ONE ACRE FUND

Income and Expenditure Study

⊖ 1. SUMMARY

Understanding how our clients manage their money and choose to allocate their finite resources offers us insight into how we can serve our communities better, with increasingly personalized and gainful inputs and products. To better understand our clients at this level, we conducted a baseline survey of over 3,000 One Acre Fund farmers (referred to as One Acre Fund farmers or simply as "clients"). The findings from this study are available in the report "Income, Consumption, and Expenditure Analysis: One Acre Fund Kenya 2015." That report sought to identify the characteristics of clients and how they differ across geographic areas.

Following that analysis, One Acre Fund tracked a subset of the client households (200) and additional non-client households (200), and conducted detailed household surveys every month for a year. Household selection of One Acre Fund clients within districts was random, and a list of these randomly selected One Acre Fund farmers was provided to each enumerator. Clients were One Acre Fund households for the 2015 long rain season. Control farmer are neighbors of the randomly selected One Acre Fund clients.

The data offer unique insights into how income and expenditure patterns vary over the course of a year, and how these patterns differ among client and non-client households. Although we show differences between clients and non-clients throughout this report these differences are due to two sources: (1) pre-existing differences between clients and non-clients that are not attributable to participation in One Acre Fund (e.g., selection bias) and (2) possible program impact. We present statistics for client and non-client farmers in this report as a descriptive exercise. We do have suggestive evidence of program impact on p. 6, 8, 23, and 31.

The Executive Summary table (Table ES1) presents the main results.

Table ES1. Executive Summary

	One Acre Fund Farmers			Non-One Acre Fund Farmers		
	Median	Mean	Mean Excluding Outliers	Median	Mean	Mean Excluding Outliers
Annual Total Income	**$1,247**	$1,561	$1,504	**$827**	$1,054	$1,017
Annual Cash Income	**$579**	$850	$796	**$368**	$546	$504
Annual Total Expenditure	**$1,689**	$2,209	$2,080	**$1,197**	$1,399	$1,354
Annual Cash Expenditure	**$997**	$1,498	$1,377	**$655**	$891	$846

NOTES:
(1) Total income and expenditure include the value of home-produced consumption, valued at the local market rate.
(2) Income includes the value of business income less business expenditures.
(3) Outliers are any value above or below two standard deviations from the mean. The mean excluding outliers caps outliers values at mean +/-2*sd.

Our key findings and recommendations from these surveys are below. All reported summary statistics (means and medians) for clients and non-clients reflect differences that are due to both pre-existing differences as well as program impact. We consider the below regression results to be suggestive of program impact because we control for a number of factors likely to influence selection into treatment.

1. Income and expenditure are highly skewed to the right with a few clients having very large values of income and cash expenditure and most having very modest values.

2. Median annual total income is $1,247 USD for clients and $827 USD for non-clients.[1] This is the value of cash income plus the value of home-produced consumption.

3. Median annual total expenditure is $1,689 USD for clients and $1,197 USD for non-clients. This is cash expenditure plus the value of home-produced consumption.

4. Expenditures (whether looking at cash or total expenditures including home production) are larger than income for both client and non-client farmers. Other studies of smallholders have similarly found that reported expenditures outstrip reported income, which is an indication that farmers are likely financing their purchases through savings and loans.

5. Home-produced consumption is by far the largest source of total income for both client and non-client households. Similarly, the highest share of total expenditure for both groups is home-produced consumption.

6. Agriculture remains the most important income and expenditure category for study households. Farm income, including maize sales, other crop sales, livestock sales, farm wages earned, and the value of home-produced consumption, comprises 66% of total income. Total food expenditure (both purchased and home-produced) accounts for more than 50% of total expenditures for clients and non-clients (both in terms of mean and median amounts).

7. There is a bimodal distribution in mean monthly income among client households, with high and relatively steady income between September to January and relatively stable and low between February and August. Non-client farmers' mean incomes are consistently lower than One Acre Fund farmers.

8. We have suggestive evidence on the impact of One Acre Fund on income. On average, One Acre Fund clients make $17.5 USD more per month (p<.05) than non-client households, controlling for factors likely to influence selection into the program: number of household members, land ownership size, whether the household owns a granary, whether the household owns a livestock shed, and female education level. We also include sublocation and month controls to account for geographic differences as well as temporal fluctuations that could affect income. However, as we cannot control for selection in this study, we may under or overestimate the true treatment effect.

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[1] The exchange rate used is 1 USD per 101.56 Kenyan Shillings, which is the market exchange rate as of July 14, 2016.

9. Debt is significantly higher for client than non-client households, which is also commensurate with higher incomes, asset values, and savings. Moreover, all clients necessarily take out a One Acre Fund loan, which ranges from $29 USD to $147 USD for new clients and up to $260 USD for returning clients. We find that there is no strong association between repayment rates of One Acre Fund loans and times of greater financial stress.[2]

10. Tenure in One Acre Fund is associated with a statistically significant increase in monthly total expenditure, total income, savings, and education spending. Each additional season in One Acre Fund increases farmers' monthly total expenditure (including the value of home-produced consumption) by nearly $10 USD and school expenditure by over $2 USD, on average (p<.10), controlling for a number of factors likely to influence selection into the program. However, there is a small sample size for this analysis, limiting the generalizability of these findings.

⊕ 2. OBJECTIVES

Through in-depth personal interviews, this study attempted to trace all incoming cash, outgoing cash, and total household consumption, and to track these streams on a monthly basis for a year. From the outset, the principal goals of the survey were to:

1. Deepen our knowledge of client household money management.

2. Understand how income and expenditure patterns vary throughout the year.

3. Learn how One Acre Fund clients differ from non-One Acre Fund client, in their income and expenditure patterns.

All of these inquiries can be leveraged for actionable changes to how our program operates. For example, One Acre Fund may be able to provide loans to clients during times of the years when farmers have the highest expenditures and lowest income levels. Through this process, our team gained a more nuanced understanding of how our typical client household views agriculture, and how their finite resources were allocated.

⊕ 3. METHODOLOGY

3.1 Sampling Strategy

Ten One Acre Fund Districts in Kenya were selected for Income and Expenditure surveys. There was an uneven allocation of households sampled per district, with a high of 78 farmers sampled in Chwele and a low of 24 households sampled in Gucha. District selection was non-random, and was informed by the preferences of the Field Operations department, the Product Innovations department, and the Scale Innovations department.

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[2] Repayment data are available at the district level. Repayment data were matched with farmer level data by district, month, and year. Therefore, it is possible these correlations mask how an individual's repayment rate correlates with their financial situation. That is, one household may repay when they have high incomes and low expenditures and another household may repay when they have low income and high expenditures. In this situation, there would be no overall correlation between income and expenditure and repayment rates. Furthermore, repayment rate data are for all One Acre Fund farmers whereas this study only includes 200 One Acre Fund farmers. Although study farmers were selected randomly, it is possible that study farmers' repayment habits are not representative of One Acre Fund farmers in general.

Household selection of One Acre Fund clients within districts was random, and a list of these randomly selected One Acre Fund farmers was provided to each enumerator. Clients were One Acre Fund households for the 2015 long rain season. Enumerators conducted a baseline study of over 3,500 client farmers in February, 2105. Enumerators followed up with approximately 200 of these client farmers and an additional 200 control farmers every month, except March and June, until January, 2016. Control farmers are the nearest geographic neighbors of the randomly selected One Acre Fund clients.

This report analyzes the consumption and expenditure patterns for the 200 farmers in the baseline survey who were also part of the subsequent follow-up surveys, as well as the 200 control farmers. It thus offers a unique longitudinal dataset of client and non-client households' detailed expenditure and income patterns.

3.2 Data Quality and Assumptions

A number of assumptions were made to complete this analysis:

- Follow-up surveys were not conducted in March or June, thus all annual figures are estimated by multiplying the monthly sum by 1.2.

- Food consumption and expenditure figures were reported for the last seven days. To determine a monthly figure, weekly total food consumption and expenditure amounts were multiplied by 4.25.

- Total income and expenditure figures include the value of consumption from food produced at home. Cash income and expenditure excludes home-produced consumption.

- Home-produced consumption is valued at the local market rate.

- Business expenditure was subtracted from business income.

- Asset values were monetized according to the local market rates. Asset values thus do not account for depreciation.

- Odd values were removed from the data according to information from sources familiar with the households' study area.

- All descriptive statistics of the data present both means and medians[3] due to the skewed nature of the data.

- For regression analyses, all outlier values were capped at the mean plus or minus two standard deviations, to prevent undue influence of these numbers on results.

- Newly enrolled clients are considered to be controls in the months before harvest (January to September), as we only anticipate treatment effects of participation in One Acre Fund to occur post harvest.

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[3] Median refers to the value of the midpoint of a frequency distribution, rather than the mathematical average. This is often the measurement of choice when analyzing highly-tailed distributions, such as in Figure 3. For this purpose, the median usually captures the "typical" household better than the mean. In terms of "average" income, this means that households reporting extremely high incomes cause the mean value to be higher than the majority of what most households report as their income.

3.3 Limitations

There are several limitations to this analysis:

- This is all self-reported data and there are incentives for farmers to inflate consumption and deflate reported income when reporting to a large NGO in order to appear more needy.

- Respondents may have difficulty accurately recalling amounts spent or earned (however this is mitigated by using shorter time periods, e.g., spending in last seven days).

- The results can only be generalized to ten districts in Kenya and are not necessarily representative of the whole program.

- This study has a relatively small sample size, with only 200 One Acre Fund and 200 non-OneAcre Fund farmers. This limits the generalizability of the findings.

- We present summary statistics (means and medians) as well as impact estimates in this report. The summary statistics do not reflect an attempt to account for selection bias and so are a combination of both pre-existing differences as well as program impact.

- All estimates of the treatment effect of One Acre Fund may suffer from omitted variable bias. This analysis does not apply a randomized control trial nor attempt any quasi-experimental analysis, such as propensity score matching. Propensity score matching was infeasible due to the small sample size and small number of indicators that could be used for matching. Given data availability, appropriate attempts were made to account for differences between treatment and control, such as controlling for wealth and geographic indicators. We thus consider the results to offer suggestive evidence of the treatment effect of One Acre Fund.

⊕ 4. RESULTS

4.1 Annual Income and Expenditure

Farmers in the study region are quite poor. **Median values of cash income are $579 USD for client farmers and $368 USD for non-clients, annually.** One Acre Fund farmers on mean average make $850 USD in cash income (not including the value of home-produced consumption) annually. Non-client farmers make on average $546 USD annually. All income figures include business profit (e.g., business income less business expenses).

When considering total income, including the value of home-produced consumption, farmers fare better. **Median annual values of total income are $1,247 USD for clients and $827 USD for non-clients.** One Acre Fund clients make on average approximately $1,561 USD annually. Non-client households make significantly less on average, at $1,054 USD annually.

We examine the poverty levels for client and non-client farmers. We consider both the mean and median values of annual total expenditure levels (including the value of home-produced consumption) as well as cash expenditure. Expenditures are typically used in poverty analyses because they provide a more accurate metric of consumption than income. As Table 1 shows, the typical client and non-client farmer are living on well below a dollar per day. As Kenya is among the wealthier countries that One Acre Fund serves, we believe that comparable statistics would be even lower for One Acre Fund's other client populations.

Table 1. Poverty Line Levels

	One Acre Fund		Non–One Acre Fund	
	Daily Total Cash Expenditure Per Person	Daily Total Expenditure Per Person	Daily Total Cash Expenditure Per Person	Daily Total Expenditure Per Person
Median	$0.43	$0.73	$0.32	$0.58
Mean	$0.65	$0.95	$0.44	$0.68

NOTES:

(1) Client households on average have 6.35 members, 3.6 of them children. Non–clients on average have 5.61 members, 3.0 of them children.

