iDE Ethiopia - RPI2

Rural Prosperity Initiative Impact Evaluation

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Executive Summary

iDE conducted an impact evaluation of its Rural Prosperity Initiative (RPI) in Ethiopia, implemented in partnership with the Bill & Melinda Gates Foundation. The RPI aimed to significantly increase the incomes of smallholder farmers through a few key channels, including: development and promotion of affordable micro-irrigation technologies, farm credit, training and advisory services, creating private manual well-drilling services and developing high-value markets for key crops.

RESEARCH QUESTIONS

- What are the impacts of iDE micro-irrigation technology adoption and marketing and/or agronomic support on smallholder productivity and income **one** year after adoption?
- What are the impacts of iDE micro-irrigation technology adoption and marketing and/or agronomic support on smallholder productivity and income **five** years after adoption?

ONE-YEAR IMPACT EVALUATION

STUDY METHODS

The study used a quasi-experimental design to estimate the degree to which the initiative has caused changes in farmers' production and incomes in Kore, Kofele, Aleltu, Kimbibit and Abichu Guna'a woredas. The evaluation compares 196 'treated' households (households that have invested in iDE-promoted irrigation technology and other services) with 100 matched controls: households from neighbouring villages that have not invested in an iDE technology or participated in iDE trainings.

KEY DESCRIPTIVE STATISTICS FOR THE ONE-YEAR EVALUATION

- 1/3 of treatment and control group households earn less than $1.25/person/day;
- Significantly more treatment households used a well or a borehole for irrigation;
- More control group households already used improved technologies or services at baseline;
- More treatment households took up new technologies and services during the intervention;
- There were no significant differences between treatment and control households' average baseline and endline rain-fed income;
- There were significant differences between treatment and control households' average baseline and endline irrigated income;
- The difference between treatment and control irrigated income increases over the course of the project; treatment households earned more revenue from seven different crops, compared with two for controls.

ONE-YEAR IMPACTS

The matched analysis testing impact one year after adoption found the following:

- Significant and robust positive impacts on **irrigated crop revenues** of ETB 2,047-2,079 ($392-398) after the first year of adoption;
- Treatment households increased their earnings by an average of ETB 3,350 more per hectare;

- Improved seed appears to be a critical component of the program, increasing impact on irrigated revenue by more than four times;
- The impact estimates for **non-irrigated revenue** are positive but not statistically significant;
- However, non-irrigated revenue impact estimates appear to be significant within all woredas except Abichu Guna'a.
- Positive significant impacts on total crop revenues of ETB 2,700-3,441 ($518-660);
- Positive significant impact on total crop profit of ETB 3,440-3,981 ($659-763).

FIVE-YEAR IMPACT EVALUATION

STUDY METHODS

The five-year impact evaluation measured changes in household income over a five-year period, following up with treatment and control households from the first RPI phase in Adami Tulu, Arsi Negelle and Dugda. By conducting follow-up surveys with the first cohort of survey respondents we completed a panel dataset spanning five years for 200 iDE clients and 75 non-clients. Attrition and cross-over (control households adopting the treatments) limited our ability to test for long-term impact.

EVIDENCE OF CONTINUED INVESTMENT IN IRRIGATION TECHNOLOGIES AFTER INITIAL EVALUATION

- Many of the original control-group households self-selected an iDE irrigation technology after the original surveys in 2008. Although this is problematic for the evaluation, it is a promising sign that a market-based approach to technology and service provision is continuing to serve new clients;
- The majority of new technologies adopted were rope-and-washer pumps;
- There was a very large increase in households using improved seeds and chemical fertilizers: necessary components for significant income impacts as shown in the one-year evaluation.

FIVE-YEAR IMPACTS FOR ORIGINAL EXPERIMENTAL GROUPS

- There are no statistically significant impacts on irrigated crop revenues over time. As noted, attrition and cross-over limited the power of the analysis;
- There appears to be a significant impact on treatment households' non-irrigated crop revenues;
- Households that invested in an irrigation technology continue to earn more income than households that did not invest in an irrigation technology.

CONCLUSION

iDE measured significant and robust impacts of the RPI investments on smallholder productivity and income (on average $700 PPP in additional annual crop profit). The five-year analysis suggests continued impact on earnings, as well as significant broader uptake of new technologies and services, but attrition and cross-over in the sample limited the power of the evaluation.

