

One Acre Fund Diligence Trip – Jinja, Uganda
10/6 – 10/7/16

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History of OAF Uganda

- 2013 – Scouting. 150 test farmers.
- 2014 – Pilot year 1. First research station opened. 395 clients (aggregate). 97% farmer repayment rate.
- 2015 – Pilot year 2. 2120 clients. 100% farmer repayment rate.
- 2016 – Country adoption and full OAF program rollout. 4756 clients (current). Harvest season is now complete, and final repayments from farmers are expected within the next two months. Estimated 97% to 100% farmer repayment rate (after collection of crop insurance proceeds).
- Estimated 2017 – 7000 clients.

Program Overview

- 120 staff in Uganda, including approx. 33 field officers and approx. 30 in Jinja program HQ.
- Accelerated learning curve thanks to similarities with Kenya program.
- Like in Kenya, OAF only works with the March planting season (heavier rains) and does not service clients with respect to the September planting season (too complicated to manage overlapping programs, and less robust rains reduce program impact).
- Unlike in Kenya, OAF only works with maize crop currently. Currently testing beans, sorghum, peanuts, and onions for intercropping, but substantially behind Kenya in this regard. The concern is that intercropping could reduce maize yields and add complexity that will make farmer enrollments more difficult, in addition to draining research resources from OAF battle against the Striga weed problem (discussed below). In terms of intercropping, Uganda is simply 4 or 5 years behind OAF Kenya and needs more time and resources.
- Uganda program has faced some unique challenges and headwinds that cause farmer yields to be substantially lower than Kenya's, and that largely define the focus of the OAF program here. Challenges in order of importance:
 - Striga weed – Striga weed is a major problem in many districts in eastern Uganda, including those where OAF began operations. Striga germinates and attaches to the maize root and “strangles” the maize, stunting its growth. Combatting the Striga problem is the largest focus of the Uganda innovations team. Methods being developed and tested include: a.) Planting of desmodium grass to kill Striga via “suicidal germination”, and b.) use of maize seeds that are treated with “IR” herbicide that kills the Striga.
 - Poor input quality – OAF is forced to buy seeds from only a few registered seed suppliers in Uganda. The main seed supplier used in the Pilot program (a

Ugandan company, Naseco) provided bad quality seed for the 2016 planting season, which frequently failed to germinate and resulted in abnormally low yields. Sourcing higher quality inputs from international seed providers is now a priority, as is overcoming some trust issues with farmers resulting from OAF's bad seed recommendation in 2016.

- Abnormally low rainfall in 2015 and 2016 – Low rainfall has resulted in low baseline yields (around 35% of baseline in some districts), which has made repayment for some farmers difficult (despite healthy relative gains vs. baseline). Even with 100% gains vs non OAF farmers, many still have not received significant absolute yield gains. This has made repayment for many farmers a challenge. The problem will be partially offset when the crop insurance policy pays out in several months. But for now, this creates additional trust challenges with some farmers who feel they haven't received the promised benefits, even though their relative gains are still healthy (there is a tendency to blame OAF for low yields that were largely caused by external factors). With time, this unlucky condition will likely resolve itself.
 - Note: OAF's crop insurance policy in Uganda is based on actual measure of OAF harvest. The insurance company has more trust in OAF's harvest data than it does in weather data available in Uganda, so the policy is based on actual harvest (not rainfall data). The policy kicks in if the harvest rate falls below 70% of the baseline value in an insured district. Some districts are experiencing harvest rates as low as 35% of the baseline. The policy covers deficient yields regardless of cause (weather, blight, poor seed, etc. and regardless of fault). It therefore is moot whether the cause of the low yield is classified as "weather related" vs. poor decision-making by OAF regarding seed sourcing from a single poor quality supplier.
- Baseline agricultural knowledge and practice of typical farmer is very low. Farmers in Uganda are significantly behind Kenyan farmers generally. Most have never used fertilizer (2kg average per acre in Uganda vs 20kg average per acre in Kenya) and there has been minimal adoption of modern "hybrid" seeds like the ones OAF sources. It is therefore a greater challenge getting farmers to understand the OAF program, making enrollment more difficult. It also means the farmers are less ready to understand intercropping concepts involving crop diversity. On the other hand, low baseline knowledge means the farmers experience lower yields, more poverty, and thus the potential for impact in Uganda is greater.
- Despite challenges, OAF participants have still achieved highly positive results on a relative basis (nearly a doubling of output vs. baseline on average). OAF now has an 85% retention rate.

