Proof of Concept Series No. 3 2016

Mobile Maize Shellers for Improved Quality and EAC Exports

Feed the Future Uganda Commodity Production and Marketing (CPM) Activity began in 2013 and runs for five years. CPM works to increase productivity and income of rural families so they can lift themselves out of poverty and thrive. The Activity harnesses market forces and uses innovative methods to increase the quantity and quality of coffee, maize, and beans that smallholder farmers produce and sell. CPM does this by 1) working with exporters and other buyers to extend a variety of services down value chains to improve production and marketing; and 2) building trust and win-win relationships between value chain actors to change processes and behavior. In particular, CPM focuses on incentivizing value chain middle actors to improve relationships up and downstream **(Box 1)**. The goal of this proof of concept technical brief series is to share learning, scalable approaches, and practical steps for the agricultural sector growth in Uganda.

THE FOCUS ON INTERMEDIARIES (Box 1)

In reaction to farmer-trader mistrust, development projects often ignore "middlemen". This approach has yielded limited success because the farmer organization development model on its own contributes perhaps 2 to 5 percent to production aggregation and sales according to those knowledgeable of Uganda's agricultural sector. As evidenced by limited impact of past agricultural development programs, Uganda requires different triggers. For this reason, CPM facilitates intermediaries to play key roles in promoting high quality, consistent quantity product. This starts with CPM engaging buyers willing to establish relationships that incentivize intermediaries to in turn better serve and incentivize farmers. By targeting leverage points in the "middle" of value chains, productivity and market access increase, stimulating supply response to demand, intermediary business models include buyer-linked village agents and village service agents, farmer organization depot committees; small-scale processors like coffee washing station operators; and farm service centers.

State of the Agricultural Market System and Maize Postharvest Technologies

The agricultural market system in Uganda is in part characterized by ineffective competition and poor cooperation, with entrenched mistrust among value chain actors combined with a history of government and donor "handouts". For improved functioning, there is continued need for effective vertical and horizontal relationships, allowing a system that is competitive, inclusive, resilient, and able to lift large numbers of households and their communities from poverty. Within the market system, the maize subsector is vital to national, community, and household food security through both consumption and marketing. Uganda is the main source for staple food commodities in Eastern Africa, contributing 70 percent of the region's total consumption. Uganda's regional exports consist primarily of grain sales to Kenya, Rwanda, the DRC, and South Sudan. Ugandan maize dominates formal and informal export markets to Kenya, South Sudan, Rwanda, Burundi, and the Democratic Republic of Congo. In 2013, Uganda supplied 91 percent of the informally traded maize, or 654,261 MT. Roughly 54 percent of this maize was exported to South Sudan, 31 percent to Kenya, 7 percent to Tanzania's northwestern lake region, and 7 percent to Rwanda.

A major issue for maize value chain actors, from village agents to traders, apex farmer organizations, processors, and exporters is that quality product is often hard to come by, even when farmers increase yields through use of improved seed, inputs, and technologies and large maize exporters are willing to pay farmers a price premium for high-quality product. The impacts on quality occur at postharvest due to use of rudimentary tools and methods for shelling, the process where maize kernels are separated from the cob. The difficulty of the process depends on variety, maturity, and moisture content. Women, who already have significant duties in agricultural production, water collection, child rearing, and cooking, tend to be responsible for this labor-intensive task. Traditional shelling issues include:

- Stick method shelling, where a bag of maize cobs is hit repeatedly, is slow. Shelling one bag takes eight hours of a woman's time and leads to kernel breakage and contamination, contributing to postharvest loss and reducing the shelf life and value of the grain.
- Hand shelling to obtain kernels for maize seed produces unbroken grain but the process is tedious. A few kilograms can be shelled in an hour, taking a toll physically on shellers' hands.
- Drying maize directly on the ground and storage in damp, warm conditions at the household level before and after shelling leads to deterioration, discoloration, aflatoxin growth, and further postharvest loss.
- There is limited access to stationary maize shelling machine processors due to remote locations of many farmers. While household-level mechanical hand shellers exist, there is limited financing for farming families to purchase them.
- To reach remote farmers on poor roads, small stationary maize shellers are trucked to farmer communities; this brings additional costs to service providers that are passed on to farmers. This approach is not always successful as many roads are impassable for trucks.

The Opportunity

Point of Intervention

To expand farmer access to shelling services, CPM looked to market intermediary business models it supports, including the buyer-linked village and village services agents **(Box 2)** that extend services down the value chain for improved production and marketing through this and other models. Given the pervasiveness of poor quality maize offered by farmers, it was clear that access to maize shelling services for unserved farmers was a priority. But how could intermediaries provide access to unserved farmers? The answer came in the form of motorized mobile maize shellers.

VILLAGE AND VILLAGE SERVICE AGENTS (Box 2)

Village agents are the main interface with farmers, buying produce on behalf of exporters, processors, traders, or apex farmer organizations. With buyer and CPM encouragement, agents bring extension, inputs, and other services closer to farmers. Village service agents also offer services, but do not purchase produce for bulking. Some self-employed agents have built their enterprises into microenterprises and small businesses, hiring needed staff.

