MRR INNOVATION LAB PROJECT IN BRIEF

THE VALUE OF LINKING FARMERS TO MAIZE VALUE CHAINS IN RWANDA

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Project Partners
ATAI, Indian School of Business, Innovations for Poverty Action, Kumwe Harvest, MINAGRI, Williams College, World Food Programme

Development Innovation
Maize value chains

Commodity
Maize

Targeted Population
Small-scale maize farmer cooperatives

Country/Location
Rwanda

Timeline
2020-2023

Funding
$410,000 (USAID)

Transitioning from subsistence farming to commercial agriculture is a key pathway to achieving agricultural transformation. In Rwanda, MRR Innovation Lab researchers are connecting maize farmer cooperatives with the innovative processor Kumwe Harvest to provide a stable market for newly harvested maize while increasing the quantity accepted for purchase. This connection to markets could increase farmers' investments in productivity enhancing inputs and profits while also ensuring a consistent supply of high-quality maize for consumer markets.

The Challenge

One of the main challenges keeping farmers from tapping into commercial value chains is that smallholders' output often does not meet food processors' phytosanitary standards. Farmers typically hand-shell maize kernels and dry them on plastic tarpaulins outside the home, increasing the risk of contamination.

In Rwanda, the start of the next rainy season comes shortly after the harvest of the main growing season, causing maize to often be insufficiently dried before it is put into storage. Residual moisture can lead the maize to be tainted by aflatoxin, a carcinogenic fungus. Contaminated maize does not meet the quality standard required by large food processors, and as a result, a large share of the maize brought in by small-scale farmers tends to get rejected. Without a way for farmers to effectively process and dry their maize after harvest, linkages to maize processors are meaningless.

Kumwe Harvest, a logistics and maize processing startup in Rwanda, has custom-built industrial shelling and drying machines that end the need for farmers to process and dry their own harvests. The machines reduce the traditional six-to-ten week process with a process that takes just 24 hours from picking up maize at the farm to delivery at the factory gate of the final buyer at a

RESEARCH INNOVATION

Research on contract farming and value chains largely pertains to cash crops like cut flowers and sugar cane.[1] Little is known about the challenges and opportunities of staple crops, which the vast majority of smallholder farmers grow.

Value chains and the division of production are at the heart of modern production theory. Mistakes at any step toward producing a final good can reduce its value.[2] Since Kumwe Harvest's technology will reduce losses at a critical step in production, farmers may increase their investments early on. The optimal sorting of tasks based on comparative advantage[3] may ultimately reduce farmers' total labor time.

This project will also provide evidence on the dynamics of technology adoption. Providing a consistent buyer at a predictable price may reduce market uncertainty, encouraging farmers to invest more in productive inputs that connections to value chains make more profitable. The resulting higher income could lower liquidity constraints in subsequent seasons.

[1] Casaburi, L. et al. 2016. "Contract Farming and Agricultural Productivity in Western Kenya." *African Economic Successes: Volume IV Sustainable Growth*
[2] Kremer, M., 1993. "The O-ring theory of economic development." *The Quarterly Journal of Economics*.
[3] Antràs, P. et al. 2013. "Organizing the global value chain." *Econometrica*.

near-zero rejection rate.

Research Design

This study will examine how access to Kumwe Harvest affects farmers' investments into productivity enhancing inputs, specifically fertilizer, as well as agricultural output, total yields and sales. The project will also measure how farmers procure grains and other items after selling their entire harvest to Kumwe. Farmers may switch from consuming their own harvest and maize from local markets, both likely to be aflatoxin-contaminated, to processed grains or to reducing their overall consumption of maize.

Cooperatives are randomized to either a treatment or control group. In the treatment group, researchers are arranging visits with representatives from Kumwe to explain the program and enroll cooperatives. In this way, the treatment encourages cooperatives to secure a guaranteed buyer contract prior to the agricultural season.

