

Integrating Gender and Nutrition within Agricultural Extension Services

Technology Profile

Type of Technology:
Physical

PICS Bags

March 2016

This profile was compiled by Elizabeth Hohenberger, University of California – Davis, with input from Cultural Practice, LLC.

The **Integrating Gender and Nutrition within Agricultural Extension Services (INGENAES)** project works to improve agricultural livelihoods focusing on strengthening extension and advisory services to empower and engage smallholder farmers, men and women. The technology profiles support INGENAES's goal of improving the dissemination of gender-appropriate and nutrition-enhancing technologies and inputs to improve women's agricultural productivity and enhance household nutrition. The technology profiles identify issues and opportunities to make technologies more attractive for men and women farmers, to increase men's and women's benefits from using technologies, and to design distribution models for extension agents, input suppliers, and mobile devices to get the technologies into men's and women's hands.

Sixty percent of Zambians live in fairly remote rural areas with very limited infrastructure in the way of roads, water or electricity. Poverty and stunting levels are very high across the country, and particularly in Eastern Province where the technology assessments were conducted. Agricultural productivity is particularly low in Zambia with only 50 percent of agricultural enterprises using fertilizer.

In Zambia, 78 percent of women are engaged in agriculture whereas 69 percent of men are engaged in agriculture (Sitko et al. 2011). Women are also responsible for domestic food production and household nutrition. However, women farmers in Zambia often do not own or control most productive resources, are disproportionately excluded from decision-making processes, and are less likely to benefit from of public services, such as extension services (Sitko et al. 2011). Few women have land in their own name (USAID n.d.). They are disadvantaged by poor access to information, communications, infrastructure and markets, and reduced access to training and education. Limited access to and control of resources and services frequently results in lower crop yields for women, and women's income-generating abilities are also constrained by their primary task of producing agricultural products to meet household consumption needs (Sitko et al. 2011). Results from the Women's Empowerment in Agriculture Index showed that only 40 percent of women in households with both adult men and women in the Eastern Province Feed the Future Zone of Influence have achieved gender parity. Lack of control over use of income and limited access to assets were particularly strong contributors to this lack of parity (Feed the Future FEEDBACK 2013). Zambia would benefit from improvements in small-scale agricultural production and processing, and reaching women is a necessary approach given their active participation and potential.

Technology Design and Dissemination

The Purdue Improved Crop Storage (PICS) triple layer bags are designed to store crops and reduce post-harvest losses from pests such as bruchids, also known as weevils. Researchers from the USAID-funded Bean Cowpea Collaborative Research Support Program (CRSP) designed the PICS bags in 1986 to be easy to use, constructed from available and local materials, and to maintain the nutritional quality of the stored grains (Murdock and Baoua 2014). To use the PICS bags farmers pour grains into a polyethylene bag and tie it shut, then place that bag into a second polyethylene bag, which is then sealed. The double bag is then placed into a woven polypropylene bag and sealed. The hermetic seal shuts out oxygen and raises carbon dioxide levels to kill and prevent infestation from weevils. Farmers can easily open and reseal the bags as needed (Murdock et al. 2003).

In 2007 PICS bags were disseminated and widely adopted in West and Central Africa through the PICS project funded by the Bill and Melinda Gates Foundation (Murdock and Baoua 2014). Since then over 1.8 million PICS bags have been sold in five West African countries (Ibro et al. 2014). PICS bags were originally tested on cowpeas, but more recently the PICS project is testing the efficacy of PICS bags to reduce pest damage in other crops like maize, sorghum, wheat, rice, peanut, common bean, hibiscus seed, mung bean, pigeon pea and bambara groundnut. The project has also expanded its scope to increase employment opportunities in the production and dissemination of PICS bags (Purdue University 2015). The PICS project disseminates bags through local distributors, agro-dealers, farmers, cell phone vendors, and entrepreneurs (Hays et al. 2014).

In Zambia, PICS bags are not as widely distributed or adopted as they are in West and Central Africa. Catholic Relief Services, through the Feed the Future Mawa project (2012-2017), in partnership with Purdue University and Zasaka has performed demonstrations of PICS bags with farmers through its agricultural extension program (Feed the Future Zambia Mawa Project 2014). In 2015, 3,611 PICS bags rebranded as saka nkhokwe were purchased by farmers following those demonstrations (Feed the Future Zambia Mawa Project 2015). PICS bags are also disseminated to farmers through the USAID-funded Production, Finance, and Improved Technology Plus (PROFIT+) program implemented by ACDI/VOCA. On average PICS bags cost ZMW12-15 per bag and are manufactured at only one site in the capital, Lusaka.

Gender analysis

PICS bags were recently introduced to Zambia and are used to store maize and cowpeas. In Zambia, large amounts of maize, grown primarily for consumption, are lost during pre- and post-harvest (Mulunga and Kandiwa 2015). Weevils are the primary cause of post-harvest loss in maize, particularly for hybrid varieties. Maize is commonly stored in outdoor structures called nkhokwe typically controlled by women who manage the food stock (Mulunga and Kandiwa 2015). Maize is also stored in “common bags” and chemicals are often applied to ward off pests. These chemicals can be costly to farmers. Increased use of

BOX I DATA COLLECTION

Data collection for the technology assessment occurred in the Eastern Province region of Zambia from July 13 – July 18. Most interviews and focus group discussions were coordinated through Zasaka and the Mawa project.

