

# Needs Assessment of Smallholder Farmers in Eastern Zambia



D-BRIEF from MIT D-Lab Scale-Ups – Spring 2016

## RESEARCH OBJECTIVES

**Determine** what challenges smallholder farmers face at their farms and homes

**Understand** what opportunities there may be for improvement or new solutions to support smallholder farmers

**Identify** existing gaps, unmet needs, and aspirations of smallholder farmers

**Document** current crop storage behaviors of smallholder farmers

**Learn** what users and non-users think about existing crop storage technologies

## Improving productivity, profit, and quality of life for smallholder farmers

In August and September of 2015, an MIT D-Lab team conducted a study with smallholder farmers and other stakeholders in eastern Zambia to gain an understanding of current farming practices and related challenges, needs, and aspirations. D-Lab worked closely with Zambian agricultural company Zasaka, co-founded by Carl Jensen (a 2015 D-Lab Scale-Ups Fellow) and Sunday Silungwe. The study was intended to provide data for Zasaka's operational strategy, to address questions raised by the MIT Practical Impact Alliance working group on global food loss and waste, and to increase D-Lab's knowledge and capacity in the agriculture sector.

The study also focused on crop storage practices and related needs, and examined the pattern of adoption of existing improved storage technologies such as the Purdue Improved Crop Storage (PICS) bag, a low-cost hermetic storage solution. Lessons drawn from the introduction of PICS may guide those looking to increase access to other technologies desired by farmers, including those identified in this study.



Farmer, Zambia.

## Key findings

Farmers and other stakeholders reported a number of interconnected challenges and needs. As farmers strive to increase yield and cultivation, access to appropriate and fair markets are needed to realize profits and improve their quality of life. Specific needs are:

### Improved Productivity

- Farmers want more fertilizer, at affordable prices and shorter distances
- Farmers struggle to meet labor demands at the farm, particularly those related to weeding

### Improved Profitability

- Farmers work to increase yields, but lack access to reliable markets for their crops
- Farmers are not able to afford agricultural technologies or services at the times needed

### Improved Quality of Life

- Farmers aspire to have improved housing structures for their families
- Farmers struggle to meet food security needs

### Methods & participant selection

Over the course of three weeks in August and September of 2015, a five-person research team (D-Lab staff and student and three Zambian researchers) conducted a needs assessment study in the Chipata and Lundazi districts of eastern Zambia. Chipata-based partner organization Zasaka facilitated community connections through their private extension agent network.

Research methods for the study included semi-structured interviews with 81 smallholder farmers – 52 non-PICS-users and 29 PICS users – and seven other stakeholders (including three additional PICS users). The farmers included 40 women and 41 men with an average age of 47 and an average farm size of five acres. The majority of those interviewed were from the Ngoni tribe and had an average household size of seven. In addition to their work as farmers, interviewees played other roles in the community as small business owners, church leaders, committee chairs or members, village lending group members, lead farmers, and cotton agents. The team also conducted four focus groups, with five female and four male PICS users, and five female and six male non-users.

Potential interviewees were identified by local coordinators based on desired diversity across sex, age, and farm size, and a given ratio of PICS users to non-users.



Zasaka staff member introducing grain storage bags to local farmers.

### Context

Smallholder farmers are the main producers of food in Zambia, meeting an estimated 80 percent of the country's food needs (FAO). Agriculture employs roughly 85 percent of the population but makes up only nine percent of GDP, while industries such as copper mining account for six percent of the labor force and 31 percent of GDP (CIA World Factbook). In 2015, Zambia's economy suffered a rapid depreciation of the Zambian kwacha, greatly depressed copper prices, and a drought that caused significant cuts in power generation. The drought also affected farmers' 2014-2015 yields, threatening the mainly rain-fed agricultural production.

#### *Conventional and conservation agriculture*

Conventional farming practices include traditional tillage through soil inversion or ridging. Users of conventional farming practices face decreased water infiltration and retention due to dense layers of impervious soil, declining soil fertility, delayed planting due to rain-facilitated land preparation, and fertilizer loss due to rain.

