

Feeding the Future

Postharvest and Agro-processing (PHAP): Theme 2 newsletter

December 2014



Leony Halos-Kim, SAA's PHAP Director demonstrating grain storage in sealed plastic tank and conducting training on storage management in Bugiri, Uganda.

Rural women and service providers benefit from PHAP

Around 5,000 women processors in Ethiopia, Mali, Nigeria and Uganda – the Sasakawa Africa Association's four focus countries – are now engaged in agro-processing enterprises; processing and packaging maize, rice, groundnuts, cassava, spices, milk, animal feed and confectioneries.

In Ethiopia alone, SAA's Postharvest and Agro-processing (PHAP) Extension team has established 25 agro-processing enterprises, benefiting over 3,400 members of rural women's agro-processing groups. This led to an MoU being signed last year with the Ethiopian Transformation Agency, to scale-up agro-processing centers in four regional states.

Participation in cooperatives has enabled income generation and protection against the risks of economic shocks. This has improved the quality of life for rural families – in some cases enabling women's cooperatives to start side businesses, while creating further job opportunities.

"I am delighted with the progress made by PHAP – and the beneficial impact it is having on women's groups in rural areas;"
Professor Ruth Oniang'o, Chairperson of SAA.

Exceeding targets

The number of private service providers for postharvest handling operations, such as threshing, shelling, rice milling and groundnut shelling, is also on the rise, reaching 425 by mid-2014. This is over the targeted number of 364 by the end of 2016. Private service providers are reporting satisfaction with the way business is providing them income and are happy to help the smallholder farmers handle their operations more efficiently.

Uganda alone recorded 81 private individuals in 2013 purchasing different postharvest machines and providing services in their communities. Farmers have started to use maize shelling service providers allowing them to quickly shell maize before deterioration. In Ethiopia, threshing/shelling service providers are now

over 300. One service provider reported an income of US \$5,000, in two months, from the provision of maize shelling services. In Nigeria, rice and groundnut oil processors are providing services to other processors that add to their income.

The PHAP team is committed to encouraging more private entrepreneurs, especially the youth in the rural areas, so that more farmers and agro-processors can access their technologies.

Overcoming losses

Losses due to insects in storage at the farm level have been significantly reduced to a negligible level, owing to effective promotion of, and training on, appropriate postharvest handling and storage technologies. Hermetic storage facilities have been adopted in the focus countries. Benefits of such technologies include improved quality and food safety, resulting in enhanced smallholder farmers' food security and income. For example, economic analysis in Uganda found an income advantage of approx. \$700 per ton of maize stored in plastic tanks for 3-4 months.

Training stakeholders

PHAP has created the Postharvest and Agro-processing Extension and Learning Platform (PHELP) which acts as a model to disseminate information and train stakeholders on improved postharvest and agro-processing technological options. Despite challenges, these are evolving into self-sustaining agro-processing enterprises.

"We are well on track to realizing specific outcomes of SAA's Strategic Plan 2012-2016," comments PHAP Director Leony Halos-Kim.

A history of agro-industrial development

The Sasakawa Africa Association's Postharvest and Agro-processing theme (or theme 2) has its roots in the pioneering Postharvest Engineering Unit originally headed by Dr Yong Woon Jeon, an agricultural engineer and rural sociologist at the International Institute of Tropical Agriculture (IITA) in Nigeria. Dr Jeon began to develop small-scale agricultural machinery in South East Asia during the 1970s and 1980s largely related to rice harvesting and processing. While at the International Rice Research Institute (IRRI) in the Philippines, he developed a range of equipment appropriate for the rural areas of developing countries.

When he moved to IITA in the late 1980s, he was joined by Leony Halos (later Leony Halos-Kim), an agricultural engineer at IRRI. Their first challenge was to develop improved technology for the production of fermented flour from cassava, called gari, a staple food in Nigeria and much of West Africa. They studied every step of the gari production process, and began to develop, successfully, small-scale machinery – hand and motor powered – to improve the laborious traditional processes.