Background

Agriculture is the foundation of Ethiopia's economy, accounting for half of gross domestic product (GDP), 83.9% of exports, and 80% of total employment.[1] Despite the importance of the sector to the economy, the country's agricultural resources remain relatively undeveloped. Only about a third of the estimated 30-70 million hectares of potentially cultivable land is currently cultivated, and of the existing cultivated area, only about four to five percent is irrigated (Awulachew, 2010). Less than 5 percent of total renewable water resources are withdrawn annually (FAO, 2005 in Tucker and Yirgu, 2010).

The development of irrigation and agricultural water management holds significant potential to improve productivity and reduce vulnerability to climatic volatility in any country. However, the challenge that Ethiopia faces in terms of food insecurity is associated with both inadequate food production, even during good rain years, and natural failures due to erratic rainfall. Therefore, increasing arable land or attempting to increase agricultural yield alone cannot be a means to provide food security in Ethiopia, due to environmental impacts (expansion into marginal land, deforestation) and unpredictable natural factors (climate). The solution for food security will be provided by a combination of enhancing water availability for production and expansion of irrigation that can lead to security by reducing variation in harvest, as well as intensification of cropping by producing more than one crop per year (Awulachew et al, 2005)

Irrigation is one means by which agricultural production can be increased to meet growing food demand and enhance the living standards of households by increasing incomes in Ethiopia, especially through the use of household irrigation technologies (HIT). The advantages these technologies are: 1) they can be adopted and used by individual farmers because they do not depend on collective action by groups; 2) they are of relatively low cost in terms of their capital and operating costs per farm; and therefore are potentially affordable by smallholder farmers; 3) they are often highly efficient in use of water with high water productivity, while also improving crop quality and reducing labor costs; and 4) they can be distributed by private firms through markets that are not dependent on being provided for by government institutions (ITC 2003 in Awulachew et al, 2005). In line with the use of HITs, enabling farmers to engage in market-driven profitable agriculture provides farmers incentives to invest in soil fertility (Awulachew et al, 2005).

In previous studies, irrigating households reported an average 20 percent increase in annual income after adopting irrigation, and in some cases up to 300 percent, due to cultivation of higher-value crops, intensified production and reduced losses. In some cases, households reported improved nutrition as various fruit and vegetables became locally available. The most successful households have increased their assets, particularly livestock, which is an important form of saving and wealth accumulation. Some have bought new farming equipment to further increase productivity. In this way irrigation can lead to an upward spiral of increased production and income, and some households say that their livelihoods have been 'transformed' (Tucker and Yirgu, 2010).

The Rural Prosperity Initiative reached farmers through a few key channels:

- Development and promotion of affordable micro-irrigation technologies (MITs) and water lifting and distribution equipment to alleviate the drudgery of small-scale irrigation farmers.

1 http://en.wikipedia.org/wiki/Agriculture_in_Ethiopia accessed on July 15, 2013

- Facilitation of farm credit for vegetable producers to increase production, productivity and incomes.
- Training and advisory services in Integrated Pest and Disease Management and vegetable cultivation and business management for farmers to build their capacity and improve their skills for enhanced livelihoods while caring for the environment.
- Increasing access to ground water by creating private manual well-drilling businesses in areas that have shallow ground water.
- Developing high-value market channels for key crops.

Key Outcomes

This evaluation aimed to estimate the impact of RPI2 investments on the following key outcomes:

- Irrigated Crop Income
- Non-Irrigated Crop Income
- Irrigated and Non-Irrigated Crop Productivity
- Off-farm Income

Research questions

- What are the impacts of iDE micro-irrigation technology adoption and marketing and/or agronomic support on key outcomes **one** year after adoption?
- What are the impacts of iDE micro-irrigation technology adoption and marketing and/or agronomic support on key outcomes **five** years after adoption?

Study Methods

Quasi-Experimental Design

The study used a quasi-experimental design to estimate the degree to which the initiative has caused changes in farmers' production and incomes. The design is very important as observed changes may or may not be due to the project itself. Measuring change without reference to a control group ignores the fact that those changes may have occurred even if farmers had not used the promoted products and services offered by iDE.