Four focus group discussions were held with men and women farmers. The first group included 1 man and 3 women, group two included 6 men, group three included 15 men, and group four included three men and 1 woman. One man who is a private extension agent was also interviewed.

Men and women used PICS bags to store maize and cowpea. Most of the men and women farmers accessed the PICS bags through their farmer association targeted by Zasaka. These farmers had been using the PICS bags for a year. On average farmers used one two PICS bags for part of their harvest, using common bags for the rest of their harvest.

PICS bag technology in Zambia has the potential to decrease post-harvest losses of maize and other crops caused by weevils, improving food security and income generation opportunities.

While there is a dearth of research on men's and women's use of PICS bags in Zambia, research in West and Central Africa, where PICS bags have been disseminated more widely, shows that targeted farmers are adopting the technology. For example, in Nigeria and Burkina Faso 34 percent of targeted farmers' harvest was stored in PICS bags compared to seven percent in villages not targeted. A weighted average of 46 percent of women who were targeted adopted the technology in Niger, Burkina Faso, and Nigeria (Ibro et al. 2014). While, there has been uptake by men and women, in Burkina Faso and Niger, research shows that the distance of the retail outlet from a village affects adoption, particularly for women who may have time or mobility constraints (Baributsa 2013).

In Zambia, both men and women reported learning about the bags through the Feed the Future Mawa project partner Zasaka's demonstration. Each farmer interviewed said he or she had personally made the decision to use PICS bags after watching a demonstration of how the bags are used. The bags were only available for purchase through the Mawa project and Zasaka.

This gender analysis explores potential constraints and opportunities for men's and women's use of the PICS bags in Zambia based on field research in 2015 (Box 1). It examines how the use of the technology impacts men's and women's access to quality food, men's and women's time and labor, and income.

Food Availability and Quality

Men and women reported how use of PICS bags reduces post-harvest losses thus increasing the amount of food available to farmers. Men said that PICS bags saved 20 to 30 percent of the crop from spoiling and therefore being wasted. Both men and women farmers reported that when they used PICS bags their grains kept well and as a result there was more food stored for the household.

The grains stored with PICS bags are of better quality than grain stored using other methods. A few men described how their meals are good and clean because they used PICS bags. A few women said that the nutritional value of grains improved because there were no chemicals or weevils, echoing a nutritional message from the Feed the Future Mawa project. When using common bags farmers often apply chemicals to combat pests. These chemicals create residues on the grain and may acquire an undesirable odor, reducing the quality of the grain (Baributsa 2013).

Evidence also suggests that PICS bags can prevent aflatoxin infestation, which is a highly dangerous mold (Williams et al. 2014). Although farmers did not report instances of mold they explained that the grains did not spoil and were therefore of better quality. Maize is one of the most important food commodities in Zambia making up about 90 percent of food consumed (Mulunga and Kandiwa 2015). Reducing aflatoxin through storage in PICS bags will have health and nutritional benefits for men, women, boys, and girls.

Time and Labor

Farmers save some time and labor when using PICS bags compared to other methods of storing grain. Men and women reported saved time using PICS bags compared to the common bags because they did not have to apply chemicals every three months. A private extension agent with Zasaka said using the PICS bags could save women time because they would not have to wash the grains before putting them in the PICS bags like they would with common bags. A few women reported that the PICS bags saved them some time, but not much. Most farmers reported no or little change in time spent bagging grains when using PICS bags. This was partly because farmers on average were only using one to two PICS bags. Men and women farmers also reported that the bags were not affordable, averaging ZMW12-15 per bag, limiting the number of bags they could purchase.

Income and Assets

PICS bags can improve the quality of the grain and selling price. A few women explained that the quality of stored grain was better when using PICS bags. Since the grain was of higher quality it could be sold for a higher price. Many farmers, however, did not report an increase in income from using PICS bags because low rains over the year reduced their overall harvest.

In Zambia men tend to dominate marketing activities and control income derived from the sale of crops including crops stored in PICS bags. Similarly, men largely control the sale of maize. Some women sell maize as feed to mills in Lusaka after it has been processed in hammer mills (Farnworth 2011). Men's control over marketing and income suggests that increased income generated through the sale of higher quality maize and cowpeas stored in PICS bags would largely be controlled by them.

Issues and Opportunities

PICS bags can enhance the quality of grain, which could improve the health of men, women, boys, and girls consuming the grain and increase farmers' income. Increased use of PICS bags has the potential to reduce aflatoxin in grain, which would mitigate health risks associated with consuming the dangerous mold. The gender analysis also suggests that storage of maize in PICS can improve the quality and therefore the selling price of maize; however, it is unlikely that women will have direct access to that additional income because it is largely controlled by men.