Figure 1 below shows median total annual income and the components of income flows, for client and non–client households. The preponderance of income for the median (or typical) farmer is from home–produced consumption (72% for clients and 76% for non–clients). Business income reflects all income coming from business net of business expenses, such as money spent on inventory or hired labor. Neither income nor total cash income include the values of stored maize, which is considered an asset although it is relatively liquid. Appendix Figure AF1 shows mean annual income values.
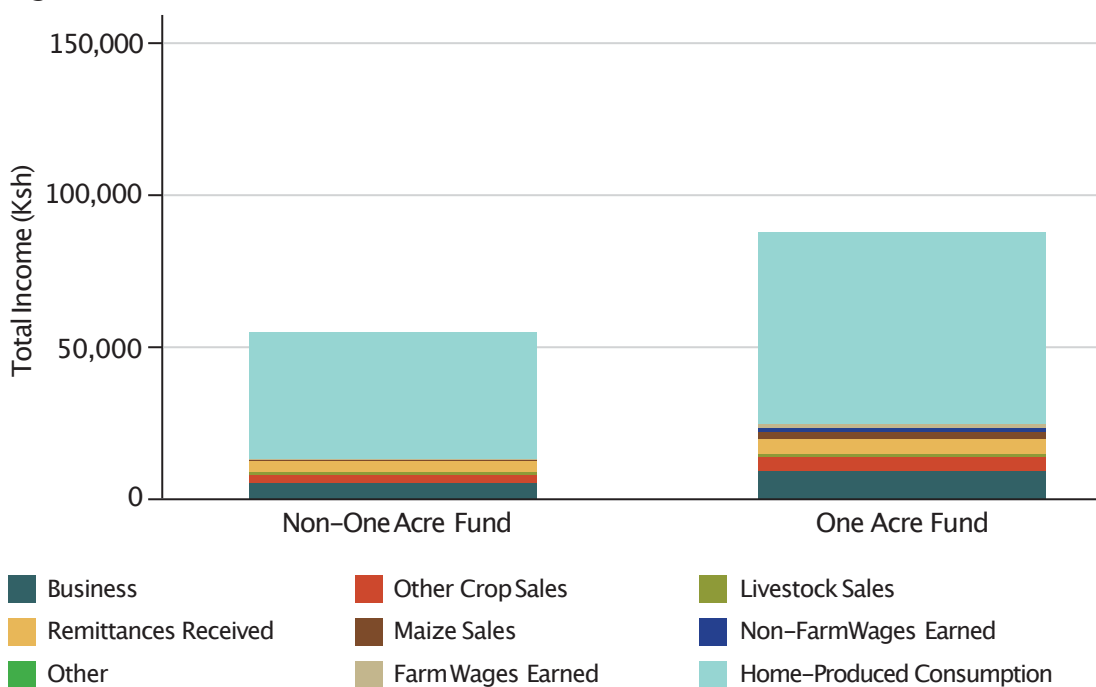
Figure 1. Median Annual Total Income

Table 2 shows the shares of income coming from each income stream. Farm income, including maize sales, other crop sales, livestock sales, farm wages earned, and the value of home-produced consumption, comprises 66% of total income.

Table 2. Annual Total Income Shares for One Acre Fund and Non-One Acre Fund

	One Acre Fund				Non-One Acre Fund			
	Median Amount	Share	Mean Amount	Share	Median Amount	Share	Mean Amount	Share
Business	$92	11%	$239	15%	$53	10%	$157	15%
Other Crop Sales	$47	5%	$118	8%	$28	5%	$78	7%
Livestock Sales	$11	1%	$63	4%	$7	1%	$43	4%
Remittances Received	$48	6%	$126	8%	$34	6%	$93	9%
Maize Sales	$24	3%	$98	6%	$4	1%	$44	4%
Non-Farm Wages Earned	$12	1%	$141	9%	$0	0%	$84	8%
Other Income	$0	0%	$27	2%	$0	0%	$21	2%
Farm Wages Earned	$11	1%	$37	2%	$3	1%	$26	2%
Food Produced at Home	$621	72%	$711	46%	$412	76%	$508	48%
Total Income	$865		$1,561		$542		$1,054	

NOTES:
(1) Income includes the value of all home-produced consumption valued at the local market rate.
(2) Income includes the value of business income less business expenditures.

All the above estimates of client and non-client income in this section are summary statistics only. Therefore differences are due to two sources: (1) pre-existing differences between clients and non-clients that are not attributable to participation in One Acre Fund (e.g., selection bias) and (2) possible program impact.

Although the self-selection of households into One Acre Fund rules out any causal analysis of the effect of One Acre Fund on income, the evidence for the effect of One Acre Fund on income is promising. Table 3 below shows an analysis of monthly income on One Acre Fund status, controlling for other factors likely to influence income and selection of households into One Acre Fund, namely number of household members, land ownership size, whether the household owns a granary, whether the household owns a livestock shed, and female education level. Moreover, we also include sublocation and month controls to account for geographic differences as well as temporal fluctuations that could affect income. We cap all values of monthly income at the mean plus or minus two standard deviations to remove the influence of outliers. We also consider newly enrolled farmers to be controls in the months before harvest, as this is before we expect the treatment effect.

Results show that, on average, One Acre Fund clients make $17.5USD more per month (p<.05) than non-clients, controlling for other factors. Standard errors are clustered by district to account for spatial and serial correlation in the data. Results are also robust to farmer level clustering. While there may be other factors, like motivation or ability that we do not control for and which explain some of the monthly income difference, we think these results are suggestive.

Table 3. OLS Regression of Total Monthly Income (USD)

One Acre Fund Client	17.519** (6.447)
Household Member	8.067** (2.577)
Female Education	15.351*** (2.383)
Land Ownership (acres)	12.056*** (2.637)
Own Livestock Shed	14.344 (9.647)
Own Granary	2.097 (7.715)
Constant	17.892 (19.697)
Sublocation Controls	YES
Month Controls	YES
N	3055
adj. R–sq	0.237

NOTES:
(1) Standard errors in parentheses.
(2) Standard errors clustered by district.
(3) Total income and expenditure include the value of home–produced consumption, valued at the local market rate.
(4) To remove the effect of outliers, all outcome values greater or less than mean plus or minus two times the standard deviation are capped at these max/min values.
(5) Total income excludes business expenditures.
(6) Newly enrolled OAF clients were considered to be control between Jan – Sept, as these were pre–harvest measurements.
(7) * $p<0.10$, ** $p<0.05$, and *** $p<.01$

Disaggregating farmers by whether they are newly enrolled, pre–existing clients, or non–clients give us another way to identify the impact of participation in One Acre Fund. Newly enrolled clients should be very similar to non–clients before harvest, since they have not yet experienced a program effect. Pre–existing clients, however, should have higher incomes in this period if they are still reaping the benefits of an increased harvest the prior season.

While this method cannot control for potentially omitted covariates that could still differentiate earlier from later adopters and cause different incomes, it does give us a strong indication of program effect. Indeed, it is likely that newly enrolled farmers and pre–existing farmers should share many unobservable characteristics that cause these farmers to enroll in One Acre Fund, like motivation. The inability to control for these factors in regression analysis could bias our estimates of program impact. Thus, the result below that newly enrolled clients are highly similar to controls and differ from pre–existing clients in the period before harvest provides strong evidence of program impact. The income differences are unlikely to be attributable to pre–existing differences across farmers.

Table 4 shows summary statistics by farmer type. As predicted, newly enrolled clients income level are very similar to control farmers' income in this period and pre–existing clients' income is markedly higher.

Table 4. Total Monthly Income by Farmer Type (January – September)

Farmer Type	Pre–Existing Client	Newly Enrolled	Control
Median	$95	$66	$63
Mean	$145	$104	$93
Number of Observations	315	294	1386
Number of Farmers	45	42	198

NOTES:
(1) Income includes the value of all home–produced consumption valued at the local market rate.
(2) Income includes the value of business income less business expenditures.

In addition to income, we are also concerned with how One Acre Fund clients allocate their resources. In fact, expenditures are widely considered to provide a more accurate estimate of rural poverty. This is because income, especially cash income, is likely to be highly variable over time whereas households try to smooth expenditure/consumption over time. Clients are also more likely to accurately report expenditures than income.

Median annual total expenditure is $1,689 USD for clients and $1,197 USD for non–clients. Clients on average spend approximately $2,209 USD per year and non–client households spend approximately $1,399 USD annually. These amounts do not include loan repayments, which we describe in section 4.6 below. They include the value of home–produced consumption, valued at the local market rate. **Looking only at cash expenditure (excluding home–produced consumption), median annual values of cash expenditure are $997 USD for clients and $655 USD for non–clients.** Client households on average spend $1,498 annually and non–clients spend $891 USD annually.

The greater cash expenditures by client households is commensurate with their larger incomes. However, both clients and non–clients report spending more in cash than they earn in cash income. This confirms findings from the recent study by the World Bank that used financial diaries to survey poor smallholder farmers in Mozambique, Tanzania, and Pakistan. Particularly in Mozambique, farmers regularly report earning less than they spend. Many rely on borrowing from social networks and informal groups or relied on stored crops and savings. It is likely that households in this study are also relying on savings and loans in order to make ends meet.

We also cannot rule out the possibly that farmers have not accurately reported income. Indeed, most economists [recommend](#) focusing on consumption figures because farmers are more likely to accurately report expenditure than income. Self-reported income data is notoriously noisy. Farmers have incentives to both over-report and under-report their income and it can be difficult to recall income when it is not consistent.

Client and non-client households also display some differences in how they choose to allocate their resources. Figure 2 shows the median outlays for different items, including the value of home-produced consumption, valued at the local market rate. The vast majority of expenditures for the typical or median farmer are for food purchased with cash or from home production (71% for clients and 79% for non-clients). Appendix Figure AF2 shows the mean expenditure values.

Figure 2. Median Total Expenditure
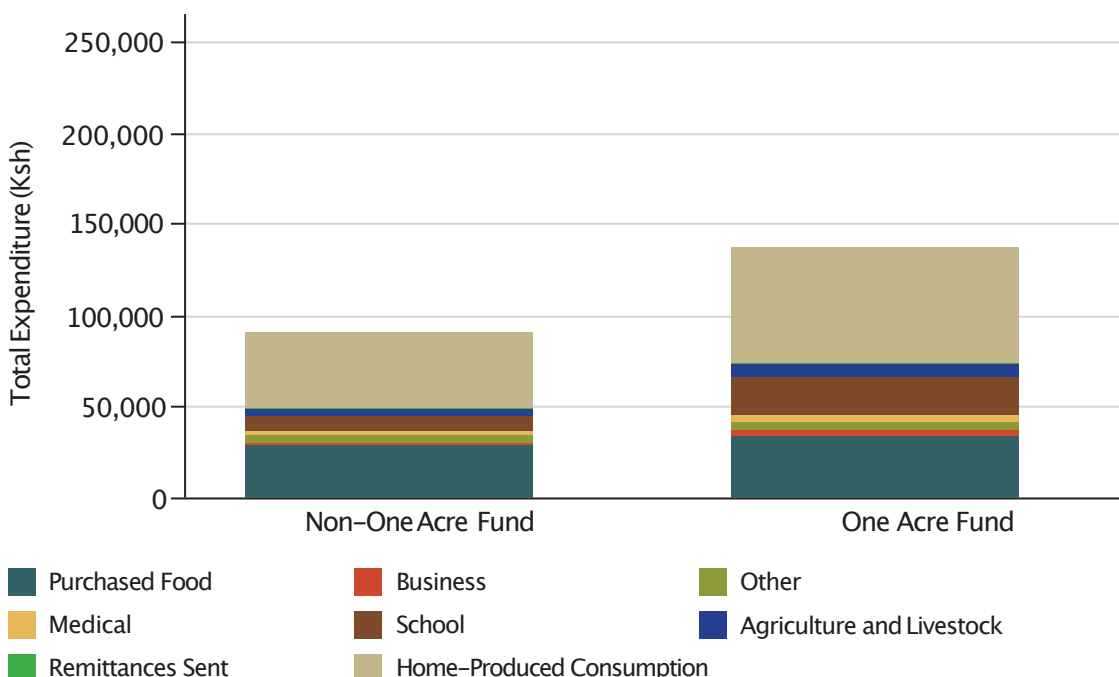
Table 5 shows the share of expenditures that farmers are allocating to each purchase type, including the value of home-produced consumption. **Client households on average spend a similar share on home-produced consumption but spend a significantly smaller share on purchased food**. Conversely, clients spend slightly greater shares on school, agriculture and livestock, and business expenses. Both clients and non-clients spend an equal small amount on medical expenses and sending remittances. Total food expenditure (both purchased and home-produced) accounts for more than 50% of total expenditures for clients and non-clients (both in terms of mean and median amounts).

