

FLETCHER D-PRIZE COMPETITION

2022-2023 Academic Year

Agriculture Challenges

Provide Proven Agricultural Inputs & Improve Crop Yield At Scale

We challenge you to design a new social enterprise that helps smallholder farmers grow more. Combinations of simple, cost-effective agricultural inputs, like quality seeds and micro-dosing of fertilizer, along with training, enable smallholder farmers to produce more crops. Unfortunately these inputs do not reach many of the farmers who need them most. Fletcher D-Prize will award up to \$20,000 to teams with a plan to launch a pilot delivering quality inputs, farmer training, and customer financing to 100 farmers in one planting season. You should have a vision to reach 100,000 beneficiaries within five years and scale country-wide.

The Poverty Problem

Most of the world's poorest people are smallholder farmers, and most, especially in sub-Saharan Africa are drastically under producing. For instance, cereal crops grown in sub-Saharan Africa average 1.2 tons per hectare, while the developing world average is about 3 tons/ha.¹ There are at least 475 million family farms in the world that are less than 2 hectares in size.² In rural sub-Saharan Africa, 75% of people living on \$1 a day work in agriculture.³

The implication on low production is staggering. As a comparison, farmers in South Asia during the "Green Revolution" implemented modern farm practices, and between 1961-2001 increased crop yield by 145%. Smallholder farmers in sub-Saharan Africa during that same time period increased crop yield by only 30%.⁴ Increasing the productivity of African smallholder farms has potential to lift millions of people out of extreme poverty.⁵

¹ http://www.fao.org/fileadmin/templates/wsfs/docs/Issues_papers/HLEF2050_Africa.pdf

² Lowder, Sarah K., Jakob Skoet, and Saumya Singh. "What do we really know about the number and distribution of farms and family farms in the world?." Background paper for the State of Food and Agriculture 8 (2014).

³ Jack, B. Kelsey. "Market inefficiencies and the adoption of agricultural technologies in developing countries." (2013). p. 2

⁴ From figure in World Bank. Independent Evaluation Group, ed. World Bank assistance to agriculture in Sub-Saharan Africa: an IEG review. World Bank Publications, 2007. p. 70

⁵ World Bank. Independent Evaluation Group, ed. World Bank assistance to agriculture in Sub-Saharan Africa: an IEG review. World Bank Publications, 2007. p. 64

The Proven Intervention

Fortunately a bundle of interventions that increase yield is well known:

- *Quality Seeds* are proven to increase crop production and farm productivity.⁶ These seeds are naturally bred to be higher-yielding, resist disease, mature earlier, and respond well to fertilizer.⁷ Groups like The Alliance for a Green Revolution in Africa (AGRA) have spurred development of hybrid seeds that are appropriate for many local regions. As of 2014, their work has produced 464 new seed varieties across 15 major crop types.⁸
- *Fertilizer*, when used effectively, has increased crop yields throughout most of the world. For example, increased fertilizer use contributed to 50% of the yield growth in Asia during their “Green Revolution” and is responsible for 33% of recent growth in worldwide cereal production.⁹ Currently fertilizer is used at a much lower rate among sub-Saharan African farms. African farmers use just 9 kg per hectare, compared to 104 kg in South Asia and 86 kg in Latin America.¹⁰ Increasing effective use of fertilizer in sub-Saharan Africa has potential to radically increase crop yields.
- *Education on Micro-dosing and other farm best practices* ensure that seeds and fertilizer produce maximum yield. For example, the microdosing method, which requires a small pinch of fertilizer be directly applied to the seed, uses 60-75% less fertilizer than the traditional “broadcasting” method^{11,12}, while simultaneously increasing yields by 30-50%, across a variety of soil and climatic conditions and farmer practices.¹³
- *Post-harvest protection products*, including Purdue Improved Crop Storage (PICS) triple-layered hermetic storage bags and chemicals like Actellic Super, can produce 15-22% returns for farmers storing crops to sell when prices rise, and can minimize loss on grain stored for future household consumption.¹⁴

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 farm interventions to under-producing smallholder farmers (cultivating land of 2 hectares or less).

⁶http://citeseerx.ist.psu.edu/viewdoc/download;jsessionid%3DC1D9F27C10187241D5A4A9AA9C386EFA?doi%3D10.1.1.682.7822%26rep%3Drep1%26type%3Dpdf&sa=D&ust=1479090972518000&usg=AFQjCNG4OEQoFLw-_jIR8AiaMGY0naW-0Q

⁷<https://globalfoodforthought.typepad.com/global-food-for-thought/2012/05/guest-commentary-growing-prosperity-planting-the-seed-s-of-africas-green-revolution.html>

⁸<http://reliefweb.int/sites/reliefweb.int/files/resources/agrapassreporthires.pdf&sa=D&ust=1479077939824000&usg=AFQjCNH9bPOshzXo5R8hfWAD0cn4NIK-XA>

⁹ Morris, Michael L. Fertilizer use in African agriculture: Lessons learned and good practice guidelines. World Bank Publications, 2007. p. 33

