

FLETCHER D-PRIZE COMPETITION

2023-24 Academic Year

Agriculture Challenges

Grow Farmer Profits through Post-Harvest Support

We challenge you to design a new social enterprise that helps smallholder farmers earn more. In need of quick cash, many farmers are forced to sell crops at harvest when prices bottom out. Fortunately there is a simple intervention proven to help farmers store more to sell when prices rise. Fletcher D-Prize will award up to \$20,000 to teams with a plan to launch a pilot of this work, and who have a vision to serve 100,000 farmers within five years before scaling country-wide.

The Poverty Problem

The vast majority of people living in poverty are smallholder farmers. Farmers constitute 78% of the world's poor, which is nearly 800 million people.¹ Most live on less than \$2 per day.²

Increasing income of smallholder farmers has the potential to lift millions of people out of extreme poverty.³ However, a farmer's income is often reduced due to market timing. Farmers are typically forced to sell the fruits of their labor directly after harvest, when cash is needed for daily expenses. This is also when market prices are lowest. The result is a loss of potential income and food security.⁴

Farmers less in need of immediate cash could store their harvest until prices increase, however this is risky too. Pests and mold can cause losses of up to 50%. Because of this risk, farmers have added pressure to sell prematurely.⁵

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<https://www.worldbank.org/en/news/feature/2014/11/12/for-up-to-800-million-rural-poor-a-strong-world-bank-commitment-to-agriculture>

2 <https://www.worldbank.org/en/news/feature/2016/02/25/a-year-in-the-lives-of-smallholder-farming-families>

3 https://www.brookings.edu/wp-content/uploads/2019/09/LNOB_Chapter4.pdf

4 <https://www.povertyactionlab.org/evaluation/innovative-finance-technology-adoption-western-kenya>

5 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5296677/>

The Proven Intervention

Fortunately a combination of two interventions is proven to reduce post-harvest loss and help farmers earn more:

- *Post-harvest loans* provide farmers with short-term cash to cover daily expenses. The financial flexibility allows farmers to delay crop sales until market prices recover. Studies have found post-harvest loans help farmers increase annual net revenues by 29%.⁶
- *Post-harvest protection products*, including Purdue Improved Crop Storage (PICS) triple-layered hermetic storage bags and chemicals like Actellic Super, store harvest safely. Safe storage reduces the risk of spoilage. Studies have found that proper storage may produce 15-22% returns for farmers, and can minimize loss on grain stored for future household consumption.⁷

Combined, a study in Tanzania found that farmers with access to post-harvest loans and PICS bags increased their revenue by 40% compared to the cost of the loan. Researchers observed that maize sales six months after harvest were 11% higher compared to baseline. Farmers also held a maize inventory 20% larger than baseline, suggesting potential for future sales or consumption.⁸

Your Distribution Challenge

Fletcher D-Prize will award up to \$20,000 to teams that can create a new social enterprise that provides location-appropriate post-harvest loans and protection products to 100 smallholder farmers.

You must have a vision to grow quickly and serve at least 100,000 smallholder farmers within five years. Our award is meant to enable the first step toward this vision by supporting a small test pilot of the enterprise that serves 100 smallholder farmers through one full harvest season.

Designing Your Social Enterprise

We believe a successful post-harvest distribution entrepreneur must have compelling answers to the following questions:

(1) *What is the appropriate bundle of post-harvest protection for your local market?* The ideal combination of credit and storage technology must be designed to fit your local market. The interventions work together, such that farmers are able to earn more and increase their

⁶ <https://www.povertyactionlab.org/evaluation/innovative-finance-technology-adoption-western-kenya>

⁷ Jones, Michael S., James Lowenberg-DeBoer, Corrine E. Alexander. "Profitability of Hermetic Purdue Improved Crop Storage (PICS) Bags for African Common Bean Producers." Dept. of Agricultural Economics, Purdue University, 2011. p. 19

⁸ <https://blogs.worldbank.org/impactevaluations/five-things-we-learned-loan-and-grain-storage-intervention-tanzania-guest-post-hira-cha-anna>

consumption.