Table 5. Annual Total Expenditure Shares for One Acre Fund and Non-OneAcre Fund Farmers

	One Acre Fund				Non-One Acre Fund			
	Median Amount	Share	Mean Amount	Share	Median Amount	Share	Mean Amount	Share
Purchased Food	$339	25%	$401	18%	$290	33%	$340	24%
Business	$24	2%	$221	10%	$10	1%	$70	5%
Other	$46	3%	$170	8%	$35	4%	$82	6%
Medical	$40	3%	$78	4%	$24	3%	$59	4%
School	$198	15%	$410	19%	$83	9%	$242	17%
Agriculture and Livestock	$76	6%	$178	8%	$36	4%	$82	6%
Remittances Sent	$9	1%	$40	2%	$2	0%	$17	1%
Home Produced Consumption	$621	46%	$711	32%	$412	46%	$508	36%
Total Expenditure	$1,353		$2,209		$892		$1,399	

NOTES:

(1)   Expenditure includes the value of home-produced consumption, valued at the local market rate.

The above estimates of client and non-client expenditures are summary statistics only, and so differences are due both pre-existing differences as well as possible program impact.
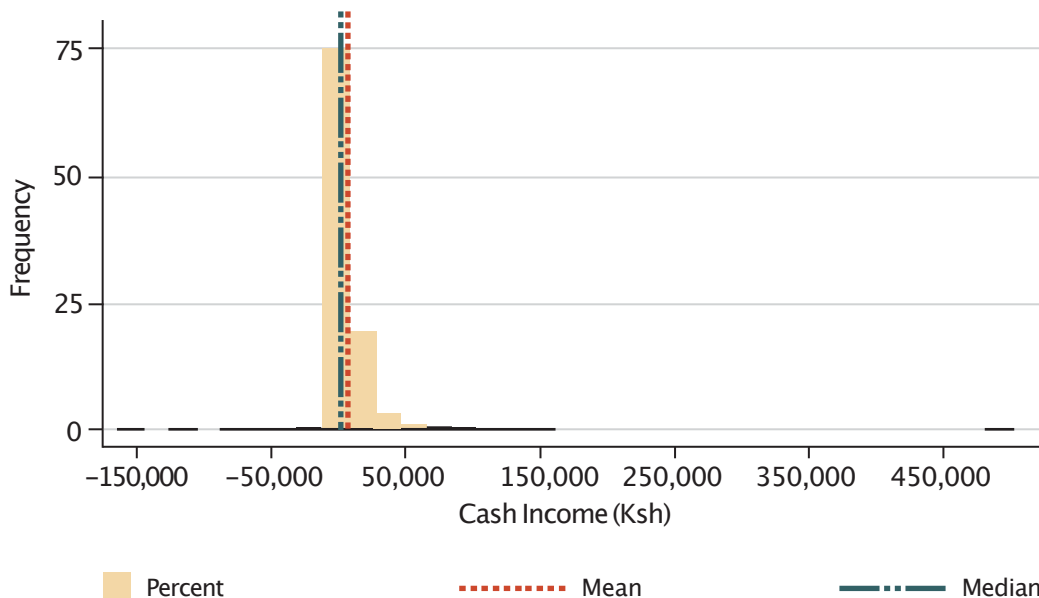
4.2 Monthly Cash Income

Farmers in the areas in which we work are highly cash strapped. **With median and mean values of reported monthly cash income[4] at $30 USD (3,000 Ksh) and $66 USD (6,705 Ksh) respectively, it is apparent that the cash income of our clients is not evenly distributed (Figure 3).**[5] In fact, many farmers reported that there was at least one month in the year that they earned absolutely no cash, although of those the vast majority only reported one or two months with no cash income. Moreover, some clients have negative incomes in some months because their business expenditures exceed their total incomes.

Patterns do differ among client and non-client households. **Median cash income among clients is $36 USD and non-clients it is $25 USD**. Client households on average report earning more monthly cash income than non-clients ($79 USD versus $52 USD).

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[4] Monthly total cash income does not include the value of home produced consumption. Total cash income does include home produced consumption, valued at local market rates.

Figure 3. Distribution of Monthly Cash Income of all Households

In addition, we also plot the distribution of monthly total income, including home–producedconsumption (Figure 4). The distribution looks similar to monthly cash income but slightly shifted towards the right.

Figure 4. Distribution of Monthly Total Income for all Households
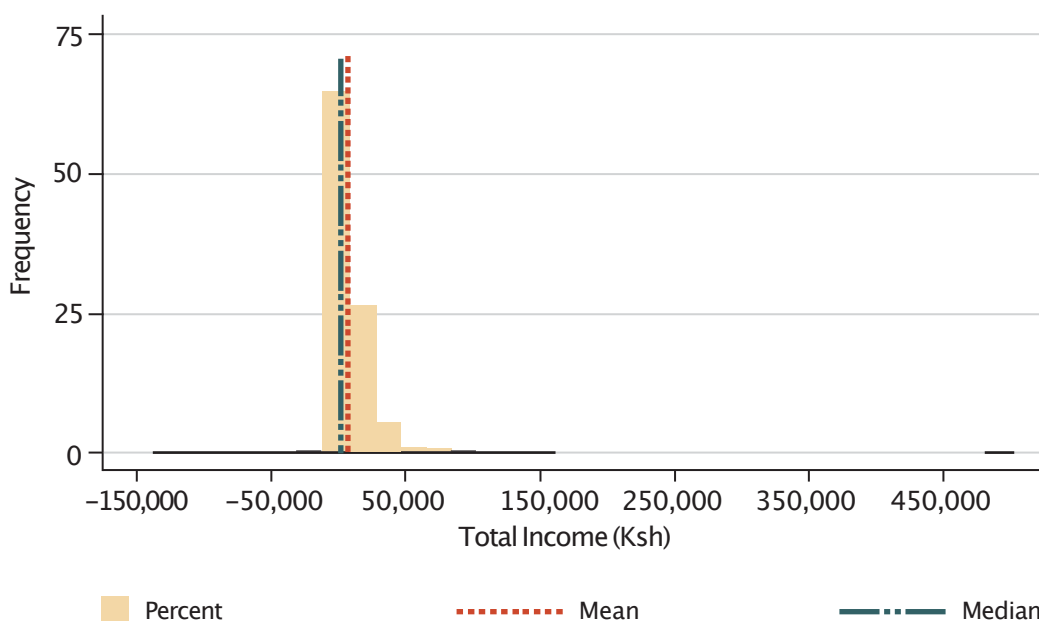
4.3 Income and Cash Expenditure Distribution

Income and expenditure patterns vary greatly over the year. Cash expenditures outpace income in approximately half the year, for both client and non–client farmers. Figures 5 and 6 show the median amounts. For comparison purposes, since we subtract business expenditures from income, we also subtract business expenditures from expenditures, for these figures only. Figures 7 and 8 show total mean income and cash expenditure patterns over the year for client and non–clients, respectively.

Figure 5. One Acre Fund Median Total Income and Cash Expenditure
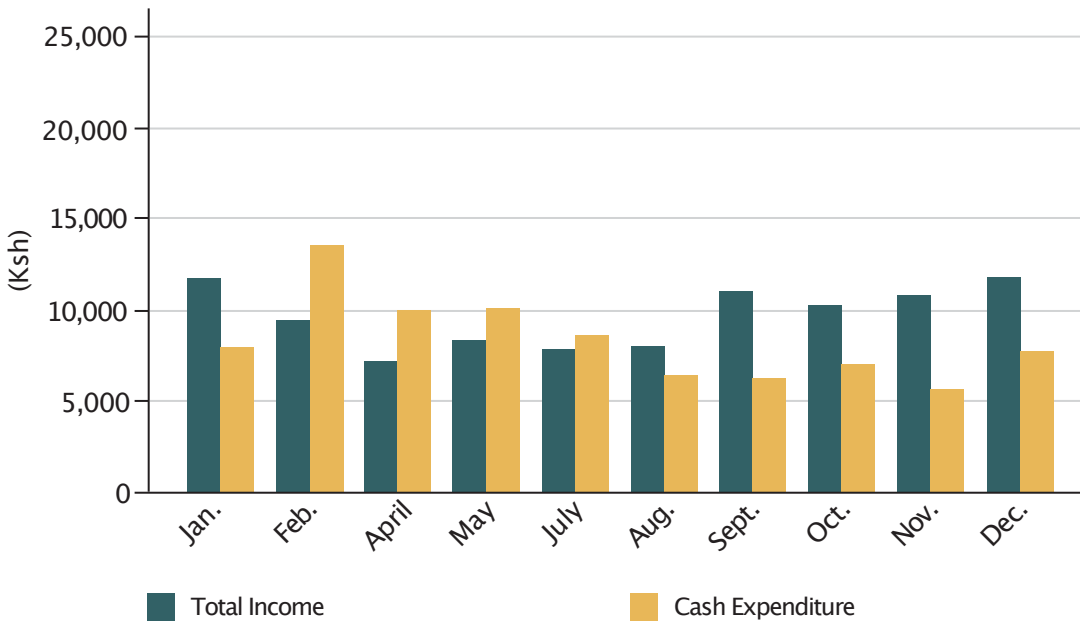
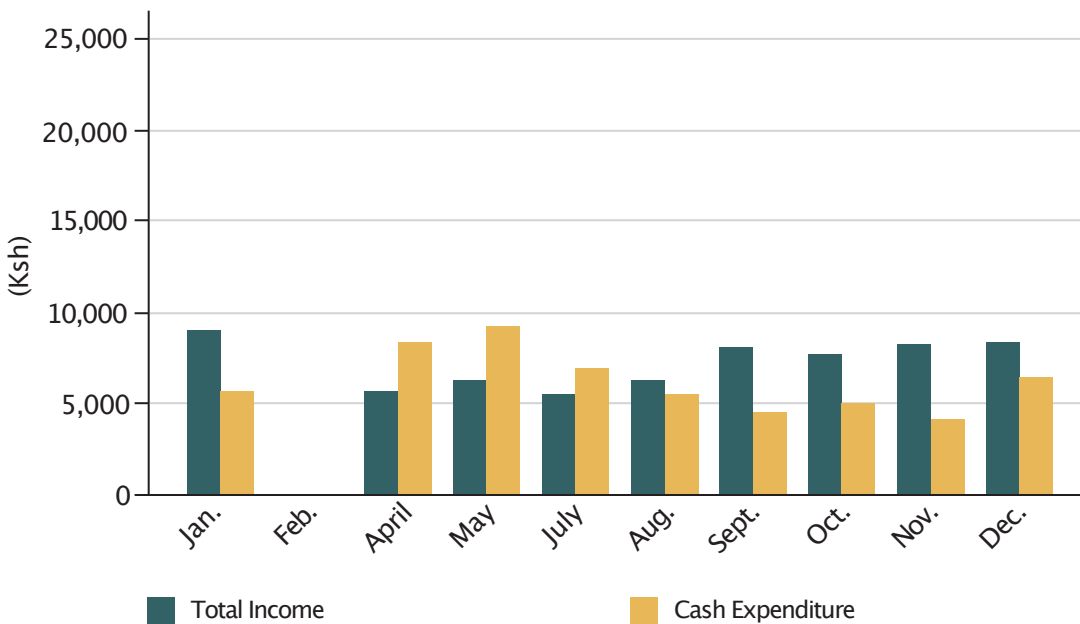**Figure 6. Non One Acre Fund Median Total Income and Cash Expenditure**

