

## Farmers First

One Acre Fund believes in measuring our program impact for two distinct purposes: to both *prove* and *improve* our impact. Every year, we take thousands of physical harvest weights from both One Acre Fund farmers as well as their neighbors, who are matched on observable characteristics, and estimate the extra profit farmers make by joining our program. We use this data to prove our impact, but it's especially useful for improving our program, as it provides us with a rich data set to make strategic decisions and to assess our progress over years and across countries. For example, this data allows us to understand variations in impact among crops and regions, place research attention where we are underperforming, and scale up in areas where we are performing well.

We believe these assessments provide a robust and representative understanding of our impact. However, we also feel it's important to periodically measure program impact using the gold standard of program evaluation: a randomized control trial (RCT). Our recent RCT measured outcomes for two groups taken from a pool of farmers who were interested in our program – one group was randomly selected to receive our services, while the other did not. Because both groups had shown interest in One Acre Fund, this removed selection bias in our impact results. Or, put another way, any measured differences in outcomes between the two groups can be attributed solely to program participation, and not to innate differences between participants and non-participants. It would be impossible to conduct an RCT in all countries for all years, so we will continue to rely on our internal evaluation strategy, but we feel it's important to validate our program impact through such a trial.

### Study design and research questions

With the financial support of Global Innovation Fund, One Acre Fund commissioned an RCT to study our program's impact on maize and bean yields in the 2017 long rains season in Kenya's Teso District. The study was conducted in partnership with 3ie, which validated the design and pre-analysis plan. Intermedia Development Consultants audited the data collection, and an independent analysis was conducted by Emilia Tjernström and Josh Deutchmann of the University of Madison-Wisconsin. Primarily, the study sought to understand three questions:

- (1)** Did the One Acre Fund program impact participating farmers' yields and profits?
- (2)** Was there any evidence of an enduring impact for farmers who initially join One Acre Fund, but don't re-enroll in future seasons?
- (3)** How would the yield impact measured in the RCT compare to One Acre Fund's internal impact estimates?

We enrolled about 2,400 farmers in the study, half of whom were selected to be control farmers. All program expansion in 2017 was "internal," meaning farmers in the study were drawn from areas quite close to existing program locations. Quite unexpectedly, we discovered that about two-thirds of all the farmers in the study had been in the program in the prior year. Even though they were not in a "program area" in prior years, they had commuted into these areas to take advantage of the program. This was not ideal because many of the control farmers had already learned One Acre Fund practices, and this could easily diminish any measured impact.

Running this study using control farmers who had experience with One Acre Fund in the past had two consequences. First, it meant that whatever impact we observed would likely be a lower-bound estimate. Secondly, it provided the opportunity to try to understand the persistence of program impact by comparing control farmers, who had been involved in the program in the past, with "pure" or non-exposed control farmers.

Finally, we rely heavily on our internal estimates to understand our impact and inform our strategy, so we wanted to use the RCT to evaluate and validate our measurements. We hoped that by comparing our impact estimates from areas surrounding the RCT with the results of the trial, we could better understand the validity of our internal measurement strategy.

## Results

The analysis was conducted independently by Emilia Tjorestrom and Josh Deutchmann, who found the following:

1. One Acre Fund participation led to statistically and economically significant increases in both yields and profits. The results were highly statistically significant over multiple model specifications. Specifically, in the authors' preferred model, participation led to an increase in over 340 kg of maize per enrolled farm family, which translated into an extra \$80 of maize profit.

This study serves as another powerful validation of the impact of our model, alongside our 2014 RCT and 2015 difference-in-difference studies (see [here](#)). Additionally, paired with data on the net cost to serve a One Acre Fund farmer, this study also validates our strong cost effectiveness.

