Analysis: One Acre Fund Spillover Effect in Kenya

ONE ACRE FUND

Farmers First

Purpose

One Acre Fund undertook this analysis in order to better understand the extent to which farmers who live in our program areas, but who are not enrolled in the program, still receive some program benefit. We hypothesize that neighboring farmers and those who have personal connections with One Acre Fund farmers could learn about and adopt One Acre Fund training practices and possibly see a benefit in terms of improved yields.

We know from anecdotal evidence that this is happening to some degree. Non-One Ace Fund farmers who we survey as part of our regular M&E sometimes tell us they plant "the One Acre Fund way." However, we have never before attempted to measure or quantify the spillover of our program to non-participating farmers.

Spillover has implications for how we both understand and measure our impact. The presence of spillover means we are double under-counting our program impact in the following ways:

1. Because we use neighboring farmers to assess our program impact, spillover to those farmers would mean that we are under-estimating our impact.

2. We are not capturing the program benefit to non-participating farmers.

Methodology

We conducted parallel analyses using both 2014 and 2015 monitoring and evaluation data on harvest yields, which are collected by physically weighing two randomly selected portions of each farmer's maize fields.

2014 Impact Data

We ran our analysis on data we had already collected as part of our 2014 impact assessment, but limited the dataset to control farmers in Kenya. Control farmers were identified by One Acre Fund farmers as "interested" in the program, so we have reason to believe that they have close connections with One Acre Fund farmers and could be subject to spillover effects. We included over 300 observations that had data on program density, One Acre Fund duration (the length of time One Acre Fund has been operating that area), demographic variables, farm inputs, land size and yields. The data were collected from over 173 "sites" (a site is the area a field officer serves and typically includes around 200 farmers).

All the data were collected in 2014 with the exception of the two key variables below, which we attempted to add to the data:

- *Program density rate*: It was incredibly difficult to get good data on program density. One Acre Fund site boundaries do not line up perfectly with government boundaries, so it was difficult to

get an accurate population figure to use in the denominator of a program density calculation. Our internal consulting team did provide some estimate of this based on a Ward population level (an administrative unit which incorporates several program sites). This gives us a very rough density estimate as it adds up several program sites together (which each might have different density levels) and these boundaries do not perfectly match ward level boundaries. We therefore preferred to use duration of One Acre Fund presence to estimate spillover.

- *Program Duration*: It is also difficult to get good data on the duration of One Acre Fund presence per each site, as program sites split, combine, and are renamed over the years. Therefore our internal records were not very reliable. So, to get this data we surveyed field directors who had long worked in each area directly and they were able to provide data on the number of years we have been operating in each site.

Findings

Thinking critically about how spillover might work, we might not expect that an additional *single* year of One Acre Fund presence would predict a big boost in yield for controls. However, the accumulation of several years of One Acre Fund presence might encourage neighbors to both change their planting practices and adopt more improved seeds and fertilizer, which could lead to an improved yield boost.

Therefore, we divided our sample of control farmers into those who are in an area which One Acre Fund has been operating for more than/equal to 4 years or less than 4 years (the median duration of One Acre Fund presence). We include covariates in our regression models, which we think might influence yields: education, total livestock (as a proxy for wealth), fertilizer and province location. Because both provinces we work in, Nyanza and Western, have very different yield profiles, it was important to control for this. We look at the models both with and without fertilizer because we feel that while fertilizer has a powerful influence on yields, it is also subject to program spillover effect itself.

Even the most conservative regression specification ("all factors" below), shows that control farmers in "old" One Acre Fund areas see an increase of about 145 kg of maize per acre, and this is significant at $p<.05$, meaning that there is less than a five percent chance that these result occurred by chance.

OLS Regression on Control Maize harvest Yields 2014 (cut-off at 4 YEARS)				
	Informed	Informed with fertilizer	Informed with location effects	All factors
Years (under and over 4 years of One Acre Fund presence)	**165.7****	**183.0*****	**128.0***	**144.9****
Some secondary education	**192.9*****	**174.1****	**184.4*****	**172.4****
Total livestock	**0.00148**	**0.00155**	**0.00184***	**0.00184***
Total fertilizer		**0.836*****		**0.584****
Province fixed effects			**329.5*****	**287.6*****
Constant	**1,129*****	**1,080*****	**990.4*****	**973.8*****
Observations	302	302	302	302
R-squared	0.049	0.086	0.120	0.137
Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1				

2015 Impact Data

We repeated this analysis using data we collected from our 2015 impact sample. This time we had a larger sample of 959 control farmers representing nearly 400 One Acre Fund sites. We again found a statistically significant boost in yields among control farmers in "old" One Acre Fund sites of about 90 kg of maize per acre.

OLS Regression on Control Maize harvest Yields 2015 (cut-off at 4 YEARS)				
	Informed	Informed with fertilizer	Informed with location effects	All factors
Years (under and over 4 years of One Acre Fund presence)	**82.1****	**81.7****	**93.0****	**91.02****
some secondary education	**77.3**	**59.6**	**96.7***	**78.6**
total livestock	**0.051**	**0.023**	**0.056**	**0.030**
total fertilizer		**1.7****		**1.6****
province fixed effects			**158.5****	**154.2****
Constant	**1,062.7****	**1,029.6****	**949.0****	**920.7****
Observations	**959**	**959**	**934**	**934**
R-squared	0.01	0.03	0.03	0.03
Standard errors in parentheses;		*** p<0.01, ** p<0.05, * p<0.1		

Observations and Conclusions

We believe that the analysis above gives a fairly strong indication that program spillover is happening to control farmers. A possible critique might be that we simply started the program in higher yielding areas and these outcomes are reflecting the fact that older areas were simply more productive. However, we do not believe this is a concern with this data because our growth develops both inward and outward geographically. Older sites can be situated quite close to new sites, both of which are subject to the same agro-ecological conditions.