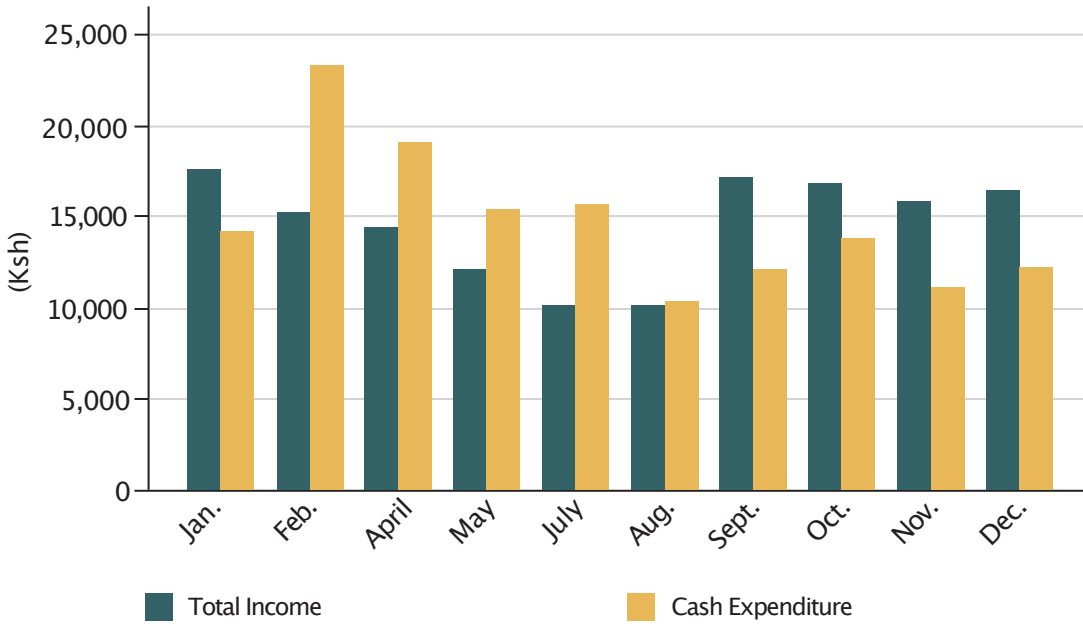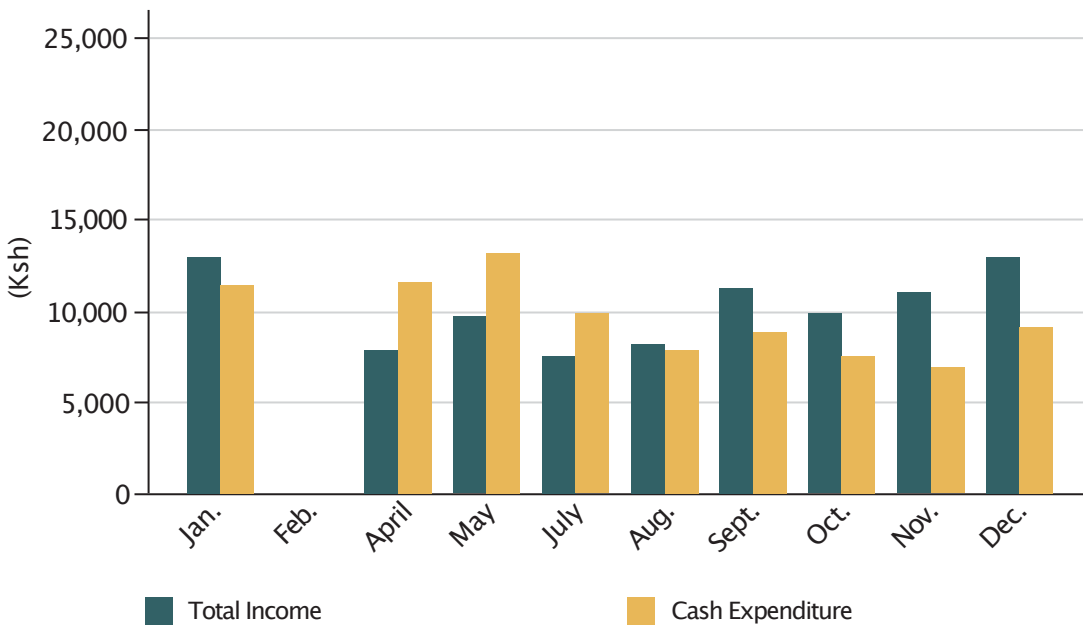**Figure 7. One Acre Fund Mean Total Income and Cash Expenditure**

Figure 8. Non One Acre Fund Mean Total Income and Cash Expenditure

We delve more deeply into the pattern of income and expenditure by looking at components of income and expenditure patterns, for client and non–client farmers. Note that these figures include the value of home–produced consumption in income amounts, valued at local market rates, and not in expenditure (e.g., only cash expenditure is included).

As Figure 9 shows, most clients make no income at most times of the year, except from home-produced consumption. In fact, business is the only other source of income where most farmers see any return, and this only occurs in October through January. However, it should be noted that business income excludes business expenditures. Home-produced consumption does seem to increase in the post-harvest period for most One Acre Fund farmers. The median value of home-produced consumption for client farmers in July is 3,931Ksh and increases to 4,739 Ksh by August. Most clients do not seem to be selling their harvest; median maize sales are zero in the post-harvest period. Clients are primarily using their maize for home consumption and may also be storing some of it.

Figure 9. One Acre Fund Median Total Income
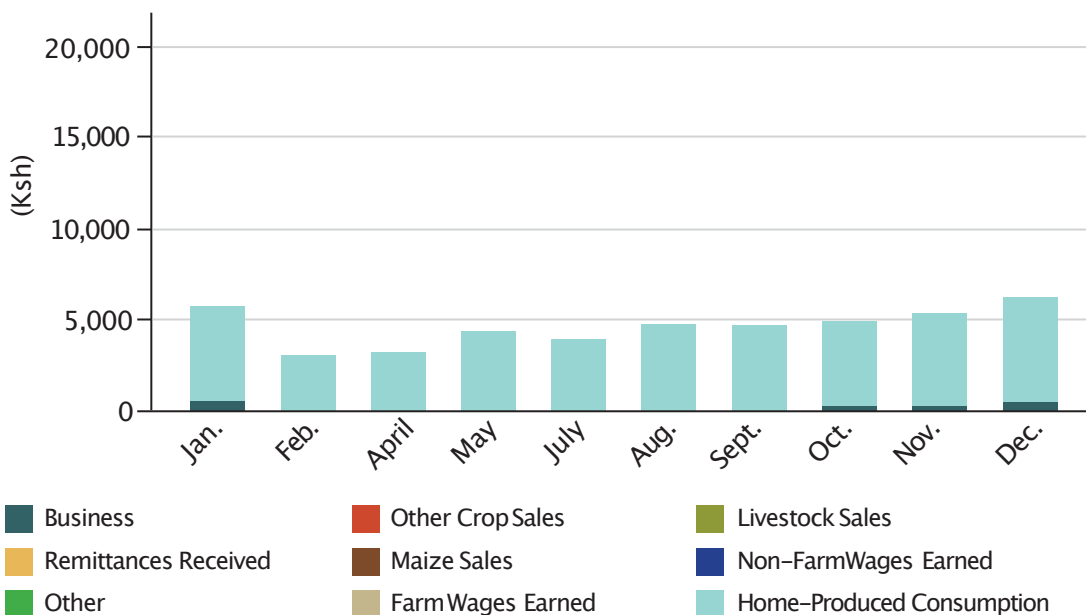
When plotting their median income by month (Figure 10), non-OneAcre Fund farmers also show a boost in post-harvest home-produced consumption but it is not as large as One Acre Fund farmers' boost. Most non-OneAcre Fund farmers are not seeing the income boost from business in October to January that One Acre Fund farmers are. The median boost in total income (percent change in total income) from August to September is 29% for client farmers and is 22% for non-clients.
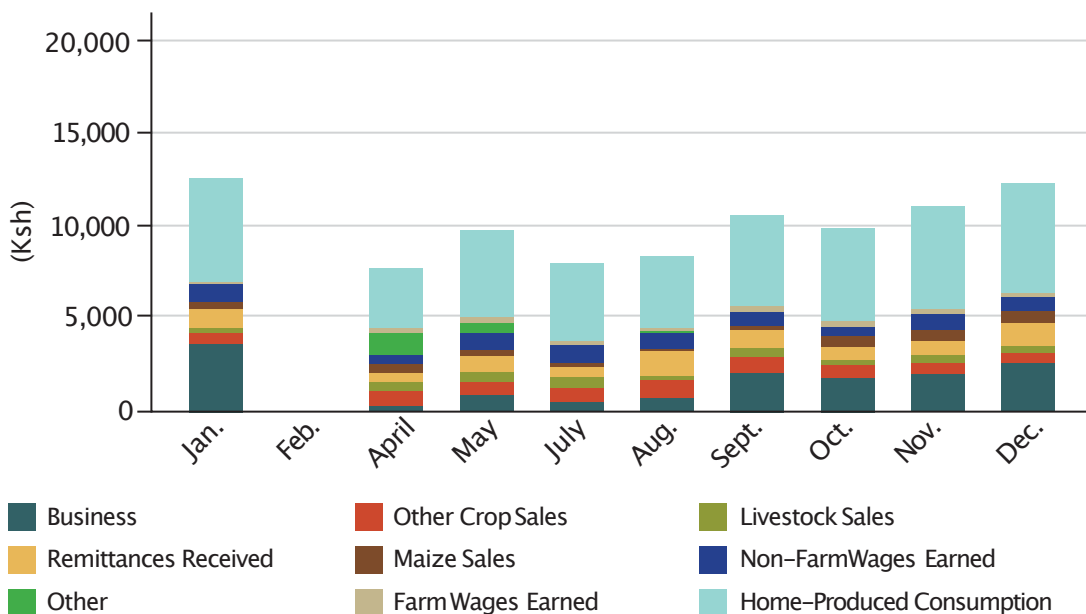
Figure 10. Non–OneAcre Fund Median Total Income
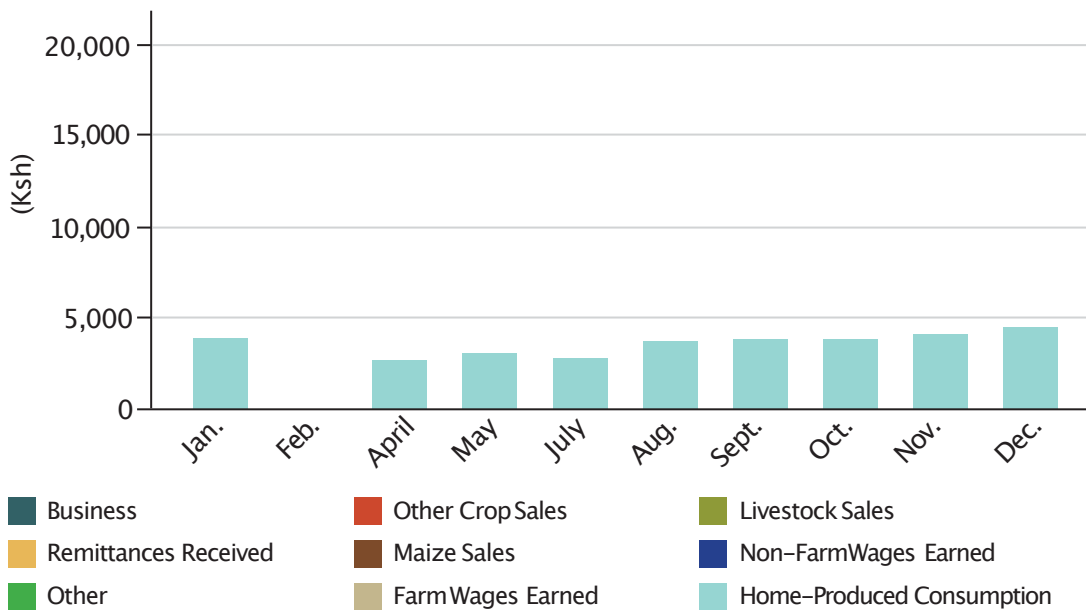
Average monthly income figures reveal a different story. As Figures 11shows,client households generate less in mean income between February to August than September to January. In fact, client households' incomes are relatively steady and high between September to January and relatively stable and low between February and August. The timing of this income boost is likely due to harvest since most farmers will harvest by September. Client households' value of home–produced consumption is 5,179Ksh on mean average in September and is 6,366 Ksh on mean average in October. Client households also see a large boost in business income in the post–harvest period, beginning in September. This is potentially due to farmers considering harvest part of their business. Another possibility is that client farmers invest their harvest income into their businesses, increasing their returns from their businesses.