The experiment spans two seasons. Round 1, includes 200 cooperatives split between treatment and control groups. Round 2, taking place in the following year, include an additional 200 cooperatives. The analysis measures effects during the year of implementation, two subsequent years for Round 1 cooperatives and 1 subsequent year for cooperates added in Round 2.

The data on fertilizer purchases come from Rwanda's Smart Nkunganire System (SNS), a digital database administered by the Rwanda Agriculture Board (RAB) that records all individual farmers' fertilizer purchases. The Rwandan government subsidizes all fertilizer purchases and fixes all retail prices. This leaves no private fertilizer market that would add unrecorded purchases.

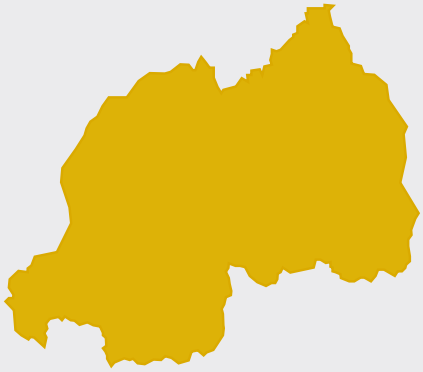
Data on farmer outcomes come from Kumwe Harvest and surveys administered by the researchers. Kumwe is providing information on the timing of, quantity and price received by farmers for sales. Surveys take place at the cooperative- and farmer-levels to measure crop yields, sales, agricultural income, land holdings, investments in assets and inputs and other related outcomes as well as perceptions and behavior change due to the intervention and grains consumption.

Development Impact

Kumwe Harvest can provide farmers with superior returns while ensuring a consistent supply of high-quality maize to be processed for output markets. This process benefits consumers by reducing aflatoxin contamination in maize. Providing a guaranteed market to farmers will also eliminate uncertainty, which also may spur investments in productivity enhancing inputs.

Since Kumwe's technology will reduce losses at the end of the value chain, the team expects increased investments in inputs and possibly shifts in land purchases and labor allocation. In a pilot of this project with funding from the Agricultural Technology Adoption Initiative (ATAI) in 2019, 70 percent of cooperatives given access to Kumwe Harvest reported increases in purchases of fertilizer and seeds, and 30 percent reported renting additional land as a direct consequence of the announced 25 percent price subsidy.

The project also relates to gender as an important cross-cutting issue. According to the EICV4, 70 percent of female-headed households in Rwanda depend on agriculture as their primary source of livelihood. More than half cultivate a plot of less than 0.3 ha compared to 40 percent for men, and only 25 percent use fertilizer compared to 40 percent for men. Measuring impacts separately for men and women will provide important insights on the gender-related impacts of linking farmers groups to value chains.



Development Opportunity: Rwanda

12.3 : Population in millions (2018)
38.2% : Poverty rate at $1.90/day, 2011 PPP (2016)
10.2 : Rural population in millions (2018)
66% : Total employment in agriculture (2019)
36.8% : Prevalence of undernourishment (2017)
37.9% : Prevalence of stunting for children under 5 years (2015)

Source: World Bank

This project is directly relevant to Rwanda's "Strategic Plan for Agriculture Transformation 4 (PSTA4) 2018 – 2024" in its emphasis on agro-processing and technology-intensive agriculture. While the vast majority of farmers in Rwanda are not connected to value chains of any sort,[1] the government's Crop Intensification Program has organized roughly 20 percent of agricultural households into 2,400 agricultural cooperatives.[2]

This project will also provide evidence on how value chains in general impact farmers' input decisions and their livelihoods. This evidence can drive efforts to expanding farmers' access to markets, which is one of three key programmatic goals of Hinga Weze, a USAID-funded Rwandan agricultural activity which will be operational from 2017 to 2022.

[1] 2014 Integrated Household Living Conditions Survey (EICV4).
[2] Rwanda Cooperative Agency.

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