



Agriculture Challenges

Winter 2016

Scale Up Distribution of Quality Seeds

New varieties of naturally-bred seeds produce 2-3 times higher yield than old seeds. However, only a small minority of smallholder farmers have access to high-quality seeds. In three months, pilot an evidence-based model that distributes high-quality seeds and reliably boosts the standard of living for 50 smallholder farmers, growing to 2000 farmers in two years. A successful plan will include continuous monitoring and testing, and a commitment to change if evidence suggests your approach is not working.

The problem: The majority of people living in sub-Saharan Africa are farmers. Agriculture accounts for 64% of the labor force, and in rural areas 75% of people living on \$1 a day work in agriculture.¹ Unfortunately the vast majority of these farms are not optimally productive. Yield per hectare for major crops like maize can be as much as 80 percent below their potential.² Compared to rates in other countries, yields in Africa remain less than half of the global average.³

Low yield has impact on individual farmers, and on macro issues. A farmer who produces lower crop yields has no chance to increase profitability. Looking more broadly, the yield gap is a key reason farmers in Africa are not producing enough food to sustain the continent's rapidly growing population.⁴ Despite having about 60 percent of the world's uncultivated arable land, the continent spends about \$40 billion annually on food imports.⁵ Helping smallholder farmers increase crop yield has potential to drastically improve lives of millions of farmers, and feed the continent.⁶

The proven solution: Use of high quality seeds is proven to increase crop production and farm productivity.⁷ High quality seeds are naturally bred to be higher-yielding, and are locally-adapted to resist disease, mature

1 Jack, B. Kelsey. "Market inefficiencies and the adoption of agricultural technologies in developing countries." (2013). p. 2
2 <http://reliefweb.int/sites/reliefweb.int/files/resources/agrapassreporthires.pdf&sa=D&ust=1479077642368000&usg=AFQjCNEbbqSL7sL09pbGPBNCNajNCA7VQ>
3 <http://www.bloomberg.com/news/articles/2016-09-07/agra-plans-to-invest-500-million-in-african-seed-companies&sa=D&ust=1479077545187000&usg=AFQjCNF-QKRPFTPXyse8bOGkTaDsUIM-Nw>
4 <http://reliefweb.int/sites/reliefweb.int/files/resources/agrapassreporthires.pdf&sa=D&ust=1479077642368000&usg=AFQjCNEbbqSL7sL09pbGPBNCNajNCA7VQ>
5 <http://www.bloomberg.com/news/articles/2016-02-16/african-farmers-struggle-to-feed-continent-s-booming-population&sa=D&ust=1479079132901000&usg=AFQjCNHcYVivgdvX-VaxHuXJFTrJUdhI5A>
6 http://globalfoodforthought.typepad.com/global-food-for-thought/2012/05/guest-commentary-growing-prosperity-planting-the-seeds-of-africas-green-revolution.html&sa=D&ust=1479074579577000&usg=AFQjCNEaS3-XYLjjHCNiRWQW4dYLU5_JA
7 http://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-OQ

earlier, and respond well to fertilizer.⁸ A 2013 survey of farmers in nine countries found that the majority who invested in improved crop varieties achieved yields 50 to 100 percent above local varieties. 69 percent of farmers in Kenya, 74 percent in Nigeria, and 79 percent in Mozambique said improved maize varieties had doubled harvests per hectare. Meanwhile, 79 percent of farmers in Ghana reported doubling rice yields, and 85 percent of farmers surveyed in Uganda reporting doubling yields from cowpea.⁹ When combined with effective fertilizer use, improved seeds can produce even more yield.¹⁰

For decades the agriculture industry in Africa has lacked a supply of improved crop varieties and a strong distribution network capable of delivering seeds to large numbers of farmers.¹¹ However, thanks to many efforts in the past decades, natural seed development has vastly improved. 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).¹²

Variables affecting distribution

Market penetration for high-quality seeds is extremely low throughout sub-Saharan Africa, Approximately 80% of the seeds that are used in sub-Saharan Africa are distributed through informal seed systems, wherein the farmer saves and replants their seeds every year.¹³ There is still a much greater need to reach the remainder of the market. These are the variables we uncovered in our research that affect successful distribution:

- Crop varieties need to be suitable for local growing conditions and clearly superior to varieties farmers were currently planting. Farmers who are unable to observe an advertised higher yield may opt to not continue using.¹⁴
- Previous studies found that seeds are ideally packaged in 2 kilograms or less, because most smallholder farmers in Africa are tending plots less than one hectare in size.¹⁵
- Seasonality matters. The unavailability of quality seeds at the right place and time coupled with poor promotion system, is one of the key factors accounting for limited use of improved seeds.¹⁶
- Supply chains must reach farmers near their farms. Forcing farmers to travel large distances disincentives use of improved seeds.¹⁷