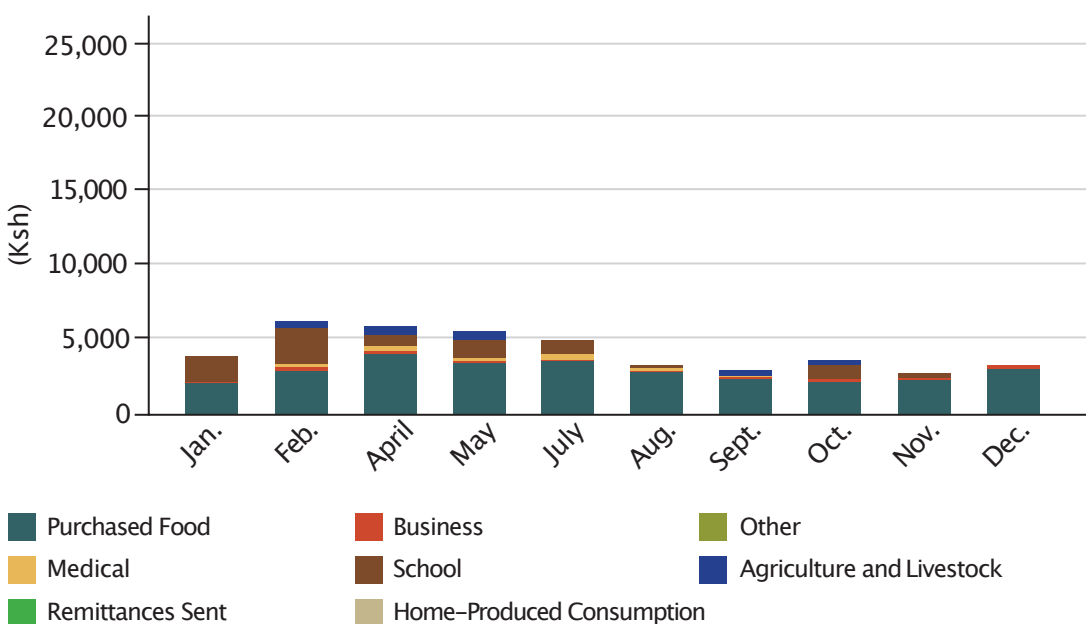**Figure 11.One Acre Fund Mean Total Income**
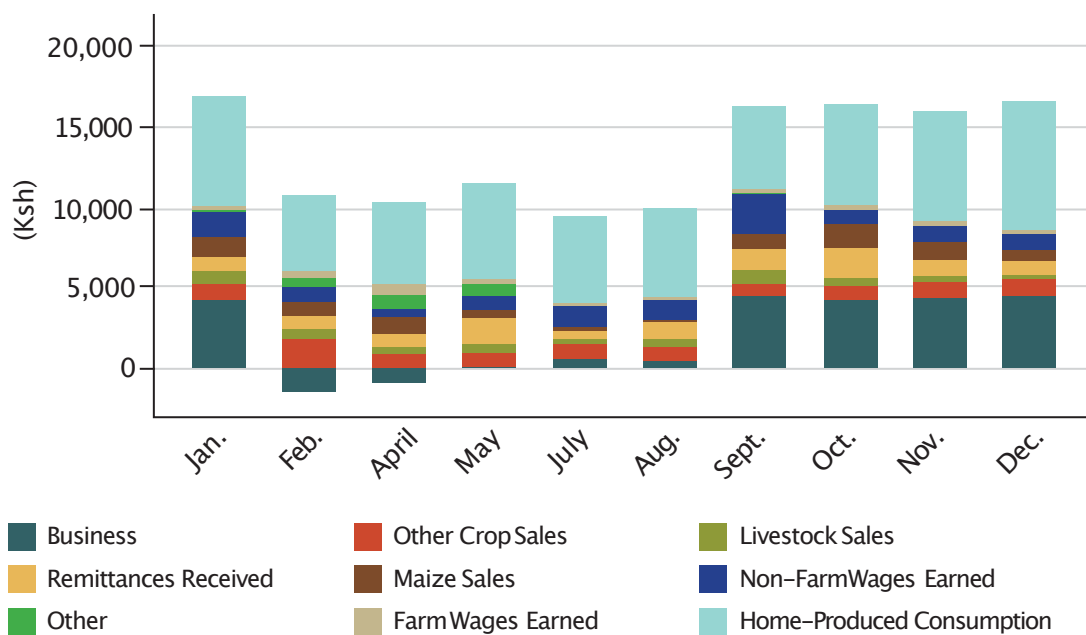
Non–One Acre Fund farmers' mean income sources by month are shown in Figure 12 below. Their mean incomes are consistently lower than One Acre Fund farmers. They do not experience as much of a bimodal distribution in mean income as client farmers do. One Acre Fund farmers see a larger boost in income post harvest than non–clients, possibly due to their participation in One Acre Fund. One Acre Fund farmers' total income increases by 160% on average, between August to September, whereas non–One Acre Fund farmers' total income only increases by 114% over the same period.

Figure 12. Non One Acre Fund Mean Total Income

Legend: Business, Other Crop Sales, Livestock Sales, Remittances Received, Maize Sales, Non–Farm Wages Earned, Other, Farm Wages Earned, Home–Produced Consumption

We also plot client farmers' median expenditure patterns by month (Figure 13). Doing so reveals a similar distribution of cash expenditure across the months but a different picture in terms of the value and composition of expenses. For most client farmers, cash expenditures each month are overwhelmingly driven by food purchases. Most client farmers also pay some school expenses in most months. Cash expenditures only include food purchases and not the value of home–produced consumption.

Figure 13. One Acre Fund Median Cash Expenditure

Legend: Purchased Food, Business, Other, Medical, School, Agriculture and Livestock, Remittances Sent, Home–Produced Consumption
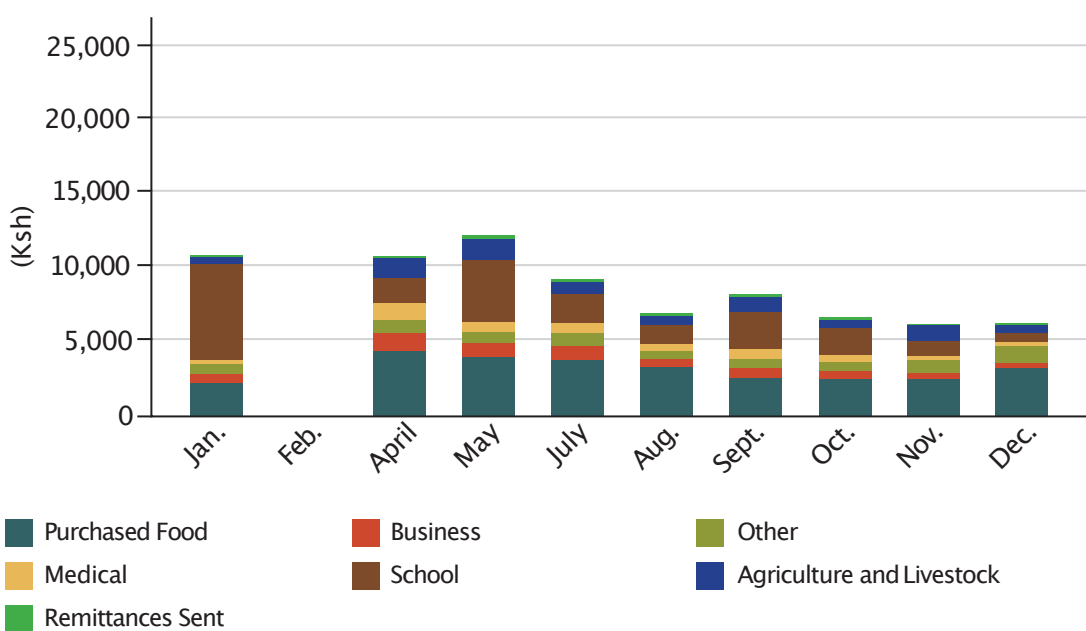
Non–client farmers' median cash expenditures by month also look very similar to clients in their distribution (Figure 14). However, non–clients' median cash expenditures are smaller than clients. Non–clients also are more likely to only spend cash on food purchases than clients are. Whereas most client farmers spend some cash on school expenses and agriculture and livestock expenses at some points in the year, most non–clients are only spending cash on purchased food at all points in the year.

Figure 14. Non One Acre Fund Median Cash Expenditure

Legend:
- Purchased Food
- Medical
- Remittances Sent
- Business
- School
- Home–Produced Consumption
- Other
- Agriculture and Livestock
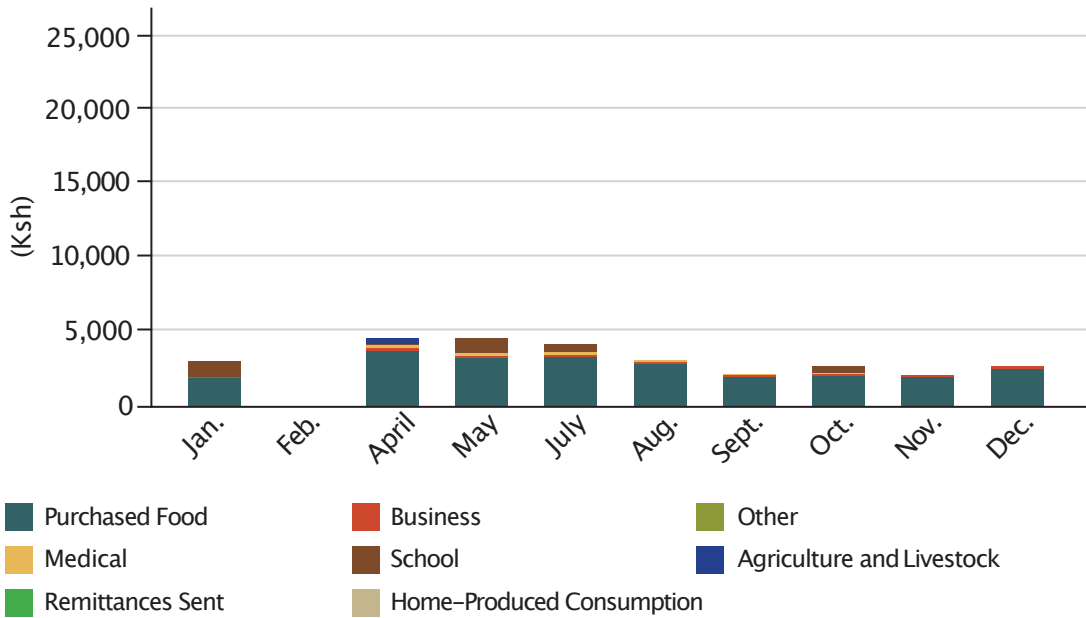
Turning next to One Acre Fund farmers' mean cash expenditure patterns (Figure 15), we see that cash expenditure is more or less stable throughout the year with the large exception of February, when school fees are due. April, May, July, and January also have somewhat higher expenditures than normal, due to higher business and school expenditures in those months.

Figure 15. One Acre Fund Mean Cash Expenditure

Legend:
- Purchased Food
- Medical
- Remittances Sent
- Business
- School
- Other
- Agriculture and Livestock

Although non–clients generally spend less than client farmers, we see a very similar pattern in non–client farmers' mean cash expenditures by month (Figure 16). They have higher than average cash expenditures in April, May, and January. We believe that their cash expenditure patterns in February would mirror client farmers' mean cash expenditures, if we had the data.