Table 1: Summary of results

	Coefficient	Std. Error	95% CI	Control Mean
Maize yields per acre	180.379***	(35.488)	[110.824, 249.935]	1124.733
Maize yields per farmer	343.681***	(82.047)	[182.8717, 504.4892]	1081.431
Maize and beans profit	71.671**	(29.628)	[13.60126, 129.7414]	353.191
Maize profit	80.658***	(29.406)	[23.02255, 138.2938]	338.942

Standard errors in parentheses

Note: standard errors clustered at cluster level

\*  $p < .1$ , \*\*  $p < .05$ , \*\*\*  $p < .01$

Coefficients presented are from 2SLS regressions with cluster-level FAW instrument and all pre-specified controls.

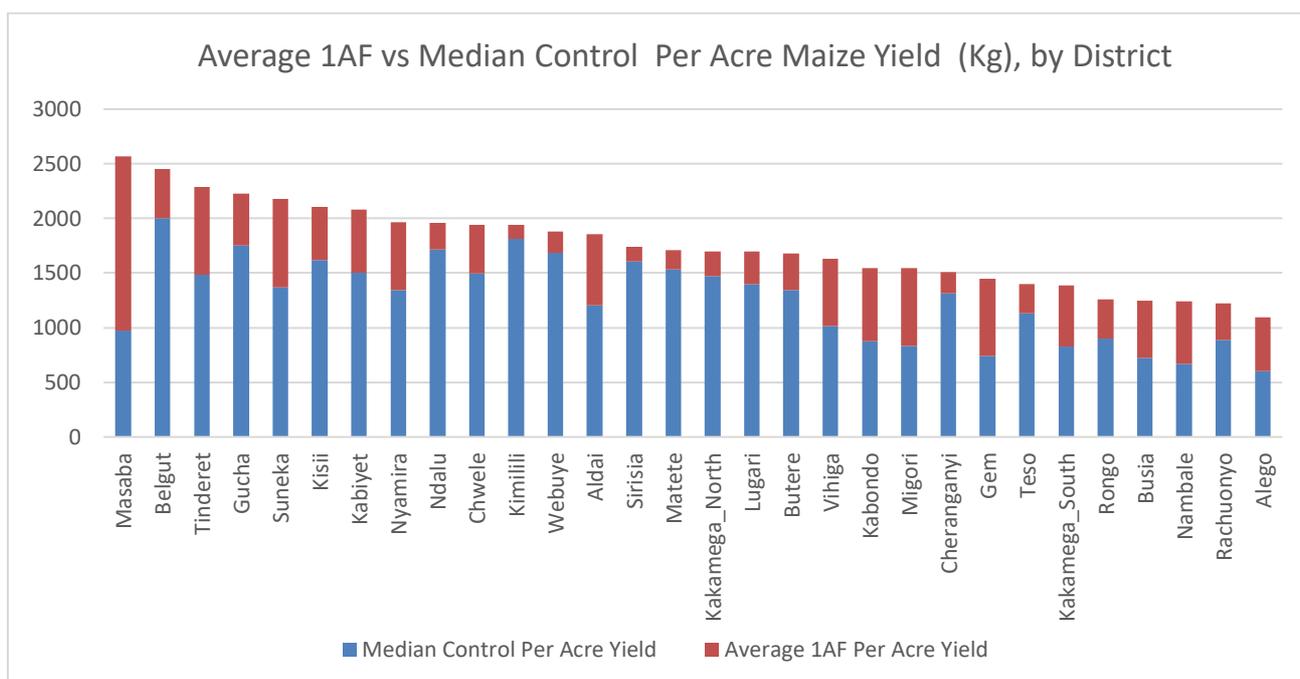
2. The authors did not find conclusive evidence of a persistent program impact on profits by comparing control farmers who had been in the One Acre Fund program in the past with others who had not. However, interestingly, the researchers did find evidence that farmers retain the One Acre Fund training practices and also increased their input use. Combined with previous research showing lower-quality locally available inputs, this could imply that the inability to continue accessing high-quality inputs is what stymies impact persistence.

Prior internal studies (less rigorous than this one, but more representative) have found some evidence of impact persistence in maize yields in Kenya. In truth, neither that nor this study was an RCT designed specifically to test impact persistence. This would require a multi-season study that randomly de-enrolls farmers in a second or later year, which we believe to be a reputational and ethical challenge not justified by the learnings. Overall, we believe the evidence shows that farmers do retain some benefit after leaving the program, but it is not as great as continued program participation.