A successful applicant will explain why the market bundle is expected to maximize farmer earnings long term. As a baseline, here are two approaches:

- A successful program run in Tanzania offered maize farmers a \$40 cash loan at time of harvest. This was calculated as the local market value of the maize stored in two PICS bags. For collateral, farmers had a choice to either purchase additional maize or use maize from their own harvest, which was stored in a central location, typically a government office or the home of a group leader. Farmers were expected to sell this maize in six months to pay back the loan to their savings group with 12% interest.⁹ At six months, this program helped farmers raise their maize storage by 20% and sales by 11%.¹⁰
- Another program in Kenya offered farmers loans worth an average of \$89 in the first year of operations and \$124 in the second, representing 43% of the value of the harvest at harvest time prices. Farmers put up their own maize as collateral and were offered 9 months to repay with 10% interest. In the end they had annual net revenues \$18 higher than farmers who did not receive loans, representing a 29% return.¹¹

(2) *Once you have a bundle selected, can it be delivered to farmers effectively?* There are a number of challenges a good enterprise will solve:

- Seasonality matters. If timed at harvest, 80% of farmers may take the loan, which compares favorably to the evidence of 2-55% adoption of other micro-credit products.¹² In previous trials, loans offered three months after harvest arrived too late and had no positive net effect on revenue.¹³ As a baseline, farmers in the Kenya program received PICS bags at harvest and put laminated tags on the bags they would store as collateral.¹⁴
- Trust matters. You should decide whether your venture will issue the loans itself or find an existing financing partner, like an MFI, to sell and manage the loans. Previous programs found success partnering with established loan providers. These partners offer existing community trust and can provide working capital. The downside is that you will have less control over operations, and must spend additional time managing an external partnership.
 - In Kenya, this intervention was distributed by One Acre Fund, who already had experience giving loans to over 400,000 farmers.

⁹ Channa, Hira et al. "Helping Smallholder Farmers Make the Most of Maize through Loans and Storage Technology: Insights from a Randomized Control Trial in Tanzania." (2018). https://ag.purdue.edu/agecon/Documents/GradStudentJobPage/HiraChanna_JMP.pdf

¹⁰ <https://blogs.worldbank.org/impactevaluations/five-things-we-learnt-loan-and-grain-storage-intervention-tanzania-guest-post-hira-channa>

¹¹ <https://www.povertyactionlab.org/evaluation/innovative-finance-technology-adoption-western-kenya>

¹²

<https://blogs.worldbank.org/impactevaluations/five-things-we-learnt-loan-and-grain-storage-intervention-tanzania-guest-post-hira-channa>

¹³ <https://www.povertyactionlab.org/evaluation/innovative-finance-technology-adoption-western-kenya>

¹⁴ Ibid.

- In Tanzania, researchers worked with Phiretajo, a local NGO with experience organizing village credit clubs.

If you are partnering with an existing MFI, please offer evidence of your partnership, including a Memorandum of Understanding, or outline how you will secure this partnership.

If you are planning to sell and manage the loans and PICs bags yourself, please be ready to explain how you will finance your operations and growth while waiting for loans to be repaid.

(3) *Do the economics work for the farmer and your venture?* Your combination of post-harvest products must produce measurable returns for your clients that replicate or exceed the targets of previous post-harvest loss interventions, including increases in maize storage, sales, and annual net revenues. A good application will include a plan for continuous testing and evaluation, and a commitment to change the plan if evidence suggests the approach isn't working.

Sustainability is important. The program in Tanzania had a less than ideal repayment rate of 85% due to an unexpected export ban that prevented the usual rise in maize prices.¹⁵ Low repayment rates are a threat to long term viability.

*Note: we have a strong bias against loan repayment programs that allow payment in harvest or other bartering ideas that are not cash. We recommend that farmers sell their collateralized maize and repay their loan in cash.

(4) Can your operation scale? We believe the first challenge in designing a micro-credit business is modeling the economics. We recommend you design a monthly cash flow model, that considers the following:

- Profit and loss for all partners: a good model should produce reasonable value for everyone involved by the end of the program. We are interested in seeing the financial impact of your model on farmers, local distribution partners, and on your company.
- Working Capital: a good model should also consider how money flows during the program. One concern is that your company (and possibly local partners) will lose money in the short term, while still waiting for loans to be paid back. How will you survive during months when you have a negative cash flow?

¹⁵ https://ag.purdue.edu/agecon/Documents/GradStudentJobPage/HiraChanna_JMP.pdf

- Default rates: does your model work in a worse-case scenario? We recommend trying to test your model in conditions where interest rates for loans are kept low, loan default rates are higher than anticipated, and market prices for stored grain are unfavorable.

Helpful Resources

- World Bank Blog: [Five things we learnt from a loan and grain storage intervention in Tanzania](#)
- Previous D-Prize winner [The Taimaka Project](#) distributes post-harvest loans and storage bags.
- [Selling Low and Buying High: An Arbitrage Puzzle in Kenyan Villages](#) by Marshall Burke, Lauren Falcao Bergquist, and Edward Miguel

Ready To Apply?

Download a First Round Application Packet and start creating your proposal at <https://sites.tufts.edu/dprize/>.

Questions? Email Ariane Theis at Ariane.Theis@tufts.edu.