widely used.

Licensing

Lela Agro Industries Nigeria Ltd. (Lela Agro) has licensed the trademarked PICS logo. Located in Kano, Nigeria, Lela Agro's business operations relate to the farming and agriculture industries. Hassan Fawaz, managing director at Lela Agro, said the company would manufacture more than one million PICS bags in 2013, selling most in Nigeria, but exporting around 100,000 to neighboring countries. The company plans to expand production to more than 1.5 million

bags in 2014. "PICS bags are more effective than other bags because they are made of 80-micron thick, high-density materials. They are more cost-effective hermetic containers for most uses than metal drums or plastic jugs," he said. "PICS bags are easy to use, which makes them an improvement upon storage insecticides, which could be misused to harmful effect."

Bell Industries Limited (Bell Industries), a private company registered under the laws of Kenya, has licensed the trademarked PICS logo. Located in Nairobi, Kenya, Bell Industries is a leading agri-business and public health products company and is a leading provider in insecticides, fertilizers, and crop protection products in Kenya and East Africa.

“ *Other companies have manufactured counterfeit bags they claim are PICS and have the same characteristics. These manufacturers will not have access to the PICS logo, which means farmers will be able to differentiate between them.*

Additional Research

The science behind the PICS bags continues to help in the education of Purdue Agriculture students. Researchers originally thought the weevils die in the bags from suffocation, but research by Dr. Murdock found that the insects die of thirst because of their metabolic processes. The PICS project has led to a new understanding of science giving students a better understanding of insects.

While the original purpose of the PICS system was to protect cowpeas from infestation during storage without the use of pesticides, researchers are conducting tests to determine if the system works with other crops grown in Africa, including corn, sorghum, rice, couscous, hibiscus seed and cassava chips, which are similar to tapioca. The potential impact is much larger given corn is grown over a much wider area.

Given the likely expanded use beyond cowpeas, the original name, Purdue Improved Cowpea Storage, is changing to Purdue Improved Crop Storage (PICS). The first PICS with Cowpea is trademarked and a trademark application was filed on the new PICS with Crop.

Testimonials

Sani Moussa, who grows cowpeas in the Maradi Region of Niger, has used PICS since 2010. Before then, weevils destroyed the crops he stored. "I remember storing three sacks of cowpeas and after four months in storage there was nothing left," he said. "Because I could not store grains for a long time, I had to sell them when prices were low. Consequently, the production could not cover daily needs, including socio-economic needs, such as marriages and naming ceremonies." Using the PICS system allows Moussa to store more of the harvest for longer periods. "With the arrival of the PICS bags, my storage increased three times that I had before because I had no fear of losses due to insect damage," he said. "I can now wait to sell until the period when cowpea prices are high and increase my profits."

Moussa Maman, who also grows cowpeas in the Maradi Region, has used PICS since 2009. Before then, he lost more than 50 percent of his grain in storage due to cowpea weevils. As a result, he had to sell his harvest when prices were low. "Now that I use PICS, I can store two or three times the quantity that I could store before. My income also has increased two or three times," he said. Maman said there are fewer worries with the PICS system. "One no longer has any worries about storing food. People gain a benefit from their production," he said.

Awards

In 2012, Dr. Murdock and Dr. Lowenberg-DeBoer were awarded the Chevalier de l'Ordre National du Burkina Faso for

their work with improving cowpea storage. This award is the highest honor given by the West African nation of Burkina Faso and is the equivalent to the U.S. Presidential Medal of Freedom. This award is rarely given to foreigners.

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