Mobile maize shellers were introduced in Uganda in 2012 by enterprising fabricator Munyegera Agro-Machinery with encouragement, advice, training, and initial funding from NGO Sasakawa 2000. Mobile shellers have the capacity to shell two to three metric tons of maize per hour. Shelling one 100 kg bag costs a farmer UGX 2,000 to UGX 3,000 and takes 30 minutes; farmers pay women about UGX 3,000 to dehusk and shell a bag of maize by hand, which takes about eight hours. CPM initially cost-shared 70 mobile maize shellers in 2015, mostly with large traders and farmer organizations linked to village agents to demonstrate benefits. Seeing the benefits, traders are buying shellers and have their village agents operate them. Apex farmer organizations have also purchased mobile shellers to provide services to their members. As village and village service agents begin to increase their incomes from services they offer farmers, they too are purchasing shellers. As of March 2016, a variety of CPM clients acquired 280 mobile shellers. CPM works with Munyegera Agro-Machinery to train more than 200 operators in operations and maintenance, as well as maize quality control with the idea that shellers will be offering premium prices on behalf of their buyers.

Operation of a mobile sheller requires three or four workers, so whether a self-employed agent or larger farmer service enterprise like the Bugiri Agribusiness Initiative Development Association, youth are typically hired to operate and maintain shellers, contributing to rural enterprise growth and jobs. Job-wise, a maize shelling service offers 120 annual work days, two months July to September and another two months December to February. Combining this

work with other pre-production, production, postharvest, and marketing services, such as input services and planting **(Box 3)**, allows for the equivalent of full-time employment.

Farmer Service Enterprise

Bugiri Agribusiness Initiative Development Association bought eight mobile maize shellers, hired 16 youth to operate them, and uses its village agent staff to identify farmers for services. The youth have access to the association's SACCO, where they place savings, which they are using to invest in their own rural enterprises.

With more cash in farmers' hands and more time for women from this labor-saving technology, the value to farming families is being proven, while bringing increased maize quality, quantity, and prices to all those along the value chain.

POTENTIAL FARMER SERVICES FOR INTERMEDIARY PROVISION (Box 3)

Pre-Production

- Crop insurance agent
- Soil testing agent
- Crop inspection agent (for banks, insurance companies, outgrower schemes)
- Digital profiling agent

Production

- Input supply services
- Planting services
- Weeding services
- Pesticide spraying services

Postharvest

- Shelling services
- Grain cleaning services
- Drying services

Marketing

- Bulking/aggregation services
- Rural sales agent, non-agricultural products
- Rural banking and Digital Financial Services (DFS) agent

Priorities Based on Learning

CPM identified the following priorities for success of this effort:

- **Proximity and affordability of shelling services leads to farmer uptake.** Lower or equivalent costs for machine-shelled over hand-shelled maize, proximity to farmers' fields, time savings, and premium price differentials make farmer uptake of this service an easy decision.
- **Increased availability of shellers for purchase.** Munyegera Agro-Machinery fabricates 20 maize shellers a month and will require financing to keep up with the market demand.
- **Financing for purchase of shellers.** Traders and farmer organizations may need loans for equipment purchase. Meanwhile, village and village service agents are forming associations to access financing to purchase equipment for their businesses.
- **Multiple intermediary business models work for service provision.** So far, three intermediary models are working well: trader-owned maize shellers operated and promoted by the trader's village agents; shellers owned by farmer organizations for member use; and shellers owned by village and village service agents with services marketed to farmer clients. Ownership and operation of shellers depends on financial resources and existing and potential relationships among value chain actors in an area.
- **Knowledge and skills of operators.** CPM and Sasakawa 2000 have helped defray costs of training operators. Over time, based on initial efforts, it appears that operations and maintenance training provided by fabricators and embedded in the cost of the machinery may be a viable option. Including training in other quality control measures, such as moisture content, grading, and awareness of purity of the product measure, is also vital.

Criteria For Success

Based on the above priorities, these factors incentivize intermediaries to provide mobile maize shelling services:

- Buy-in and support from value chain buyers that promote intermediary models bringing services such as maize shelling closer to farmers.
- Automated, mobile maize shelling has proven profitable service for traders, farmer organizations, and village and village service agents.

- Financing of mobile maize sheller fabrication to meet demand.
- Financing of mobile maize shellers for traders, farmer organizations, and village agents.
- Access to operator operations and maintenance and maize quality control training.

Results and Way Forward for Scale and Systemic Change

Results

Over the last two years, CPM has used evidence and learning to adjust and scale maize shelling service models, identifying incentives and behavior change necessary for adoption. Results as of March 2016 are in **(Box 4)**. In addition to these indicators, potential areas to assess system and systemic changes are:

- Impact of labor-saving technology on women and households.
- Number and location of new sheller fabricators and pricing.

MOBILE MAIZE SHELLER ADOPTION (Box 4)

280	**Shellers sold**
134,000	**Farmers accessing labor-saving technologies (maize shellers)**
219,324 METRIC TONS	**Maize processed using mobile maize shellers**

The Way Forward for Scale and Systemic Change

Farmer access to maize shelling is vital for improved maize marketing to domestic and EAC markets, as well as household incomes. There is good potential for scaling this high-impact innovation by emphasizing:

- Financing opportunities for mobile maize sheller fabrication and purchase; CPM will partner with aBi Trust's Clean Technology Fund to provide Muyengera Agro-Machinery needed financing. The fund was established to finance climate-smart practices for targeted value chains, including maize.
- Increased adoption by encouraging value chain buyers who have a vested interest in improved services at the farm level to promote maize sheller use by their supplier intermediaries, whether trader-village agents or farmer organizations.