This attracted the interest of a former Japanese overseas volunteer, Toshiro Mado, who was working in Ghana for SAA to improve the profitability of various agro-processing enterprises. His research led him to IITA in 1993, where he was introduced to the Postharvest Engineering Unit. In 1994, SAA and IITA established a collaborative agro-processing project – with IITA

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Newsletter of the
Sasakawa Africa Association

SAA Founders:
Mr. Ryoichi Sasakawa,
Dr. Norman E. Borlaug,
President Jimmy Carter

The importance of partnerships

Partnerships have been critical to SAA's strategy since its inception. The PHAP team works in partnership with public and private entities due to the various sectors involved in the value chain; from processing products to bringing them to market.

Public entities are crucial for researching product development and food quality analysis, as well as supplying local technologies to farmers. PHAP collaborates with EHNRI (Ethiopia Health and Nutrition Research Institute), Mechanization Research Institute in Ethiopia, BUK (Bayero University in Kano, Nigeria) - Engineering Department (Training of Technicians), NSPRI (Nigeria Stored Products Research Institute) and UIRI (Uganda Industrial Research Institute).

Private entities include service providers for the supply of technologies, spare parts and post-sale services. They are active partners who enable farmers and processors to access technologies which improve efficiency and livelihoods.

PHAP has also collaborated with a range of development organizations:

- JICA: JPP (JICA Partnership Project) has provided funding to nine women groups in Ethiopia for the development of sustainable agro-processing enterprises. In Uganda, JICA collaboration has focused on improving the rice postharvest system, and deploying JOCVs (Japan Overseas Cooperation Volunteers).
- WFP (World Food Program) in Ethiopia has provided funding to SAA to train farmers' Cooperative Unions (CU) and their Primary Cooperative (PC) members on proper handling of grains and legumes, resulting in increased supplies of good quality grains to the P4P program and other markets.
- AGRA (Alliance for a Green Revolution in Africa) provided funding for a three year project in Mali on improving grain postharvest handling and capacity development to improve farmers' access to markets.
- USAID/MARKETs Project in Nigeria contracted SAA to provide technical support to improve maize shelling, drying and storage. In 2014, the collaboration has expanded to include support for soybean postharvest handling and processing.
- SDRTVC (Selam David Röschli Technical and Vocational College), an NGO in Ethiopia, hosted the SAA Agro-processing Program for 10 years to develop and adapt selected PHAP technologies. The collaboration resulted in adaptation of different technologies which are now part of the technologies being promoted in the four countries: multi-crop thresher, grain cleaner, modular rice mill, reaper/harvester, wet-type grinder.
- GrainPro has assisted SAA with hermetic solutions for storage and drying and identified sample test kits for aflatoxin (see back page).
- ATA (Agricultural Transformation Agency) in Ethiopia has provided funding to SAA to scale up the project on enhancing the economic capacity of women through agro-processing enterprises, learning from the experiences of the JPP-assisted women groups.

Message from Managing Director

The Postharvest and Agro-processing (PHAP) Extension theme is one of five thematic program areas introduced in 2009 through the restructuring of SAA in response to the changing demands of the smallholder agricultural sector. The five themes are part of a matrix management approach that interacts with the development programs and projects in our four focus countries, Ethiopia, Mali, Nigeria and Uganda. The PHAP theme (theme 2) aligns itself to SAA's value chain-oriented extension strategy by supporting activities in theme 1 – and enhancing crop productivity as a result. It also links up with our other themes – public private partnerships and market access, human resource development, and monitoring, evaluation, learning and sharing.

PHAP's main objective is to improve postharvest handling, storage and the processing of agricultural produce to reduce losses in order to increase income and improve the livelihood of smallholder farmers and agro-processors.

This is particularly relevant for women's groups where promoting improved agro-processing technologies and techniques empowers rural women socially and economically. Thus they are learning to provide good quality food for processors and their families, and ultimately for the marketplace. As their income increases, they strengthen their participation, role and decision-

Theme 2: Country case studies

Ethiopia

The Ministry of Agriculture, in its agricultural development strategy, has given emphasis to utilization of improved postharvest and agro-processing technologies for value addition, to contribute to food security and increase farm income.