Further, if we are comparing non-randomized intervention and control groups (i.e. the project interventions were not randomly assigned to farmers) observed differences between the two may be due to other factors that predict their likelihood of participating in the first place. These factors could include geography (fundamental differences between farmers in project areas vs. non-project areas such as proximity to market, soil type, the presence of other interventions, etc.) and personal characteristics (farmers who join an iDE group or purchase an iDE technology may be by nature more entrepreneurial, have better pre-existing crop management practices, etc.). There is reason to believe that both of these biases would distort the impact estimates for the current evaluation if appropriate methods are not used.

In this case, it was not practical to set up the original project as an experiment with randomly assigned interventions. The present set of 'ex-post' evaluations seek to approximate the findings of a randomized

experiment by matching intervention and control farmers on the basis of key characteristics that predict their likelihood of adopting the offered products and services, all other things being equal. This requires a technique called propensity score matching: intervention and control farmers receive a score based on key observed characteristics and are matched on that basis in order to minimize these confounding factors. The method is far from perfect, but provides a much higher confidence in measured impact than many other non-experimental methods.

History of Data Collection and Impact Analysis Activities in Ethiopia

Data Collection Activities

iDE Ethiopia has prioritized sound monitoring and evaluation practices since the country program's founding in 2007. Each year, iDE Ethiopia has carried out a Rolling Baseline Survey (RBS) of a random sample of 200 iDE clients (treatment) that have invested in an irrigation technology. In addition, iDE collected the same income, production and household characteristics from a matched set of 75 non-client (control) households. This is referred to as the consumer characteristics survey (CCS). Both groups would provide income, crop production, expenditures and other key household information for the crop cycle before adoption, and for the crop cycle after adoption. Each year, iDE Ethiopia would conduct a new RBS and CCS with a new sample of clients and non-clients, respectively. An illustration of iDE Ethiopia's data collection activities under the RPI1and RPI2 funding cycles as well as the set of data collections that are being conducted at the close of RPI2 are shown in Figure 1 below:

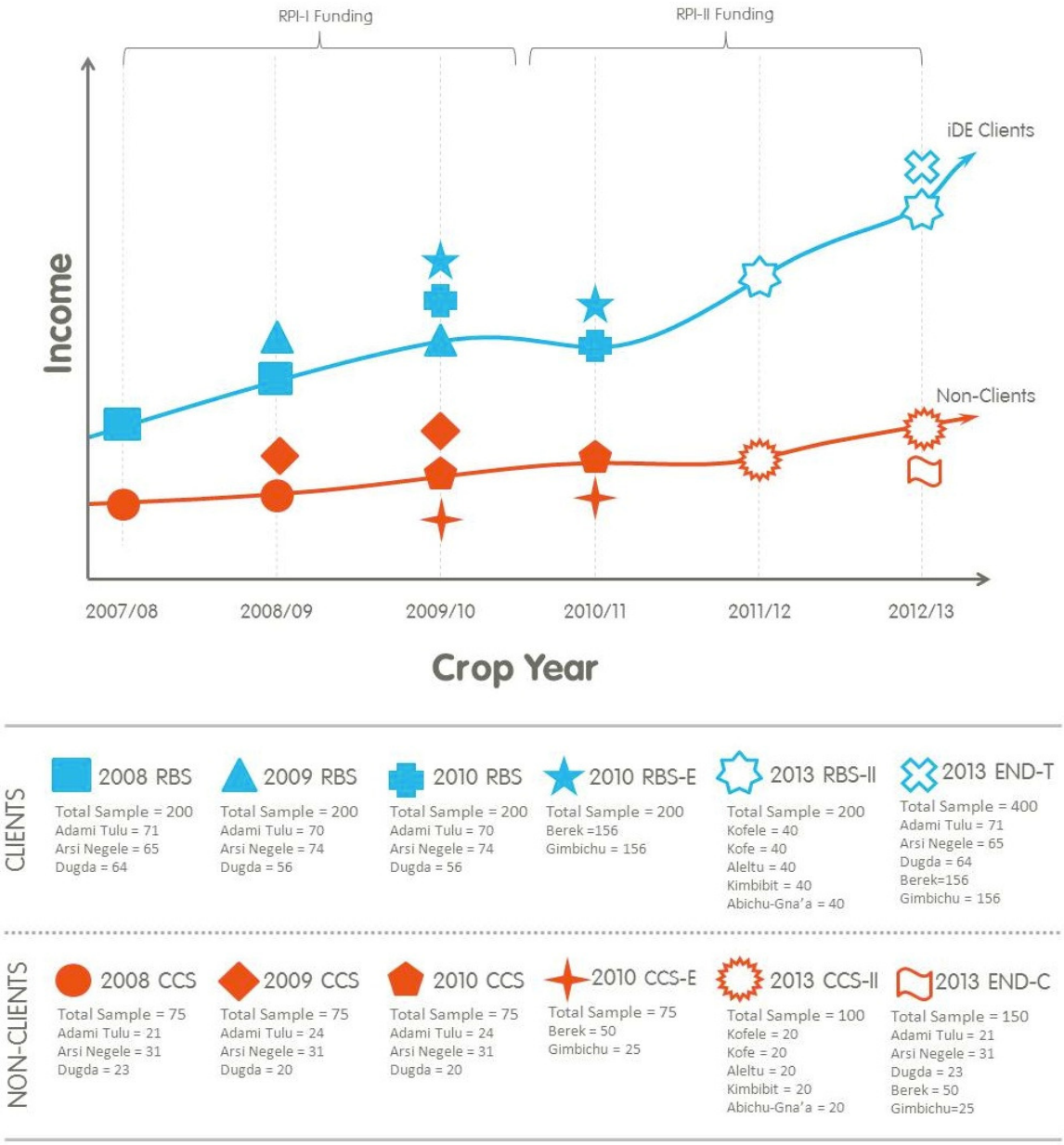


Figure 1: History of iDE Ethiopia's data collection activities

We will use a subset of these datasets to test income and crop production impacts over 1-year and 5-year periods. The research questions will be answered using the following datasets:

- **1 year impact on RPI2 added Woredas** – Kofele & Fore (Rift Valley) + Aleltu, Kimbibit and Abichu-Gna'a (Highlands) using newly collected RBS-II and CCS-II Datasets.
- **5 year impact on RPI1Woredas** - Adami Tulu, Arsi Negelle and Dugda using the 2008 RBS & CCS datasets and the 2013 END-T & END-C data.

With the addition of the RPI2 1-year impact analyses and the 5-year follow-up analysis, iDE-Ethiopia now has a convincing body of literature supporting the efficacy of their approach. A summary of the impact analyses carried out by iDE-Ethiopia under RPI funding are shown in Table 1.

Impact Analysis

By project end, every Woreda covered under the RPI1 and RPI2 funding cycles had a one-year impact analysis showing consistent and robust impacts across time and across Woreda. By carrying out the five-year impact analysis for a subset of Woredas, iDE has also developed a better understanding of the trajectory that can be expected for the Woredas that were added during RPI2. iDE strongly believes that business creation and farmer-household entrepreneurship, coupled with adoption of water lifting technologies and training, will lead to enhanced income growth over the long term. Conducting impact analyses five years post-adoption provides iDE-Ethiopia with evidence to support this claim.

The project activities have not changed much over the course of RPI1 and RPI2 funding, and the criteria for iDE program placement are consistent across all ten Woredas. As such, we can expect that the farmers showing similar one-year impacts will follow a similar path as those for whom we have estimated five-year impacts.

Table 1: Body of evidence for iDE-Ethiopia's income impacts

Zone	Funding Stage	Woreda	1-Year Impact	5-Year Impact
Rift Valley	Began with RPI1	Adami Tulu	2008, 2009, 2010	**2013**
		Dugda	2008, 2009, 2010	**2013**
		Arsi Negele	2008, 2009, 2010	**2013**
	Added with RPI2	Kofele	**2013**	-
		Kore	**2013**	-
Highlands	Began with RPIE	Berek	2010	-
		Gimbichu	2010	-
	Added with RPI2	Aleltu	**2013**	-
		Kimbibit	**2013**	-
		Abichu-Gna'a	**2013**	-

Notes: The cells with red text indicate the evaluations that are included in the present evaluation.

One-year Impact on RPI2 Added Woredas

For the purposes of RPI2 reporting, the iDE Ethiopia team requested that we complete an impact assessment of agricultural technology adoption for the Woredas that were added with RPI2 funding. iDE has carried out one-year income impact assessments[2] in the Woredas covered under RPI1for the 2008, 2009 and 2010 crop years. In order to better understand the impacts of iDE's intervention in the new Woredas we will complete the same type of impact assessment for the RPI2 funded Woredas.