Figure 16. Non–One Acre Fund Mean Cash Expenditure
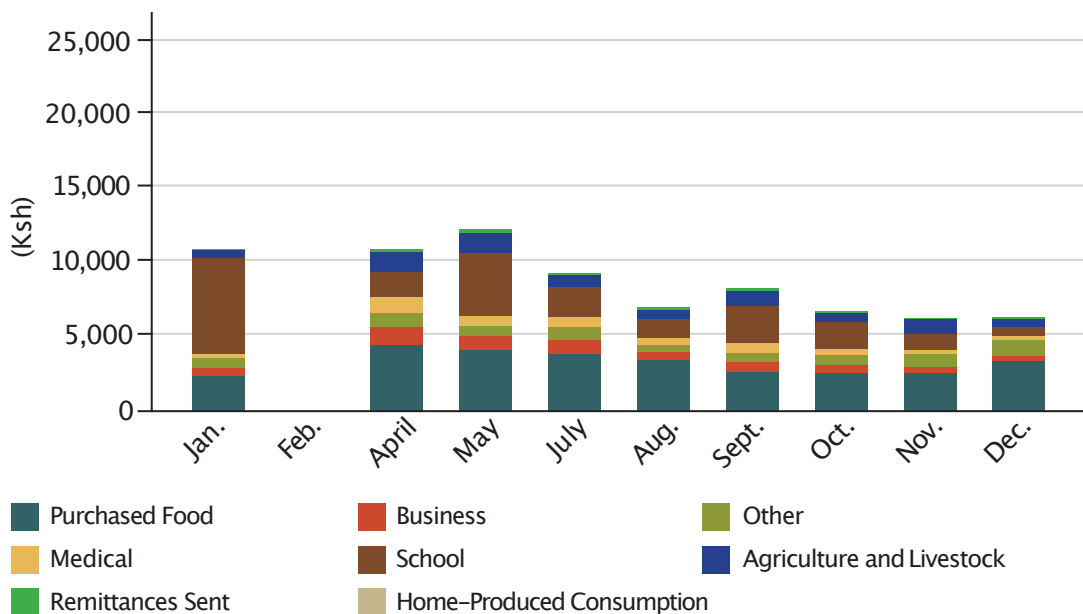
To summarize:

- We see that clients have higher total income and cash expenditures.

- The medians reveal that most clients are experiencing a boost in home–produced consumption post–harvest.

- Mean averages reveal that clients have markedly higher income in half the year.

- Median values by month reveal that both clients and non–clients spend most of their cash on food purchases but, unlike non–clients, many clients also spend some cash on school and other expenses.

- Mean cash expenditure show similar distributions for clients and non–clients over the year.

All the above estimates of client and non–client monthly income and expenditures in this section are summary statistics only, and so differences are due both pre–existing differences as well as possible program impact.

Client households tend to spend a smaller share of their income on food purchases, which may be confirmation of Engel's Law or may be a reflection that client households grow more food at home (by value and quantity, not as a share of income or expenditure), possibly due to their participation in One Acre Fund, so that they do not need to purchase food. Engel's Law is an observation in economics stating that as income rises, the proportion of income spent on food falls, even if actual expenditure on food rises. In other words, the income elasticity of demand of food is between 0 and 1.

We explore this further by regressing the share of cash expenditure spent on food purchased outside the home on whether a household is a One Acre Fund client, and control for the number of household members, the level of female education, amount of land owned, whether the household owns a granary, whether the household owns a livestock shed, and the sublocation they live in. Results (Table 6) show that One Acre Fund clients spend on average four percentage points (pp) less on food than non-clients ($p < .05$), controlling for other relevant differences that could affect the share of expenditure a household spends on food and their decision to join One Acre Fund. Standard errors shown are for district level clustering and are robust to household level clustering.

Table 6. OLS Regression of Share of Monthly Cash Expenditure Spent on Food

One Acre Fund Client	–0.038** (0.014)
Household Member	–0.007* (0.004)
Female Education	–0.043*** (0.007)
Land Ownership (acres)	–0.022*** (0.004)
Own Livestock Shed	–0.043 (0.026)
Own Granary	–0.016 (0.018)
Constant	0.561*** (0.057)
Sublocation Controls	YES
Month Controls	YES
N	3055
adj. R–sq	0.194

NOTES:

(1) Standard errors in parentheses.

(2) Standard errors clustered by district.

(3) To remove the effect of outliers, all share of food expenditure values greater or less than mean plus or minus two times the standard deviation are capped at these max/min values.

(4) Newly enrolled OAF clients were considered to be control between Jan–Sept, as these were pre–harvest measurements.

(5) * $p < 0.10$, ** $p < 0.05$, and *** $p < .01$

4.4 Effect of Repayment on Consumption

One Acre Fund farmers are liable for their loans. It is possible that repayment may cause a financial hardship on client farmers. One Acre Fund farmers are free to repay at any time of year, in order to encourage them to repay when it will create the least financial stress. One Acre Fund loan repayment data are available at the district level. Repayment data were matched with farmer level data by district, month, and year. We explore the possibility that repayments create financial hardship on client farmers by correlating monthly district level repayment rates (i.e., the amount of repayment over total credit, by month by district) with the individual farmer difference in income and expenditures.[6]

We first analyze repayment rates by month and see that August generally has the highest repayment rates, with high repayment rates also seen in July and September. September is when farmers—particularly One Acre Fund farmers—start to see higher incomes. It is likely that some client farmers are also starting to experience a boost in income earlier, in July and August, which could induce them to repay earlier than September. This is likely due to variation in harvest timing. In addition, July, August, and September are low cash expenditure months for One Acre Fund farmers.

The association between districts' repayment rate and the difference in One Acre Fund farmers' income and expenditure, is only a weak negative correlation of six percent. This indicates that there is not a strong association between the times of the year that farmers repay and how much slack they have (i.e., the difference in income and expenditures). Similarly, there is a low and negative correlation of seven percent between monthly cash income and repayment rates. This indicates that although client farmers do not tend to repay when they have more cash income, there is no clear association between cash income and district repayment rates.

It is possible that these correlations mask how an individual's repayment rate correlate with their financial situation. One household may repay when they have high incomes and low expenditures and another household may repay when they have low income and high expenditures. In this situation, there would be no overall correlation between income and expenditure and repayment rates. We thus look at individual level repayment data, which are only available for all loans—and so are not indicative of repayment of One Acre Fund loans specifically. We see that cash income is positively correlated with loan repayment for all farmers at 11%, and is higher for non-clients than clients (19% versus 7%). However, farmers also tend to repay when their expenditures are higher. The correlation coefficient between loan repayment and cash expenditures is 21.5% (19% for clients and 25% for non-clients). This indicates that farmers do not tend to repay when they have more financial slack. Note, that all these correlations are less than 50% and so reveal that there are only weak relationships among these indicators.

Overall, given the flexibility that One Acre Fund farmers have in choosing when they can repay, and the favorable monthly distribution of expenditure and income at the times of year when repayment is highest, we do not find evidence suggesting that repayments place a large burden on One Acre Fund farmers.

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[6] We do not regress income or the difference in income and expenditures on repayment rates. The two variables are likely to affect each other and so regressing them would cause simultaneity bias; households are likely to repay when they have higher slack and they are also likely to have more slack if they do not repay. Therefore, we instead run simple correlations between farmer level difference in income and expenditure and district level repayments.

4.5 Food Produced at Home

Food produced at home is an incredibly meaningful source of sustenance, especially for client households. Home production accounts for a large share of total food consumption. Figure 17 shows that client households report on mean average higher shares of home-produced consumption of total consumption in all months, than non-client households. **Client households report consuming 40% of total consumption from food produced at home whereas only 36% of non-client farmers' consumption comes from food produced at home. Moreover, the difference seems to be most pronounced in April to August. April to August are generally considered to be the hunger months in rural Kenya.** These data thus provide a potential explanation for findings from prior surveys showing that client farmers suffer less hunger during the hunger months: client farmers may have a greater ability to rely on producing food at home.

Note that the share of home-produced consumption of total food consumption presented here does not agree with the expenditure amounts presented in the above sections, such as Table 5. For expenditure amounts, food purchase expenditure amounts were calculated based on the survey question of how much households spent on all food expenditures in the past week. Home produced consumption values were calculated based on the amount of each item of home-produced food that the household consumed, multiplied by the market rate for that item. The share of home-produced consumption of total consumption for this section is determined from the questions of how much of each item of food that the household consumed is produced at home. The two calculations do not agree and we think that the value of home-produced consumption presented above may be overestimated. Nevertheless, the pattern remains clear that client farmers consistently have higher shares of home-produced consumption than non-client farmers.

In general, farmers report that nearly half their total income comes from home-produced consumption. This share is slightly higher for non-client households (48%) than client households (46%). Home production of crops and livestock thus accounts for a large share of income.

Figure 17. Mean Share of Home-Produced Consumption
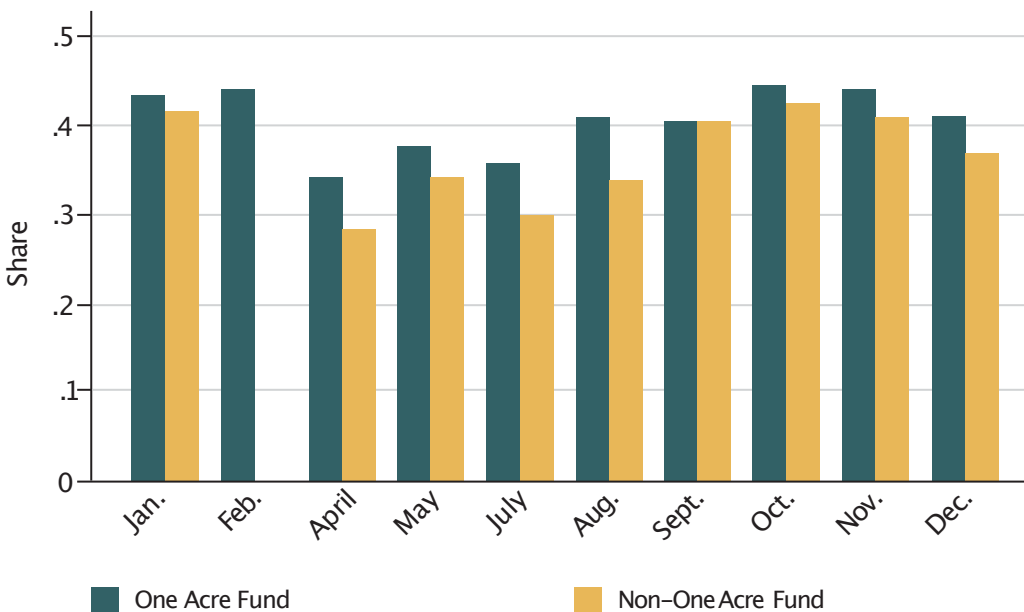
Appendix Figure AF3 shows median shares of home–produced consumption. The distribution is very similar to the distribution for mean shares, revealing the most households tend to consume similar shares of food from home–produced consumption.

As before, the above estimates of client and non–client home–produced consumption are summary statistics and so differences are due both pre–existing differences as well as possible program impact.