Conservation agriculture is a set of soil management practices that minimize the disruption of the soil's structure, composition, and natural biodiversity. Zambia has the highest percentage of conservation agriculture area on total cultivated area among sub-Saharan African countries (FAO). Benefits of conservation agriculture include reduced soil erosion, earlier planting and harvest (given the recommended dry season land preparation), more efficient use of seeds and manure or fertilizer in basins, and water harvesting benefits from breaking through dense layers of impervious soil. However, farmers may face increased weed growth due to the decreased tilling associated with conservation agriculture.

#### *Study participant context*

Among the farmers engaged in the research study, 50 percent practiced conventional agriculture on some or all of their land, while 71 percent used conservation farming methods on some or all. Maize was the primary crop for all farmers, but due to low yields in the 2014 to 2015 season, over 40 percent of farmers were using their maize harvest for consumption only, with 60 percent of farmers using their maize crop for a combination of personal use, sale, loan repayment, gifts, and labor payment, or saved for seed.

#### *Study Partner: Zasaka*

A for-profit social enterprise, Zasaka helps smallholder farmers improve their income through education and access to goods and markets. Zasaka's private extension agents provide training to farmers and sell technologies such as PICS bags (introduced in Zambia by Zasaka), solar lights, and maize shellers.

## Findings & recommendations

Three major themes arose from the challenges faced by smallholder farmers in eastern Zambia: a desire for increased farm productivity, for related increases in business and profit, and a desire for an improved quality of life for families. All themes are interconnected, with shared complexities and opportunities. Below, the needs are outlined with potential opportunities and context.

### Improved Productivity

*Farmers want more fertilizer, at affordable prices and shorter distances:*

- Increase local access to affordable and timely fertilizer supply
- Promote practices that reduce farmers' reliance on fertilizer

Farmers stated that the cost, supply, and timing of the purchase of fertilizer were the greatest challenges on the farm.

*Farmers struggle to meet labor demands at the farm, particularly those related to weeding:*

- Increase access to labor-saving tools and practices, with education and training on appropriate use
- Explore offering alternative weed management solutions

Labor requirements, exceeding what family members can meet, were named the second-largest farm challenge. Among the hardest or most time-consuming work, weeding was cited by nearly three-fourths of farmers: the weeds are fast-growing, and weeding must be done multiple times. Cultivation, land preparation, and harvesting were also cited as difficult work.

Prompted to choose the most useful farm items from pictorial product sheets provided by Zasaka, farmers selected labor-alleviating items including rippers and chaka hoes (for conservation farming land preparation), knapsack sprayers and weed killers (for weed management), normal hoes, and maize shellers.

### Improved Profitability

*Farmers work to increase yields, but lack access to reliable markets:*

- Facilitate access to closer, fair-paying and stable markets
- Increase availability of ox carts and other transport options

Smallholder farmers struggle to find good markets for crop sales, and are not in positions of power in existing sales relationships. Farmers commonly sell to the Zambian Federal Reserve Agency (FRA) or to briefcase buyers. Briefcase buyers come to the villages to pay cash, but may have fixed scales and offer low prices. The FRA offers a comparatively high guaranteed price, but payments are typically delayed for weeks or months. Farmers must transport their crops to a central FRA sales shed, often incurring extra costs.

*Farmers are not able to afford technologies or services that reduce labor or increase productivity or efficiency at the time of year needed:*

- Facilitate access to financing solutions that take into account farmer cash/asset flow and timing of farm needs

Smallholder farmers struggle to afford desired farm and home improvements. Credit and cash are primary financing options, but cash is scarce and loans bring concerns such as high interest rates and severe non-repayment consequences. Better-perceived alternatives include “lay-buy” options, in which payments can be given to trusted individuals (such as relatives or agro-dealers) little by little, and village savings groups.