In RPI2 Woredas, iDE worked with service-only clients, referred to as having "service clearance." These clients have not invested in an iDE technology but receive formal marketing and/or agronomic support.

[2] In this case, "impact assessments" refers to one year impacts estimated using pretest-posttest-non-equivalent-control-group quasi-experimental designs. In previous one-year impact evaluations, efforts were taken to identify suitable comparison groups, but no ex post matching or regression adjustment was used.

iDE is interested in learning what the one-year income impacts are for the clients that have only received iDE marketing and/or agronomic support. Unfortunately, there was a shortage of client lists identifying the farmers that have only received market training and/or agronomic training. Furthermore, the majority of farmers that are receiving marketing training are members of farmer cooperatives, and we assume the magnitude of iDE's impact to be relatively small, compared to that of iDE technology plus client training. Understanding iDE's impact on farmer cooperatives may be better accomplished through qualitative means, such as: case studies, key informant interviews or focus group discussions.

The RPI2 RBS assessment covers the Woredas that were added with RPI2 funding, including Kofele & Kore from the Rift Valley, and Aleltu, Kimbibit and Abichu-Gna'a from the Highlands area. The RPI2 RBS impact assessment followed the standard RBS methodology, with a few adjustments to the evaluation design and data collection procedures. These are listed below:

Description of Treatment Group – The Treatment group households are randomly chosen from iDE's technology client list, which are the households that have invested in an iDE irrigation technology. The treatment group sample was selected from the clients that purchased an iDE technology after January 2012 and before August 2012. This ensures that our pre-adoption information is indeed capturing pre-treatment productivity and income information, and that our endline crop year is actually the first crop year they fully employed the technology.

Description of Control group – The control group households are non-iDE and non-Service clients, and were chosen from a neighbouring village – rather than just next door[3] - for each treatment observation that was randomly selected. Once the treatment group survey was completed, the enumerator went to neighbouring village with no iDE clients, and randomly selected a household to interview.

Data Collection Practices – For both the treatment and control group interviews, farmer households are notified beforehand that a survey will take place and that they have been randomly selected to participate in the study. iDE field staff organized a meeting place for the farmers where the surveys took place. This reduced travel costs and increased the number of surveys that could be completed per day. For the current data collection, enumerators sequestered respondents in another room – or under a different tree – during the actual interview. This ensured that farmers were comfortable and willing to share sensitive information. Also, farmers were asked to bring any notebooks or field books that they used to keep track of their incomes and production. Many of the farmers did, in fact, bring their income and production records allowing for easy reference and more accurate responses.

Survey Instrument – The survey took approximately 45 minutes to complete and included sections to capture household characteristics, land and irrigation access, crop productivity, technology and service adoption, crop inputs, market access, attitudes about agriculture more generally and a Progress out of Poverty module. The full survey instrument can be found in Annex 2.

[3] Previous Rolling Baseline Surveys interviewed neighbors that lived adjacent to an iDE client as a control-group household, but as we will see in the five-year impact assessment later in this paper, many of the neighboring control-group households self-selected treatment over the intervention period. For the current evaluation, we have increased the distance between treatment and control households, which may increase the average bias between treatment and control groups in terms of agro-climatic conditions, but we also believe this will reduce bias in our impact estimates due to the spillover between treatment and neighboring control households.

Descriptive Statistics of Experimental Groups

SAMPLE SIZE COLLECTED

Although the original design was to collect 40 treatment observations and 20 control observations for each of the five Woredas that were included in the one-year impact evaluation, we had fewer clients that completed a sale in the time period required for inclusion in the sample in Kimbibit and Aleltu than we originally anticipated. The breakdown of treatment and control observations for each Woreda are presented in Table 2.

Table 2: Final sample sizes, by Woreda and experimental group

Woreda	Treatment	Control	Total
Kore	38	21	**59**
Kofele	40	20	**60**
Aleltu	17	20	**37**
Kimbibit	2	20	**22**
Abichu Guna'a	99	19	**118**
Total	**196**	**100**	**296**

Because of budget constraints and a tight timeline for data collection, we had a fairly small sample to test impact estimators, limiting our ability to test for Woreda-specific differences.