4.6 Indebtedness, Assets, and Savings

Many households report having debt in at least one month of the year. Debts may come from official sources, such as bank loans or loans from an official association, or loans may be unofficial, as households borrow from friends, family, and neighbors in time of need. Client households on average report higher levels of average monthly debt than non–client households. Client households average monthly loan amount is $97 USD whereas non–clients only have an average of $35 USD per month in outstanding loans. This is the value of all loans, including One Acre Fund loans, reported on a monthly basis (e.g., it is the mean of all monthly values). **The distribution is highly skewed, however, with most clients reporting having $19 USD in debt and most non–clients having no debt, at most times of the year (see Figure 18).**

Figure 18 plots median outstanding loans that client and non–client farmers report, by month. Figure 19 shows the mean loan amounts.
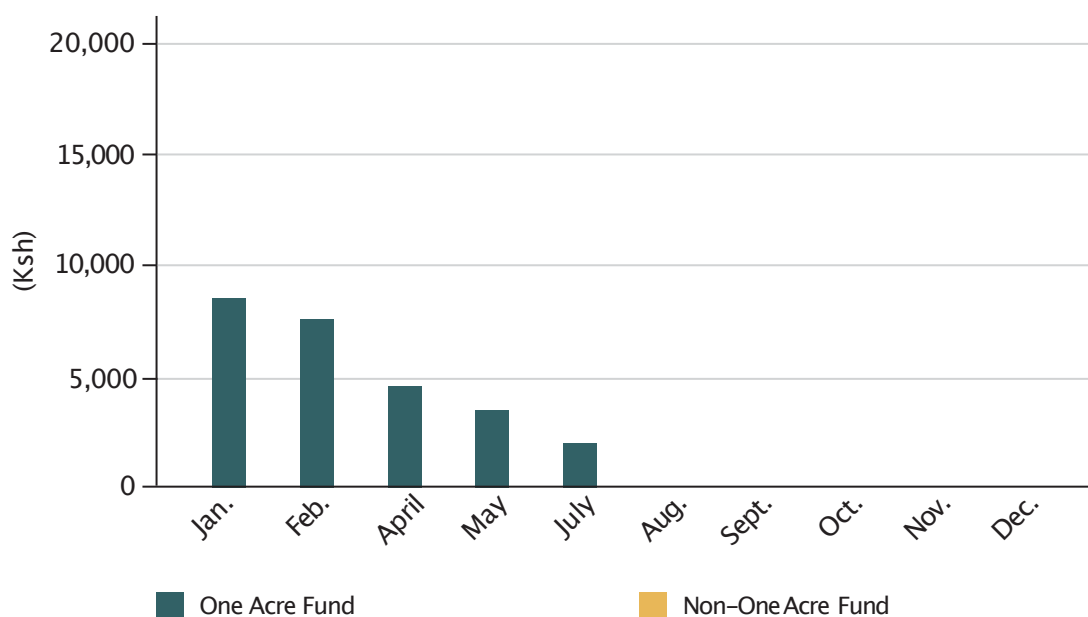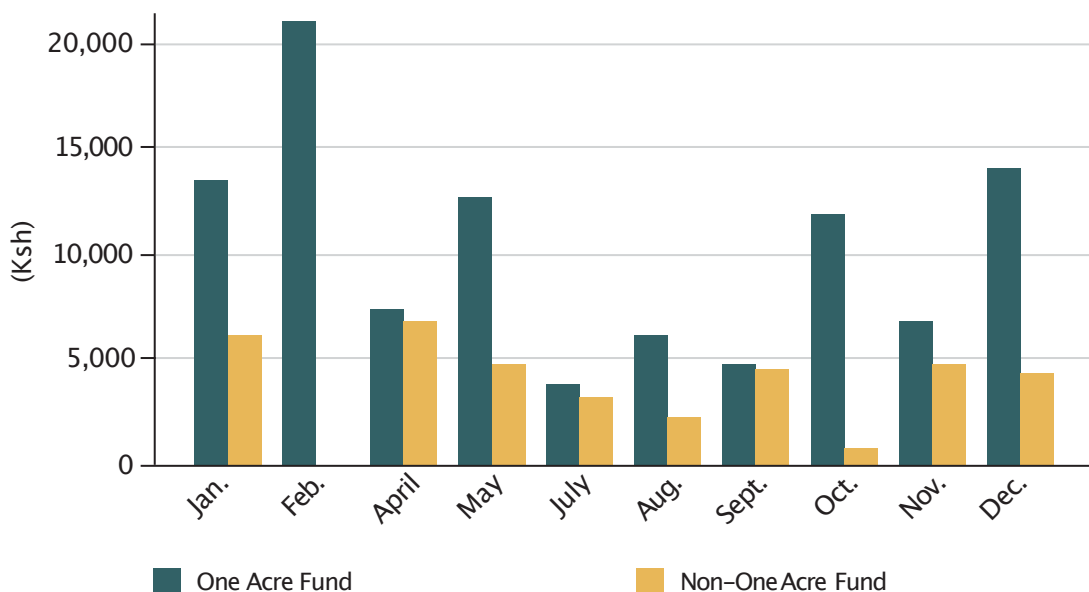
Figure 18. Median Loan Amount

One Acre Fund   Non–One Acre Fund

Figure 19. Mean Loan Amount

Client farmers report spending much more to repay their loans (average of $12 USD per month) than non-clients do ($4 USD per month). The higher loan repayment amount among client households makes sense as part of participation in One Acre Fund is conditional on loan repayment and their total loan amounts are larger than non-clients. All clients necessarily take out a One Acre Fund loan, which ranges from $29 USD to $147 USD for new clients and up to $260 USD for returning clients. Furthermore, the greater outstanding loan amount among client households is also commensurate with the greater income, expenditure, and asset levels reported by client households (described in the next section). The median share that client farmers repay each month of the monthly value of their outstanding loan amount is 14%. In contrast, non-clients' median share is 10%, which is not an appreciably higher overall loan burden and is also indicative of client farmers' greater ability to repay.

Client households report more in savings than non-clients. Savings include money saved in a bank or Mpesa account as well as other savings. Savings are highly skewed with mean savings being substantially higher than median savings. This distribution also differs by clients and non-clients. Client farmers' median savings is $10 USD and non-client farmers' median savings is only $2 USD (Figure 20).

Figure 20. Median Savings Amount
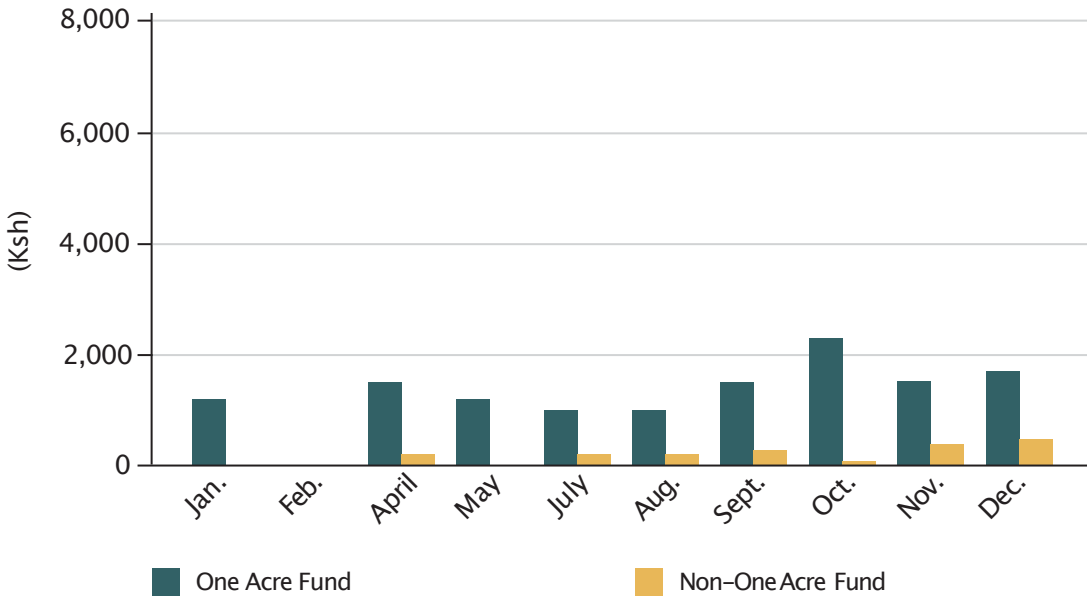
Client households report an average of $62 USD in savings per month over the course of the year. Non–client households only report an average of $23 USD in savings per month over the year. Mean savings are variable throughout the year (Figure 21).

Figure 21. Mean Savings Amount
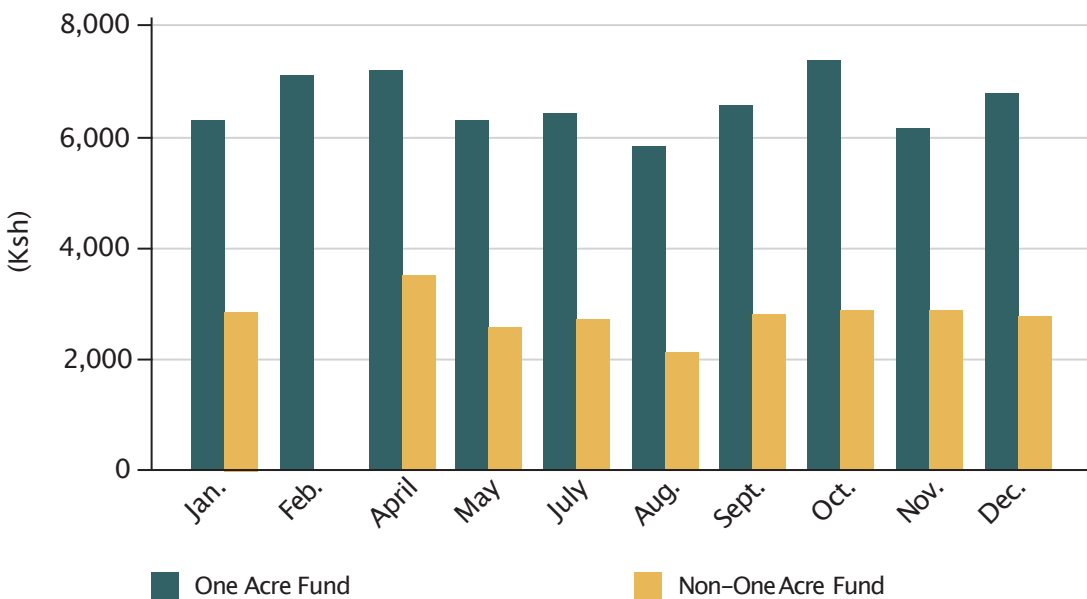
The above estimates of client and non–client loan and savings behavior are summary statistics only. Differences are due both pre–existing differences as well as possible program impact.

4.7 Assets

The distribution of assets is not as skewed as many other indicators are. **The median asset value for client farmers is $6,855 USD and for non-clients it is $4,749 USD**. The annual mean asset value for client households is $7,800 USD and for non-clients it is $5,810 USD. Assets include small items, such as frying pans and towels, and large items such as land and granary ownership, as well as productive assets like cattle. Some assets, such as saved maize bags, are more liquid meaning that they can more readily be sold and converted to cash. All assets are valued at the local market rate but do not account for depreciation, and hence are likely to be overestimated.

The major asset drivers are land ownership and, to a far smaller extent, metal sheets. Metal sheets are commonly used as roofing material. We do not consider the distribution of assets over the course of the year because most assets are lumpy and do not change much on a monthly basis.

Figure 22 shows the breakdown of assets by value for clients and non-clients. Categories are aggregated as follows: livestock includes cattle and chickens, stored crops include maize bags and other crops, small items include a range of items from frying pans to smart phones to solar lights, and large items includes granaries and livestock sheds. The breakdown of the distribution of assets is remarkably similar for clients and non-clients, although the total value of assets owned by clients is higher. The primary difference is that the One Acre Fund farmers' assets are slightly more concentrated in land (68% of total asset value versus 66%).

As the reported differences are summary statistics only, differences between clients and non-clients are likely due to both pre-existing differences between clients and non-clients as well as possible program impact.