### Improved Quality of Life

*Farmers aspire to have improved housing structures for their families:*

- Increase access to affordable materials for housing improvements, such as roofing sheets and cement

When asked to picture their home in several years, farmers envisioned improvements such as the use of metal roofing sheets, new or expanded homes, and additional floors or windowpanes. Improved living standards, such as increased food security, energy access, clothing, and sanitation, were also desired. From Zasaka's product sheets, farmers selected roofing sheets (to replace thatched roofs and protect from fire and rain) as the most useful item. The next most popular choices were bicycles, solar panels, solar lights, and PICS bags. Farmers also stated that, should they end the harvest season with surplus funds, they would choose to spend the surplus money on home construction or improvement, fertilizer, food items, or cattle.

*Farmers struggle to meet food security needs:*

- Increase timely and affordable access to improved storage methods such as PICS and cement granaries
- Address current misconceptions of crop storage technologies with decision makers to encourage adoption and proper use
- Market test 50 kg PICS bags

Protective storage options are key to household food security. Farmers commonly use a combination of storage methods for consumption crops including outdoor, locally-made bamboo granaries, normal storage bags (with chemicals often applied despite safety concerns), and PICS bags. In general, farmers desire safe and affordable crop storage, providing protection from pest or rodent damage and preventing theft. PICS bags and cement granaries are positively perceived options.

One-hundred kilogram PICS bags have been used effectively by Zambian farmers to maintain grain quality; several found the outer layer bags susceptible to damage from rodents, but inner plastic liners were not harmed. Some users struggled with the weight of the full 100 kg bags, finding them difficult to carry or move. Among non-users, 34 out of 41 were aware of PICS, with 12 of the 34 perceiving them to be too expensive (at approximately \$2 each). Sale of smaller, lower-cost 50 kg bags may help to address the perceived price and portability challenges. Some misconceptions exist, such as that the PICS bags are chemically treated, and should be addressed.

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### Market Opportunity

There is a clear market opportunity for supplying fertilizer, labor saving technologies, home construction materials, and improved crop storage solutions to farmers in eastern Zambia. Bringing these solutions closer to farmers at affordable prices has the potential to result in improved productivity and quality of life. However, to ensure improved profitability for farmers, appropriate financing solutions are needed, as farmers are typically cash constrained and cash seasonality is a factor. Community-level financing solutions may be more desirable in this context. Securing fair market options for farmers' crops is also essential to translating these improvements into lasting impact. Zasaka is not currently positioned to fill this market gap: as a social venture themselves, they are vulnerable to market volatility and are unable to absorb market shocks. Partnerships with entities that can facilitate community-based financing, and product suppliers that can hedge against currency volatility, are important in the current context.



The Purdue Improved Crop Storage (PICS) bag.

In the short term, Zasaka has shifted its focus to supporting farmer production of high-value legume crops for seed. By growing legumes for seed, farmers are likely to increase their profits while also meeting the demand for a local supply of high-quality legume seeds.

## Future research questions

**D** Lab encourages others to build on this study to explore ways to increase productivity, profitability, and well-being for Zambian farmers. D-Lab is interested in continuing this work and welcomes inquiries from potential partners.

Additional research questions have emerged from this study, and may guide further work:

What factors increase the likelihood that a farmer will adopt conservation farming methods? Can these factors increase likelihood of adoption of other new technologies or practices? Alternatively, do the potential benefits of or profits from conservation farming make those farmers more likely to be able to adopt new technologies or practices?

## Further information & full report

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## Future impact

**N** eeds Assessment of Smallholder Farmers in Eastern Zambia is a preliminary study that identified a number of needs for farmers in the current challenging context. Opportunities for increased support to farmers include education and training, access to beneficial tools, access to financing, better markets, and more; groups like Zasaka are well-positioned to continue this work. The results from this study are specific to the context of farmers in eastern Zambia. Similar studies in other geographic areas would add to the body of knowledge on the size and scope of the needs of smallholder farmers.

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*Launched in 2011 by D-Lab, the Scale-Ups program assists social entrepreneurs from MIT and the developing world, as well as NGOs and corporations, to bring poverty alleviating technologies to market at scale.*

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