HOUSEHOLD CHARACTERISTICS

There were very few significant differences between the treatment and control groups in terms of basic socioeconomic characteristics as shown in Table 3. Treatment households have more household members than control group households. One important household characteristic that could potentially limit the income impacts of any agricultural program is the distance and travel time to a viable market to sell produce. In many cases, iDE works with farmers that closer to market opportunities. For the current evaluation, however, there were no significant differences between treatment and control groups for distance or travel time to the market where the household most frequently sells.

Table 3: Household characteristic, by experimental group

HH Characteristic	Treatment	Control	Sig. Difference
# of years of Education of Head	2.8	2.6	NS
Age of Household Head	41.4	42.6	NS
% of Households with Male Head	95%	95%	NS
# of Household Members	9	7	***
Dist. to nearest market in km	5.5	6.3	NS
Time to nearest market in hrs	1.0	1.1	NS

Note: t-test on the equality of means: NS = Not Significant, * = 10%, ** = 5% & ***=1% levels of significance

POVERTY INCIDENCE - PROGRESS OUT OF POVERTY INDICATOR

The Progress Out of Poverty Index (PPI) was developed by the Grameen Foundation and is a valuable tool that iDE uses in as many of its country programs as possible to measure the incidence of poverty among iDE customers. The PPI score is obtained by adding together the scores from ten simple,

verifiable questions pertaining to household size, building materials, education, energy use, etc.[4] Each set of questions has been specifically chosen and weighted for the country in which it is to be implemented – resulting in a concise survey module that may be added to existing M&E instruments. The resulting PPI score is then used to estimate the probability that the household is in poverty using a PPI Scorecard. The PPI scorecard provides probabilities for each possible PPI score, and may be used to estimate the household's likelihood of falling below a number of poverty thresholds, including: $1.00 PPP, $1.25 PPP, $2.50 PPP and USAID Extreme Poverty.

Using the PPI, we have estimated that 17 percent of the control- and treatment-group household earns below $1.00 PPP. Furthermore, between 34-35 percent earn less than $1.25 PPP and although there were slight differences between treatment- and control-groups regarding the $2.50 PPP, the difference is not statistically significant. Poverty rates for treatment and control groups are shown in Table 4.

Table 4: Progress out of poverty, by experimental group

	Treatment	Control	Significant Difference
Less than $1.00 (PPP)	17%	17%	NS
Less than $1.25 (PPP)	35%	34%	NS
Less than $2.50 (PPP)	87%	84%	NS

Note: t-test on the equality of means: NS = Not Significant, * = 10%, ** = 5% & ***=1% levels of significance

LAND HOLDINGS AND ACCESS TO IRRIGATION

One of the key determinants of off-season crop income is the household's access to irrigation. Significantly more households in the treatment group use a well or a borehole than households in the control group, as shown in Figure 2.

In addition to the percentage of households using each irrigation source, we are concerned with the percentage of total irrigated land being supplied by each water source, as this can change dramatically when the household invests in an irrigation technology. Although there is no significant difference in total land area between treatment- and control-groups, we do see a difference in how this land area is irrigated at baseline. As shown in Figure 3, there is very little difference between baseline and endline irrigation percentages for the control group, but the treatment group increases the amount of land irrigated by borehole and river over the intervention period.[5] Although we cannot attribute this change to the adoption of an iDE technology, this is likely due to the household having access to a rope and washer pump and/or a treadle pump.

[4] The ten questions are extracted from the respective country's income/expenditure survey and must match the translation and content exactly.

[5] The survey instrument also collected access, usage and land area for harvested rain water, spring and lakes, but an insignificant number of households used these sources at baseline or endline – for both treatment and control groups.