District Coverage

- There are approx. ~120 total districts in Uganda. OAF is now active in four districts.
 - Kamuli – OAF began scouting and pilot program here. 70% - 80% Striga affected.

- Iganga – Site of our Day 1 field visit. No Striga.
- Jinja - Site of our Day 2 field visit. Some Striga.
- Buikwe – Currently only demo program operating here, launching in March of 2017. No Striga.
- Because OAF is still actively developing a solution to the Striga problem, new district additions in the short term will be to non-Striga affected districts (like Buikwe). This allows OAF to more easily recruit clients because a.) they make more money and are more financial capable of taking on the OAF debt and repayment obligations, and b.) the cost of the program is lower (because the Striga package adds around \$65 to the package costs). This makes it easier for OAF to meet its growth targets. It also means expansion will likely be more focused on Uganda's western and northern districts (as opposed to eastern) where Striga is less prevalent or non-existent. OAF hopes to later expand to Striga affected districts once they've refined the plan to combat Striga and are ready to rollout the Striga package in a more comprehensive way.

Enrollment Forecast / 5 year Plan:

- 2016 (current): farmers 4750 , 40% financially self sustaining (compares with Kenya at 220k farmers currently)
- 2017: 7000-8000 farmers
- 2018: 18,000 farmers
- 2019: 34,000 farmers
- 2020: 50,000 farmers and 100% financial self sustainability of OAF Uganda

Typical Annual Calendar

- October – Marketing to farmers and interviews
- November – Farmer selection / enrollment, contracts signed
- Jan – Feb – Inputs purchased, initial commitment payment taken from farmers
- March – Inputs delivered to farmers, planting
- July-August – Harvest, significant repayments begin
- Mid September – First repayment deadline
- Mid November – Extended repayment deadline

The Striga Problem

- Overview: Striga is a parasitic weed that seriously constrains the productivity of staple crops such as maize, sorghum, millet and rice in Sub-Saharan Africa. The weed survives by siphoning off water and nutrients from the crops for its own growth. It causes serious damage to its host crop before emerging from the soil (and flowering) by producing toxins that are harmful to the host crop. Upon attachment to host roots, it withdraws nutrients, minerals and water, resulting in stunting and withering of the crop. Striga infests as much as 40 million hectares of smallholder farmland in Africa and causes yield losses ranging from 20–80% and even total crop failure in severe infestation. Striga seeds remain dormant and viable in the soil for up to 20 years. With every planting season, some of the dormant seeds germinate and infest the host crop

while reproducing and increasing the Striga seeds in the soil thus escalating the problem. Each Striga seed, if allowed to germinate and flower, can produce thousands of Striga seeds that are easily transported to adjacent areas via wind, foot, vehicle tire, etc., making the Striga problem highly contagious.