¹⁰ World Bank. Independent Evaluation Group, ed. World Bank assistance to agriculture in Sub-Saharan Africa: an IEG review. World Bank Publications, 2007. p. 75 Morris, Michael L. Fertilizer use in African agriculture: Lessons learned and good practice guidelines. World Bank Publications, 2007. p. 18

¹¹ http://ageconsearch.umn.edu/bitstream/205879/1/Profitability%20_sustainable%20intensification_AA EA2015_2.pdf

¹² <http://www.mdpi.com/2073-4395/4/3/436/pdf>

¹³ <http://bob-mccown.com/wp-content/uploads/2011/10/TwoMlow2008Microdosing.pdf>

¹⁴ 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

You must have a vision to grow quickly and help at least 100,000 farmers improve their yield 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 agriculture distribution entrepreneur must have compelling answers to the following questions:

(1) *What is the appropriate bundle of inputs for your local market?* The ideal combination of hybrid seed, commercial fertilizer, and other agricultural inputs selected must be designed to fit your local market. Ideally, the inputs will work together. We recommend you focus on the staple crop of the market in which you operate.

*Note: Fletcher D-Prize does not award ideas for seed multiplication schemes, contract farming, or horticulture or aquaculture products.

A successful application will explain why the market bundle selected is expected to maximize farmer yield and earnings in the long run. A good application will also have a plan for continuous testing and evaluation, and a commitment to change the plan if evidence suggests the approach isn't working.

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

- Research suggests that supply chains must reach farmers near their farms. Forcing farmers to travel large distances disincentives the use of improved seeds.¹⁵
- Seasonality matters. The unavailability of quality seeds at the right place and time is one of the key factors accounting for limited use of improved seeds.¹⁶
- Farmers are sensitive to the size and packaging of seed. Some studies demonstrate that the ideal package size is 2 kilograms or less.¹⁷ One Acre Fund saves money on repackaging by having farmers share bags with their planting group.
- Microdosing of fertilizer works best when combined with other productivity-enhancing methods like spacing seeds optimally; One Acre Fund includes this in its [training program](#).

(3) *Do the economics work for the farmer?* Without financing, the average smallholder farmer cannot afford the upfront cost of seed and fertilizer.¹⁸ An ideal social enterprise will suggest a

¹⁵http://reliefweb.int/sites/reliefweb.int/files/resources/agrapassreporthires.pdf&sa=D&ust=1479078687000000&usg=AFQjCNFc-uvkDWAH3q9Anmu1Rv_BN2h0HQ

¹⁶<http://citeseerx.ist.psu.edu/viewdoc/download;jsessionid%3DC1D9F27C10187241D5A4A9AA9C386EFA?doi%3D10.1.1.682.7822%26rep%3Drep1%26type%3Dpdf&sa=D&ust=1479090972525000&usg=AFQjCNFJ84FULzzGTI-PP5hXT51pt0vD4A>

¹⁷ *ibid.*

¹⁸ Hong, David, and Stephanie Hanson. 2016. "Scaling up agricultural credit in Africa," Frontier Issues Brief submitted to the Brookings Institution's Ending Rural Hunger project (<https://www.endingruralhunger.org/>)

way for farmers to access inputs affordably.

*Note: we have a strong bias against loan repayment programs that allow payment in harvest or other bartering ideas that are not cash.

(4) *Can your operation scale?* Distributing farm inputs to the last mile typically incurs high costs. High transport costs, small markets lacking economies of scale, lack of a rural dealer network, and a lack of a competitive private sector can all lead to high input prices.^{19, 20}

The ideal social enterprise will design a program that has a good ROI for the farmer, but also controls costs.

Note: in our experience, one of the most difficult challenges is funding working capital for any loans offered to farmers. If you offer credit, be sure to consider how you will continue operating while waiting for repayment collection.

(5) Other helpful resources:

- Global Yield Gap Atlas: <http://www.yieldgap.org/>:
- [World Bank Assistance to Agriculture in Sub-Saharan Africa: An IEG Review](#) by the World Bank
- [Fertilizer Use in African Agriculture: Lessons Learned and Good Practice Guideline](#) by the World Bank
- [J-PAL's agriculture research](#)
- [Our folder of agriculture papers](#)
- [yieldgap.org](#) - an atlas of yield gaps
- [Atlas of African Research and Development](#)
- Access To Seeds Index reports on the seed industry, focused especially on the industry's work to enable smallholder farmers: <http://www.accesstoseeds.org/the-index/>
- Some country specific market overviews are contained in this report: <http://www.pwc.com/gx/en/issues/high-growth-markets/assets/food-security-in-africa.pdf>
- East African regional seed industry, sector report: <http://www.accesstoseeds.org/app/uploads/2015/12/RATSI-EA-Preliminary-Report-19-12-14.pdf>

Ready To Apply?

Download a First Round Application Packet and start creating your proposal at www.fletcher.tufts.edu/D-Prize.

Questions? Email Dorothy Orszulak at dorothy.orszulak@tufts.edu.

¹⁹ World Bank. Independent Evaluation Group, ed. World Bank assistance to agriculture in Sub-Saharan Africa: an IEG review. World Bank Publications, 2007. p. 75

²⁰ Morris, Michael L. Fertilizer use in African agriculture: Lessons learned and good practice guidelines. World Bank Publications, 2007. p. 73