In line with this, the PHAP theme of SAA/SG 2000 supports the Ministry's effort by popularizing labor saving and quality improving technologies, such as multi-crop threshers/shellers, improved storage structures and small agro-processing equipment, to add value to primary products.

Encouraging results have been observed in adoption of multi-crop threshers benefiting thousands of smallholder farmers. Many of the women agro-processing groups have added value to their primary products and accessed local markets, thereby increasing household income. Although there is progress in popularizing storage structures, more needs to be done to show impact.

The best practices that have been realized need to be scaled up by the Ministry, with its development partners, to reach millions of farmers in order to achieve the agricultural development targets of the country.

Business is on the rise

In October 2014, exactly a year after the JPP-supported project ended, the Theme 2 Director visited the Jiru Seresa Processing Cooperative in Haramaya, Ethiopia, to check on progress. To her delight, she was greeted by happy faces and reports that business is on the rise, despite the cost of regular repair and maintenance. The women processors now supply pasteurized milk to schools, in addition to the families around them. Their cafeteria is popular among travelers and their function room rental is adding to income. The group are not only self sufficient but their income is increasing. They expressed their thanks to the Embassy of Japan, JICA, the Bureau of Agriculture, Cooperatives Bureau, and SG 2000.



The Jiru Seresa Milk Processing Group in Haramaya, Ethiopia, during a visit from the PHAP team

making authority in their families and communities. This process is already delivering positive results.

Agro-processing groups are benefiting, too, from the establishment of the Postharvest and Agro-processing Extension and Learning Platforms (PHELPS) – which are linked, where possible, to existing farmers' training and marketing centres, or where farmers bring their produce for collective marketing.

At the PHELP, technological options in the form of small-scale agricultural machinery are demonstrated and can host training and field days for rural farmers. This is still an evolving process, varying from country to country.

In 2014, five new staff have been recruited by SAA to strengthen the Postharvest and Agro-processing team which now has 15 members, and has been led by Theme 2 Director, Leonides Halos-Kim, since 2010.

This special edition of Feeding the Future concentrates on this rapidly emerging sector, which SAA helped to pioneer and now leads – and in which the private sector is playing an increasing role.

Mali

PHAP, in line with Mali's agricultural development policy, is contributing to meeting the strategic objectives of the Comprehensive Africa Agriculture Development Programme (CAADP), by enhancing the productivity and the competitiveness of food commodity value chains, by transferring technologies related to the mechanization of agriculture. Theme 2 is also improving the quality of products through the modernization of postharvest handling and agro-processing operations, including enhanced marketing practices.

With funding from AGRA, PHAP has established and promoted the Postharvest and Trading Center (PhTC) in Sikasso Region, which is providing farmers with access to good postharvest and agro-processing services. PHAP, in collaboration with Public Private Partnerships and Market Access (Theme 3), has also encouraged the formation of farmer based organizations through the management of PhTCs for improved marketing of their products. The PhTC is serving as a learning platform for enterprise development. The model will also be promoted in other regions of the country.

Experiences at the Postharvest and Trading Center (PhTC), Fanidiana

In Fanidiana Village PHAP has established a PhTC and equipped it with a rice thresher, cleaner, rice parboiling unit and mill, manually-operated groundnut sheller, maize sheller and cleaner; and have trained the operators on how to use the equipment. The mobile units – sheller and cleaner – are used to provide services to farmers in the village and the Center has proved popular with farmers coming to use the rice mill, groundnut decorticator and rice parboiling unit. Women are being trained on developing their rice parboiling enterprises.

The need for repair and maintenance required the group to purchase a welding machine (welder) which is also used for the fabrication of chairs, beds, etc: an added source of income for the farmers. The group also constructed a warehouse for collective storage and marketing. The PHAP team conducted training in proper warehouse management accordingly.