Currently, PICS bags are distributed through the Mawa and Profit+ projects. If demand for the bags increases efforts should be made to ensure that men and women have equitable access to distribution centers. In Burkina Faso and Niger, women in particular had difficulty accessing PICS bags at points that were far away from the village (Baributsa 2013). Dissemination strategies should consider the different constraints men and women face accessing PICS bag distribution centers to ensure that both men and women can purchase the bags.

References

Baributsa, D., C. Dabire, K. Sawadogo, and J. Lowenberg-DeBoer. 2013. "Increasing women's participation in cowpea storage activities: The case of Burkina Faso." *Journal of Agricultural Extension and Rural Development*. 5 (10): 232-239.

https://www.researchgate.net/publication/261696611_Increasing_women%27s_participation_in_cowpea_storage_activities_The_case_of_Burkina_Faso

Farnworth, C., V. Akamandisa, and M. Hichaambwa. 2011. Zambia Feed the Future Gender Assessment. Washington, DC: USAID.

<http://static1.squarespace.com/static/551bb3ade4b0404100c31678/t/5628f381e4b0b08f4a3ea876/1445524353383/Farnworth+Akamandisa+Hichaambwa+Feed+the+Future+Gender+Assessment.pdf>

Feed the Future FEEDBACK. 2013. Feed the Future Zambia Zone of Influence Baseline Report. Rockville, MD: Westat. <https://feedthefuture.gov/resource/zambia-feed-future-baseline-report>

Feed the Future Zambia Mawa Project. 2014. Mawa Project FY2014 Annual Report. Washington, D.C.: USAID. http://pdf.usaid.gov/pdf_docs/PA00KS4R.pdf

Feed the Future Zambia Mawa Project. 2015. Mawa Project FY2015 Annual Report. Washington, D.C.: USAID. http://pdf.usaid.gov/pdf_docs/PA00KS4Q.pdf

Hays, K, J. Reynolds, and J. Mital. 2014. *Zasaka: Post-Harvest Grain Storage in Zambia*. D-Lab I: TTP 289A. Cambridge, MA: International Development Innovation Network.

<https://www.idin.org/sites/default/files/resources/UC%20Davis%20Zasaka%20Spring%202014.pdf>

Ibro, G., M. Sorgho, A. Idris, and B. Moussa. 2014. "Adoption of cowpea hermetic storage by women in Nigeria, Niger and Burkina Faso." *Journal of Stored Products Research*, pp.87-96.

<http://www.sciencedirect.com/science/article/pii/S0022474X14000216>

Mulunga M. and V. Kandiwa. 2015. *Gender Analysis of Maize Post-Harvest Management in Zambia: A Case Study of Chipata and Katete Districts*. Bern: Swiss Agency for Development and Cooperation SDC.

https://www.shareweb.ch/site/Agriculture-and-Food-Security/focusareas/Documents/phm_sdc_egsp_gender_analysis_zambia.pdf

Murdock, L.L. and I.B. Baoua. 2014. "On Purdue Improved Cowpea Storage (PICS) technology: Background, mode of action, future prospects." *Journal of Stored Products Research*. 58: 3-11.

<http://www.sciencedirect.com/science/article/pii/S0022474X14000204>

Murdock, L.L., D. Seck, G. Ntoukam, L. Kitch, and R.E. Shade. 2003. "Preservation of cowpea grain in Sub-Saharan Africa – Bean/Cowpea CRSP Contributions." *Field Crops Research*. 82 (2-3): 169-178.

<http://www.sciencedirect.com/science/article/pii/S0378429003000364>

Purdue University. 2015. Purdue Improved Crop Storage.

<https://ag.purdue.edu/ipia/pics/Pages/home.aspx>

Sitko, N.J., Chapoto, A., Kabwe, St., Tembo, S., Hichaambwa, M., Lubinda, R., Chiwawa, M.M., Heck, S., and Nthani, D. 2011. *Technical Compendium: Descriptive Agricultural Statistics and Analysis for Zambia in Support of the USAID Mission's Feed the Future Strategic Review*. Working Paper No. 52. Lusaka: Food Security Research Project. <http://www.aec.msu.edu/agecon/fs2/zambia/index.htm>.

USAID. n.d. *Country Development Cooperation Strategy 2011-2015*.

<https://www.usaid.gov/sites/default/files/documents/1860/USAIDZambiaCDCS30Sept2011.pdf>.

Williams, S., D. Baributsa, and C. Woloshuk. 2014. "Assessing Purdue Improved Crop Storage (PICS) bags to mitigate fungal growth and aflatoxin contamination." *Journal of Stored Products Research*. 59: 190-196. <http://www.sciencedirect.com/science/article/pii/S0022474X1400085X>

© INGENAES 2016

This work is licensed under a Creative Commons Attribution 3.0 Unported License.

Technical editing and production by Kathryn Heinz.

This report was produced as part of the United States Agency for International Development (USAID) and US Government Feed the Future project "Integrating Gender and Nutrition within Extension and Advisory Services" (INGENAES). www.ingenaes.illinois.edu

Leader with Associates Cooperative Agreement No. AID-OAA-LA-14-00008. The report was made possible by the generous support of the American people through USAID. The contents are the responsibility of the authors and do not necessarily reflect the views of USAID or the United States government.