Regardless of how much impact persists, we know former One Acre Fund farmers still achieve lower profits than One Acre Fund farmers who stay enrolled in the program. This speaks to why One Acre Fund seeks to both: (1) retain farm families over time, knowing they will achieve higher profits on average in our program; and (2) use our partnerships and policy work to improve the availability of quality inputs broadly, for farmers who choose not to continue farming with One Acre Fund.

- Both the RCT and our internal M&E estimates of yield were highly statistically significant. However, the evaluators did find Teso’s impact results were weaker than the results from the four surrounding districts using our internal measurement methodology (propensity score matching, or PSM). The RCT results were also weaker relative to our overall 2017 Kenya results using PSM (\$118 maize profit per farmer).

The evaluators noted that this difference could be due to two different causes. It might be that One Acre Fund’s PSM methodology does not adequately control for selection bias, or it could be that the districts surrounding the RCT study area were simply higher performing than the study area itself. One Acre Fund believes it is likely a combination of both. We note that Teso was one of the poorer-performing districts compared to the other program areas in 2017, according to internal measurements, with yields in the bottom quintile compared to 29 other districts measured. So, it is certainly possible that the differences in the RCT results and internal measurements could be due to agronomic variation in impact.



Comparing the RCT results more fully to our internal M&E results from that year, the total impact differences are even greater than what is stated above. This is because the Teso RCT did not account for the lifetime impact of other asset products (like trees and solar lamps), for which we claim the lifetime impact of the product discounted to the present value. A more full side-by-side comparison is presented in the table below:

	2017 Teso RCT	Internal Kenya M&E 2017
<b>Maize profit <sup>1</sup></b>	\$80.66	\$117.44
<b>Asset profit (includes average lifetime impact of solar lights, trees, and other products)</b>	---	\$103.10
<i>Solar lights</i>		\$22.42
<i>Trees</i>		\$78.49
<i>Other products</i>		\$3.17
<b>Total per farmer profit</b>	---	\$220.52
<b>% change in maize profit</b>	24%	27%
<b>% change in total profit</b>	---	55%

## Implications and internal learnings

The primary purpose of this study was to use the “gold standard” in impact evaluation to validate our program impact, and we feel this study is fairly conclusive on this front, as it finds robust impacts across numerous regression specifications. One Acre Fund's internal evidence has long shown statistically and economically significant impacts of our model, but it is encouraging to see this confirmed through the gold standard in evaluation.

We believe that this study, overall, validates the use of our internal measurement approach (using propensity score matching), since the results were generally similar to our internal measurement results. This RCT's profit estimate from the Teso district was slightly lower than that obtained from our other 29 districts. However, in our previous RCT (see [here](#)), the district studied showed higher impact results than our internal Kenya-wide impact. So overall, we feel our internal measurement strategy is the best way to get accurate and strategically useful data. However, the results also remind us that PSM does not control for all selection bias, and so we will continually work to improve our matching specifications to obtain the most accurate and also most useful internal impact data.

One Acre Fund has long believed that farmers enroll season after season because they see a continued benefit to program participation, and these findings lend support to that idea. There is likely some lingering impact from former program participation, but it's clear that the high level impact from the participation year does not fully sustain itself. Farmers may not be "graduating" from the program because they likely continue to have difficulty accessing quality fertilizer and seeds without our program. So, this finding lends further support to the emphasis we are placing on government partnerships and policy work to improve access to quality inputs and training for all farmers.

Finally, we have learned some operational lessons in terms of data collection. Midway through the study, we noted that farmers were not consistent or reliable in their estimates of land size, and so we switched to a more reliable GPS measurement of maize land size. We also made other improvements to our surveys, getting more precise data on labor and land type.

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<sup>1</sup> We present the RCT results for maize profit only, whereas the internal M&E measurement include bean profits. This is because we were challenged to collect sufficient and reliable bean harvest data in the RCT. However, our internal measurements show very little if any beans impact from program participation, so we believe two measurements are roughly comparable."