With the increasing number of users, 21 farmers in Fanidiana have contributed to the purchase of one multi grain thresher and 20 groundnut decorticators to serve more farmers. They were linked to a microfinance institution for the necessary capital, and suppliers to ensure quality of equipment.



Groundnut sheller in Fanidiana Village, Sikasso Region, Mali

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focusing on technology generation, and technical backstopping for equipment fabricator training, and SAA concentrating on farmer groups (largely made up of women) who could use the IITA technology and equipment to develop agro-processing micro-enterprises.

A major step forward was taken in 2003 when SAA launched the

Agro-processing Project (SAA-AP) to develop techniques and management skills to establish "small-scale appropriate and sustainable processing enterprises that were easily manageable and required little capital investment."

SAA-AP was initially implemented in Ghana and Benin – while opportunities for assisting agro-

Nigeria

To mainstream SAA's activities into Nigeria's national agricultural program, SAA has developed user and environmentally friendly, cost effective and scalable programs aimed at smallholder, emerging commercial farmers, with a view to raising productivity and incomes. One development area identified by SAA is transforming agriculture into a profitable venture. SAA's approach is to improve smallholder farmers' techniques to increase crop production. This approach is being supported with skills, backstopping and linkages towards accessing credit and acquiring inputs and markets for farmers' produce.

Through the identification, testing and demonstration of appropriate postharvest handling, storage and processing technologies, SAA's PHAP Program is significantly contributing to Nigeria's Agricultural Transformation Agenda.

The program has successfully introduced and supported service provision on threshing and shelling, and rice milling, as well as developing agro-processing enterprises with women groups processing cassava, rice and groundnuts.



A Nigerian farmer from the Tunga Women Rice Processing Group in Gombe State with her product (parboiled rice), which with SG 2000's support is now graded, packaged, sealed and labelled with their seal of quality, before retail in markets

Uganda

According to a recent study carried out by Uganda Cooperative Alliance (UCA) and Uganda National Farmers Federation (UNFFE), most farmers in Uganda incur significant losses during harvest (64%), drying (10%), and storage (12%).

In Uganda, PHAP extension is promoting postharvest handling and storage technologies that are aimed at reducing postharvest losses, improving product quality, adding value to the produce for improved market access and enabling farmers to obtain premium prices for their products. Some notable achievements are:

1. Trained 1,312 field extension agents, 46 artisans, 339 agro-processors, 121 private service providers and 100,338 farmers on postharvest handling, storage, quality standards and processing technologies.
2. Conducted demonstrations of 13 types of PHAP technologies for harvesting, drying, threshing/shelling, and hermetic storage of grains at farm level. Hermetic storage is enabling farmers to secure their food grains for more than three months selling them at 20 to 120% of the market price immediately after harvest. Facilitated establishment of agro-processing enterprise for women who are trained on technical and management requirements of the enterprise.
3. Supported more than 80 private entrepreneurs to provide postharvest handling and processing services to farmers and processors.



Lubale Yusuf bought his maize sheller in June 2014 and has already shelled 420 tons of maize for 250 farmers in Kamuli District, Uganda.

processing in other SAA countries, including Ethiopia, Guinea, Uganda, Mali, Mozambique and Nigeria, were also investigated. The project was headed by Toshiro Mado, with Leony Halos-Kim as a consultant.

In 2004, the late Chris Dowsell, then SAA's Director of Communications, wrote: "When the SAA-IITA collaboration began,

relatively few organisations were engaged in the development of appropriate technology and local manufacturing capacity. Today, there is a growing consensus that value-adding enterprises are critical to poverty reduction in Africa and to agriculture-led industrial development."

Oxygen-free storage prevents food losses

During PHAP's needs assessment interviews, farmers reported that crop and food losses occur frequently in their stores and local granaries. The losses are caused by insect infestations, which can be detrimental after one month of storage, and consumption by rodents. Some farmers reported using chemical controls but such methods can be dangerous when not applied properly.

The PHAP team conducted training on proper storage management, while identifying which storage facilities can be effective at farm level.