- OAF Actions to Combat Striga:
 - Two primary approaches being developed have shown positive results in Phase I testing and are now undergoing Phase II testing on actual farmers in the field:
 - Desmodium intercropping. Desmodium is a grass legume plant that is not edible by humans (but can be used for fodder). Desmodium releases the same chemical released by maize and other crops that triggers Striga germination. Once germination occurs, striga searches for a crop root to attach to. Desmodium's secret evolutionary weapon is that Striga is unable to attach to the desmodium root, so its survival depends on the presence of an alternative root to attach to. If there is no maize crop to attach to at that time, the germinating Striga dies. Planting the desmodium seed via intercropping at around the same time as the maize (maybe just before??), results in the "suicidal germination" of the Striga, which allows the maize seed to germinate and grow in the absence of live Striga. This solution has enormous long-term potential because it triggers Striga germination and death-by-starvation, which reduces the number of living Striga seeds in the soil (provided no new Striga weeds are allowed to flower and drop new seeds). Maximim benefits can be noticed after two planting seasons of desmodium in a particular field. OAF believes that after 6 to 12 planting seasons (3-6 years), an infected field can be permanently cleared of Striga. It thus represents an enormous opportunity to permanently impact millions of acres of farmland if OAF can formulate and roll out a proven desmodium solution.
 - Developing this solution absorbs a huge amount of OAF's Ugandan research resources, including much of Mohammed's time. Mohammed demonstrated mastery of the subject matter and appears to be one of the world's leading experts on this potential solution as a result of the testing OAF has done. Given the scale of the problem, not just in Uganda but across much of Africa, the huge allocation of resources to this solution seems highly justified with tremendous "world changing" potential.
 - Note: Sourcing of desmodium seeds in large quantity is a challenge as seed suppliers do not see it as a long term / recurring revenue source. It may require NGO intervention to make available desmodium seed in sufficient quantities to enable the eradication of Striga per the formula OAF is developing.
 - IR maize varieties (herbicide): Maize seeds can be purchased with an Imazipyr ("IR") herbicide coating that prevents the Striga from attaching to the crop root. This is a simple, albeit costly, solution that provides immediate benefits. It is a short-term solution in that it does not result in

seed bank reduction (the Striga seed remains alive and dormant in the soil for 20 years). IR treatment also kills any other crop that is intercropped with the IR treated maize (although OAF is testing greater intercrop spacing for possible exceptions). The IR treatment is also delicate and risky in that improper treatment, storage, and handling can cause the maize crop itself to fail to germinate in some circumstances.

- OAF takes other actions in support of its battle on Striga:
 - Seed testing. OAF does extensive testing in its research trying to identify maize seeds and different crop varieties that are naturally more resilient to the Striga weed. OAF has access to four seed suppliers, each of which have different maize varieties and other crops seeds. OAF bases its recommendations to Striga affected farmers based on these results. Currently OAF is only suggesting maize to all farmers in Uganda, but that could change with time.
 - Policy. OAF works with the Uganda government on Striga policy (called the “Striga Ordinance”). This includes creating regulations on moving and disposal of the seed, cleaning of vehicles, animals, and equipment that might contain the seed, and rules that prohibit farmers from allowing the seed to flower on their crops. The Striga Ordinance is expected to pass into legislation later this year.
- On our day 1 field visit we were taken to several plots where A/B testing of various Striga treatment approaches is occurring with results that are visually obvious and remarkable. OAF has observed an average 34% reduction in Striga following one season of treatment. The expectation is that a Striga affected field should experience an additional doubling of crop yields by adding the Striga package to an existing OAF package (meaning an approx. quadrupling is possible for non-OAF farmers affected by Striga that join OAF). There are currently 120 farmers participating in OAF’s desmodium intercropping program, and 218 using IR treated seeds. OAF is testing all varieties of available seeds from four different manufacturers, with and without desmodium intercropping, in an attempt to understand the problem and optimize its solution. See pics.

Seed Sourcing

- OAF currently sources seeds from three suppliers that are currently registered in Uganda:
 - Naseco (Ugandan company): Company is small with seeds grown in geographically concentrated part of Uganda. Produces the Longe 10 maize seed that performed very well in 2013-2015, causing OAF to recommend Longe 10 to most farmers in 2016 at time of large-scale rollout. Due to poor rainfall in 2015, 2016 seeds frequently failed to germinate – a problem likely related to the geographically concentrated growth of the seeds. Naseco no longer offers Longe 10 and instead offers Bazouka variety, which OAF largely recommended to farmers for September (2nd) demo planting season (not full scale rollout – OAF core program only active in March planting season). After several weeks of

planting, Bazouka appears to have germinated very well; with crops we witnessed showing excellent results. OAF still testing and recommending older Longe 7 variety in conjunction with IR herbicide in Striga areas, as Longe 10 proved to perform poorly with IR treatment.