Figure 22. Mean Asset Value
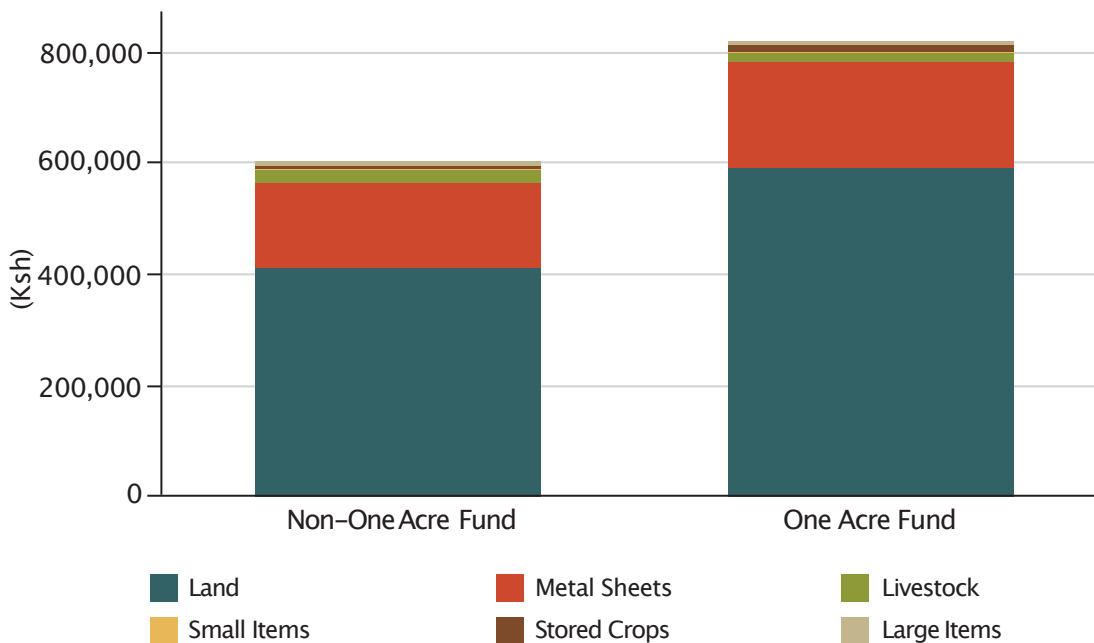
4.8 Length of Time in One Acre Fund

We find suggestive evidence that One Acre Fund increases farmers' income and other measures of well-being. We next consider whether tenure in One Acre Fund increases farmers' well-being. More than 25% of One Acre Fund farmers reported that this was their first season, approximately 10% of farmers reported that this was their second season, and another 10% reported it was their third season, 7% their fourth, and smaller shares reporting a fifth or six season. However, over 40% of farmers did not answer the question.

We run our analysis on the set of farmers who answered the question and all control farmers. We regress total income, savings, and total expenditure on the number of seasons that farmers have been in One Acre Fund and again control for other factors likely to influence income and selection of households into One Acre Fund: number of household members, land ownership size, whether the household owns a granary, whether the household owns a livestock shed, and female education level. Moreover, we also include sublocation and month controls to account for geographic differences as well as temporal fluctuations that could affect income, savings, or expenditure. We again cap any values of the outcome variables at the mean plus or minus two standard deviations, to remove the effect of outliers. Finally, we exclude pre-harvest data for newly enrolled clients as we do not expect any program effect for these farmers in this period.

We see that tenure in One Acre Fund is associated with an increase in total monthly income (Table 7 model 1). Each additional season in One Acre Fund is associated with an increase of $7 USD of monthly income (including the value of home-produced consumption). The effect is only significant at the 10% level with district level clustering. This accounts for both spatial correlation and serial correlation.

We run a similar regression using the same specification with savings as the outcome (model 2). Here we see that each additional season in One Acre Fund increases average savings by over $8 USD, on average (p<.01). We also look at the effect of tenure in One Acre Fund on total monthly expenditure (including home-produced consumption). We find that each additional season in One Acre Fund increases total monthly expenditure by nearly $10 USD, on average (p<.10). Finally, we also consider whether One Acre Fund clients spend more on school expenditures. We find a positive effect of more than $2 per month (p<.10) on average on school expenditure, with each additional season in One Acre Fund (model 4).

These results do signal a potential large positive effect of tenure in One Acre Fund on a number of important outcomes. Nevertheless, we caution generalizing from these results because:

- Results on income and expenditure are only significant at a 90% confidence level and education expenditure does not reach conventional levels of significance.

- Pre-existing differences that we cannot control for may be driving these results.

- This analysis in particular is hindered by a small sample size due a large number of respondents who did not answer the question of how many seasons they have been in One Acre Fund.

- Non-response could also bias the results. This could occur if those who had been in One Acre Fund less time were less likely to answer the question, for example.

Table 7. OLS Regression of Number of Seasons in One Acre Fund (USD)

One Acre Fund Farmer	(1) Monthly Total Income	(2) Monthly Savings	(3) Monthly Total Expenditure	(4) Monthly School Expenditure
Number of Seasons in One Acre Fund	7.097* (3.581)	8.137*** (2.026)	9.889* (4.593)	2.472* (1.346)
Household Member	7.675*** (1.934)	2.450 (1.374)	16.228*** (3.393)	2.467*** (0.622)
Female Education	14.551*** (2.966)	10.638*** (3.051)	18.996*** (5.406)	5.939*** (1.184)
Land Ownership (acres)	14.498** (4.867)	6.894*** (1.401)	11.864*** (2.642)	2.182 (1.611)
Own Livestock Shed	19.210* (10.449)	14.145** (5.131)	28.440* (14.670)	5.939* (2.828)
Own Granary	11.381** (5.022)	7.166 (9.860)	11.534 (12.304)	1.343 (3.591)
Constant	−127.431*** (28.677)	−30.340* (14.359)	−161.479*** (28.379)	−7.783 (9.175)
Sublocation controls	YES	YES	YES	YES
Month controls	YES	YES	YES	YES
N	2203	2203	2203	2203
adj. R–sq	0.315	0.268	0.329	0.223

NOTES:

(1) Standard errors in parentheses.

(2) Standard errors clustered by district.

(3) Total income and expenditure include the value of home–produced consumption, valued at the local market rate.

(4) Income excludes business expenditure.

(5) To remove the effect of outliers, all outcome values greater or less than mean plus or minus two times the standard deviation are capped at these max/min values.

(6) Newly enrolled OAF clients were considered to be control between Jan–Sept, as these were pre–harvest measurements.

(7) * $p<0.10$, ** $p<0.05$, and *** $p<.01$

5. CONCLUSION

This study highlights many key characteristics of client and non–client households, gleaned from analyzing detailed monthly income and expenditure patterns of 400 farmers, over the course of a year. The results show that One Acre Fund farmers are generally poor and cash–constrained, however, they experience higher incomes and expenditures than similar non–One Acre Fund farmers. Suggestive evidence, using OLS regression and controlling for many characteristics likely to affect both income and selection of households into One Acre Fund, shows that One Acre Fund increases farmers' monthly incomes on average by more than $17USD.

Although many of the figures presented in this report are self–reported, every attempt was made to get as accurate data as possible, through rigorous survey pre–testing and the use of short intervals for important recall information (e.g., consumption in last seven days). Moreover, the income and expenditures, as well as the specific components of income and expenditure, are similar to comparable figures reported in other studies, including the 2015 Quality of Life survey.

One of the beneficial features of these data is that they allow for analysis of the distribution of income and expenditures over the course of the year. We see that there are large shifts in income and expenditure patterns and that the patterns do differ across client and non–client households, in ways that could be important for providing auxiliary services, like loans or savings commitment devices, at key times of the year.

APPENDIX

As many farmers earn or spend nothing from certain categories the median values for these categories is zero.
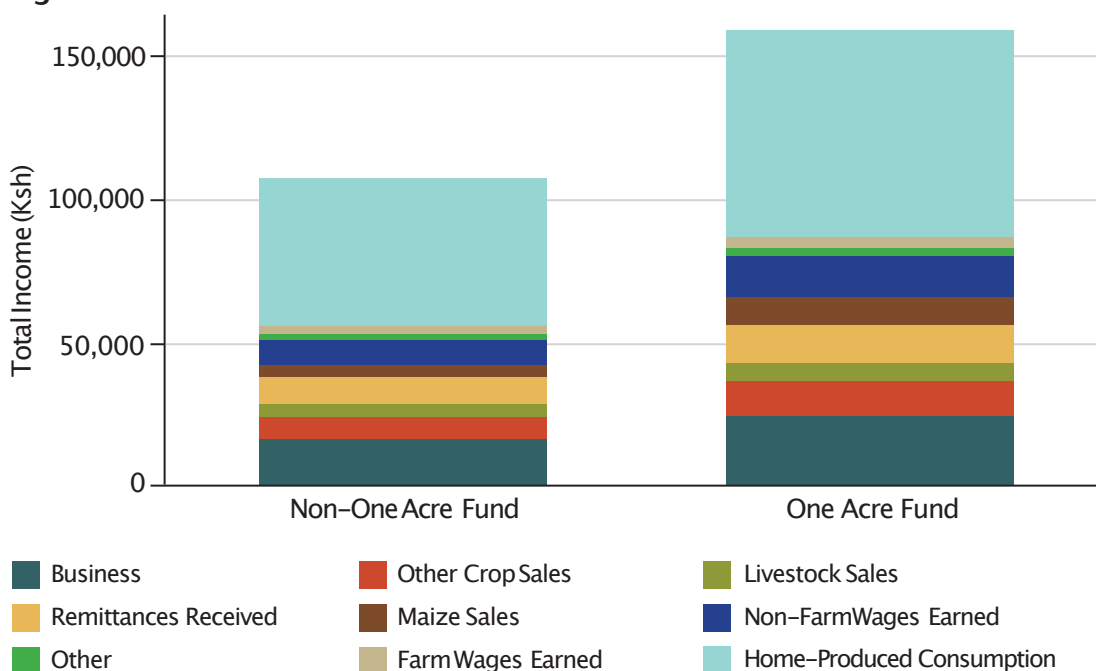
Figure AF1. Mean Annual Total Income

Legend:
- Business
- Other Crop Sales
- Livestock Sales
- Remittances Received
- Maize Sales
- Non–Farm Wages Earned
- Other
- Farm Wages Earned
- Home–Produced Consumption

Figure AF2. Mean Annual Total Expenditure

Legend:
- Purchased Food
- Business
- Other
- Medical
- School
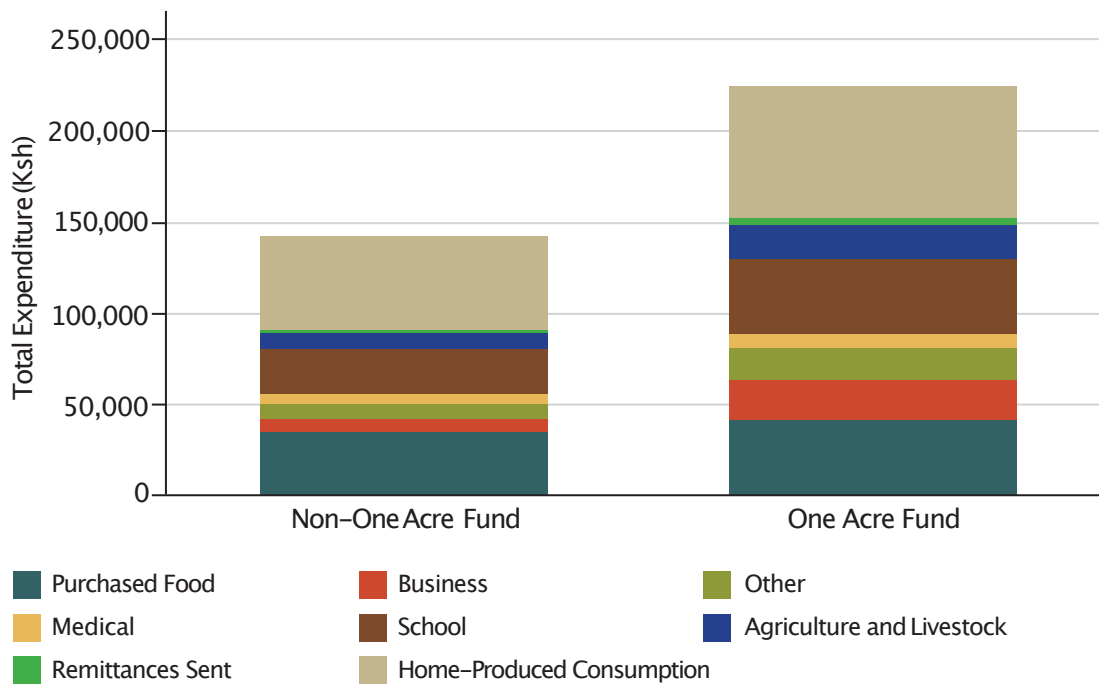- Agriculture and Livestock
- Remittances Sent
- Home–Produced Consumption

Figure AF3. Median Share of Home–Produced Consumption

Legend:
- One Acre Fund
- Non–One Acre Fund