Storage facilities identified included imported technologies such as Super Grain Bags (SGB) and the Cocoon bag supplied by GrainPro®; metal silos introduced by CIMYTT; and the PICS (Purdue Improved Cowpea Storage) bag. These technologies apply the principle of oxygen-free storage which has proven effective in controlling insect pests in storage, including rodents. The hermetic storage of grains is an ancient practice; however farmers are only now appreciating the effectiveness of such methods.

Plastic water tanks

To reduce cost and ensure the facility is available locally, the PHAP team adapted the plastic water tank (container) with a rubber sealing and demonstrated it in Ethiopia, Nigeria and Uganda, to store maize and beans side-by-side with the imported technologies. After six months the plastic tanks were opened and no sign of

insect infestation was observed. One farmer, Mrs Florence from Uganda, was thrilled that she was seeing 'maize as good as newly harvested grain' with its initial luster. She has now used the tank for 18 months and her grains are still in good condition, free from insect infestation, and even rodents cannot gnaw on the plastic container.

The plastic tanks were especially appreciated by women farmers in Uganda because they are locally available in different sizes; have zero cost to fumigants; are insect- and rodent- proof; and are easy to manage. Economic analysis found an income advantage of approx. \$700 per ton of maize stored in plastic tanks for 3-4 months. Consequently, there has been immediate uptake of the technology, yet more needs to be done to inform a greater number of farmers.

Metal silos

Metal silos, already popular in Kenya, were re-introduced to Ethiopia in 2013 in collaboration with CIMYTT. Grains (maize, sorghum and beans) were stored



Ethiopian farmers appreciating the quality of maize after storage in metal silo for nine months

and fabricators were trained to supply anticipated demand. Grains stored in the metal silos for up to nine months were found insect-free, whereas grains stored in ordinary bags were heavily infested and eaten by insects. Farmers have been impressed with the results and demand for silos is on the increase.

Trained manufacturer, Ato Negussi Gashaw of Bure Woreda (district), Ethiopia sees good prospects for the business and hopes to build and supply at least one silo per household in his community. One mother who witnessed the opening of a silo, and now hosts one of the

demonstration platforms in Ethiopia, expressed her satisfaction with the new storage method saying, 'We shall not sift again and eat left-over grains from insects and rodents... We have enough good grain even after three months.'

SGB and PICS Bags

SGB and PICs bags are improved bags which seal off oxygen-exchange with the environment. They can hold up to 100 kg of produce, depending on the grain. Both bags, if properly sealed, can prevent insect infestation but require very careful handling and are not completely rat proof.

BE IN THE KNOW. What is Aflatoxin?

Aflatoxin is a toxic, carcinogenic substance which can lead to serious health risks, including liver cancer. It is produced by *Aspergillus flavus* and *Aspergillus parasiticus* species of fungi. Aflatoxin-producing members of *Aspergillus* are common and widespread and can colonize and contaminate grain before harvest or during storage. Host crops including maize, sorghum and groundnuts are particularly susceptible to infection following prolonged exposure to high-humidity environments, or damage from stressful conditions, such as drought.

Aflatoxins commonly contaminate cassava, chilies, corn, cotton seed, millet, peanuts, rice, sorghum, sunflower seeds, tree nuts, wheat, and a variety of spices intended for human or animal consumption. When processed, aflatoxins get into the food supply. Aflatoxin transformation products are sometimes found in eggs, milk products and meat after animals are fed contaminated grains.

The danger is real but how can we reduce it? Recently, SAA/SG 2000 PHAP theme has scaled-up its Aflatoxin awareness campaign advising smallholder farmers to clean, dry and store their produce properly to prevent the fungus from growing. Frontline extension agents are trained on the dangers of aflatoxin, which they pass on to farmers in their communities. Informed farmers tend to adopt improved postharvest handling, storage and processing practices. PHAP will continue to raise awareness to reduce the dangers of Aflatoxin exposure, especially among rural families.



Extension agent in Uganda testing aflatoxin in the lab

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