- Panor: South African company that offered Panor 67 that worked well in pilot years and has been phased out. Panor 67 was replaced with Panor 15 variety that OAF offers to farmers and recommends. Many farmers not familiar with Panor company and reluctant to try in the absence of neighbors that have experience with the seed.
- Kenyase: Kenyan company offering Kenyase 513 variety. Good seed but OAF testing shows it has lower yields than Panor 67 and 15.
- Because of the bad experience with Naseco in 2016 (failed germination problem), OAF is working to diversify its input suppliers. Specifically it is looking for larger and more reputable international seed suppliers and work with them to get Ugandan import registrations. This process is likely to be eased significantly if the planned changes to the CONESA policy are implemented (free trade agreement among many African counties).

Mistakes and Lessons Learned

- As is always the case with OAF, Siler and Sebastien were open and transparent regarding mistakes made in Uganda, and what OAF has done in response.
 - Lack of effective marketing – OAF underestimated how much work would be needed to educate farmers about the benefits of the OAF program, and enrollments were slower to come than originally expected (150 actual vs. 450 goal). In response, OAF now has setup demo plots in geographically disbursed areas so that farmers can observe visually the benefits of the OAF program. Enrollment rate is now back on target.
 - Lack of coordination with the government – There was little OAF interaction with government officials, which created an awkward dynamic where many local officials felt threatened by the introduction of OAF and were bad-mouthing OAF to the farmers. In response, OAF now has a government relations department that has largely soothed the concerns and receives the unofficial support from most local government officials.

Pics:



A walk through a non-OAF farm shows one of the mistakes made by many Ugandan farmers who lack knowledge about best farming practices. Here the farmer has planted three seeds in the same hole. This practice will not produce an optimal yield (vs. evenly spaced seeds). It is most likely this farmer will either join OAF or copy OAF practices during the next planting season after seeing the productivity of his neighbor.



OAF farms have a distinctive appearance in that they are always orderly, clean, and with perfect seed alignment and spacing.



Non-OAF farms in Uganda frequently appear amateurish to the point where it's sometimes unclear if it's even a farm. We are told this is in fact a farm plot and is fairly typical in Uganda.



OAF field tests a Striga affected farm with Longe 7 IR seed (herbicide treated). The adjacent plot uses Longe 7 without the IR treatment.



On this Striga affected farm it is easy to see the benefits of the IR treatment on the Longe 7 seed (left) vs the untreated Longe 7 plot (right).



This farmer is part of OAF's demo program and currently does not pay to participate in the Striga treatment testing. He will enjoy large yield gains during the current planting season (planted in September), as is already obvious by inspecting his Desmodium treated plot (where he stands) vs. the adjacent control plot (no desmodium).



The OAF slogan is “Farmers First”. OAF hopes to have 50,000 farmers enrolled in Uganda by 2020.



This demo plot was just planted two weeks ago with the Bazouka seed from Naseco. It is apparent that the germination rate is about 99%. By comparison, the Longe 10 seed from last year would have been closer to 50%. This is a positive sign that the Longe 10 debacle from last year has been resolved.



Rainfall is critical to maize productivity. Here a small pool of rain is trapped by the design of maize leaves and flows down to the roots. During the past year, rainfall was very low in many regions in Uganda, causing OAF to trigger its Uganda crop yield insurance policy for the first time.



OAF field agents speak with farmers and FP about yield gains in these Striga affected plots.



The women farmers shown here are members of the same group and help each other farm each others fields. Their interactions make us question whether they are simply neighbors or family... the dividing lines are more blurry in rural Africa than in western countries.



Farmers stand next to a freshly planted crop where Desmodium testing is being done. A yellow rope defines the 10 meter square boundary. The adjacent crop has no desmodium and is bordered by a blue rope. The crop is yet to germinate, so anticipation builds as the farmers wait to see if the desmodium intercropping will have an effect.



This farmer experienced a remarkable 9x yield gain since joining OAF. He leads a group of six farmers and sits on the parish governing council. He is an example of OAF strategically selecting participants for the OAF program who can represent OAF in marketing to additional farmer clients.