8<http://globalfoodforthought.typepad.com/global-food-for-thought/2012/05/guest-commentary-growing-prosperity-planting-the-seeds-of-africas-green-revolution.html&sa=D&ust=1479074718194000&usg=AFQjCNGg9hcHwIGJo-7aReAO3ux-cyS9uw>

9<http://reliefweb.int/sites/reliefweb.int/files/resources/agrapassreporthires.pdf&sa=D&ust=1479078521513000&usg=AFQjCNHaXoL-Z4Vrb2L0QA8XXZVvbvj5WA>

10http://www.fao.org/fileadmin/user_upload/drought/docs/AGRA%2520Seed%2520Systems%2520and%2520the%2520future%2520of%2520farming.pdf&sa=D&ust=1479076440936000&usg=AFQjCNEXFWk4K8D0Gpv8CcDyUBGXrs0v-w

11<http://globalfoodforthought.typepad.com/global-food-for-thought/2012/05/guest-commentary-growing-prosperity-planting-the-seeds-of-africas-green-revolution.html&sa=D&ust=1479074718194000&usg=AFQjCNGg9hcHwIGJo-7aReAO3ux-cyS9uw>

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

13https://www.pwc.in/assets/pdfs/publications/2016/india-africa-partnership-in-agriculture-current-and-future-prospects.pdf&sa=D&ust=1479079565259000&usg=AFQjCNH49Bfr_jpSQAkqBGHsTRgV-0b8Vg

14http://reliefweb.int/sites/reliefweb.int/files/resources/agrapassreporthires.pdf&sa=D&ust=1479078687000000&usg=AFQjCNFc-uvkDWAH3q9Anmu1Rv_BN2h0HQ

15 *ibid.*

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=AFQjCNFJ84FULzGTI-PP5hXT51pt0vD4A>

- There is some pushback against high quality seeds related to concerns over genetically modified seeds.
- High quality seeds are further improved when combined with other interventions, such as effective fertilizer use. It may be possible to combine this challenge with our other *Increase Effective Fertilizer Use or Teach Microsoding Technique* challenges.¹⁸

Your solution will need to address these constraints within your local operating region.

Key metrics to measure success

There are several categories of metric which you might use to evaluate program success:

- Yield indicators, such as % improvement in yield. This has a couple of weaknesses:
 - A farmer may increase yields whilst decreasing earnings if the cost of fertilizer required for increasing the yield are too high¹⁹
 - Yields are variable year-to-year, which means that unless you compare with a control, a yield increase may not be due to your intervention
- Income indicators, such as % improvement in earnings. This is better than measuring yield because it avoids the weaknesses listed above. However the improvement in earnings could still be temporary, perhaps because of normal year-to-year variation.
- Long-run standard of living indicators, such as asset accumulation or Grameen Bank's 10 indicators. These show lasting improvement to farmers lives.

Metrics should be weighted so that gains to the poorest score more highly than the same gain to a richer person.

Your challenge: We will award up to \$20,000 to a Distribution Entrepreneur who will reliably boost the standard of living of 50 smallholder farmers (cultivating land of 2 hectares or less) by distributing high-quality seed varieties. Winning entrepreneurs will have a vision for growing to support 2,000 farmers over two years.

Because there are many variables that can affect whether seed quality produces higher yield and higher income, you must have a localized plan that can manage uncertainty, including:

- An evidence-based model which identifies the strongest factors that cause low yield and low earnings for farmers, specific to the region in which you will operate
- An evidenced-based model of how and why your high-quality seeds will boost farmer yield and farmer earnings in the long run
- A plan for continuous testing and evaluation of the program
- A commitment to change the plan if the evidence suggests that the approach isn't working

¹⁷http://reliefweb.int/sites/reliefweb.int/files/resources/agrapassreporthires.pdf&sa=D&ust=1479078687000000&usg=AFQjCNFc-uvkDWAH3q9Anmu1Rv_BN2h0HQ

¹⁸ *ibid.*

¹⁹ Duflo, Esther, Michael Kremer, and Jonathan Robinson. "How high are rates of return to fertilizer? Evidence from field experiments in Kenya." *The American economic review* 98.2 (2008): 482-488.

A successful team for this challenge will likely require previous experience in research and impact evaluation in international development, especially relating to agriculture, and previous field experience with agriculture in the region where you will operate.

Additional useful resources

- 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>

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Questions? Email the D-Prize team at help@d-prize.org