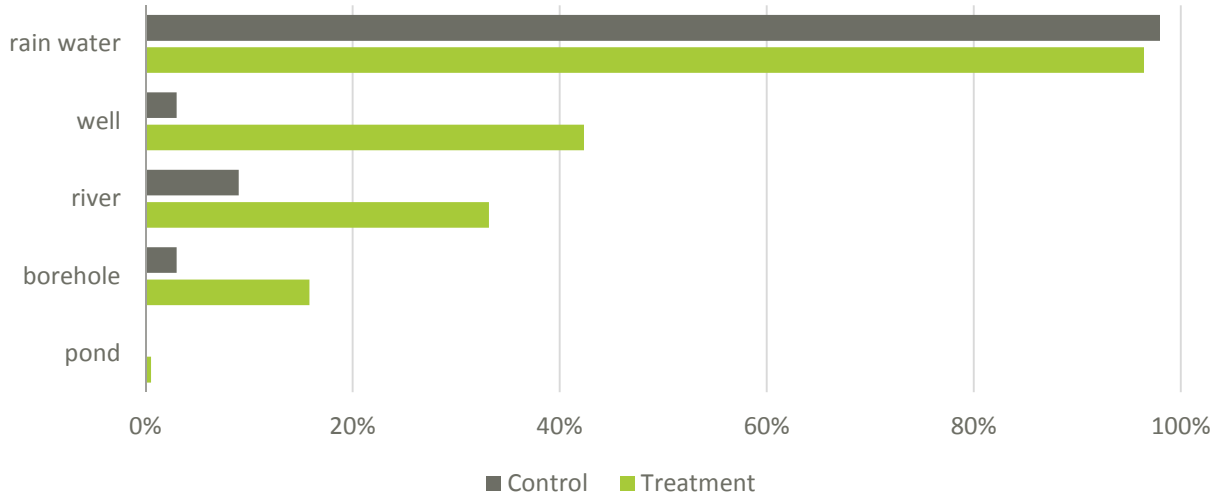


Figure 2: Percentage of households using irrigation source at baseline, by experimental group

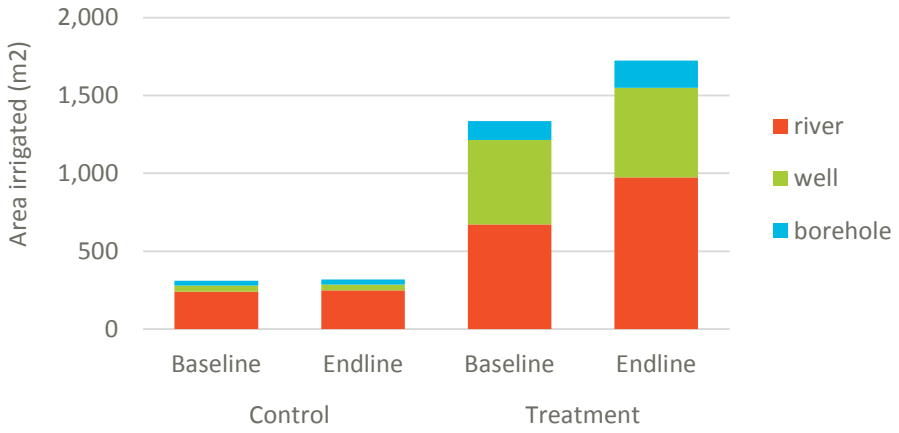


Figure 3: Area irrigated by source, by experimental group and time

EQUIPMENT AND ASSETS

Ownership of income-improving assets is another important piece of information for iDE to know to understand our farmer-clients, but also to assess the comparability of our experimental groups. You will see in Table 5 that there are very few differences between treatment and control in terms of their ownership of specific assets, the only significant differences being ownership of irrigation technologies and having an iron sheet roof.

As previously mentioned, the treatment group sample was selected from the clients that have purchased an iDE technology sometime after January 2012 and before August 2012. It is likely, therefore, that may of the respondents who reported owning an irrigation technology at baseline were responding based on the year in which they purchased the technology, without referencing the specific crop year. We do not believe that the difference in technology ownership in 2012 affects our ability to

compare treatment and control groups, because very few of the households employed the technology during the baseline crop year.

Table 5: Percentage of households owning asset at baseline, by experimental group

Asset Type	Treatment	Control	Significant Difference
River type treadle pump†	50%	0%	***
Suction only treadle pump	1%	0%	
Big diesel pump	0%	0%	
Micro diesel pump	1%	0%	
Rope and washer pump†	14%	0%	***
Drip kit	0%	0%	
Watering can	14%	6%	**
Bucket	7%	7%	
Plough (oxen)	30%	28%	
Donkey cart	4%	2%	
Wheelbarrow	1%	0%	
Knapsack Sprayer	5%	2%	
Maize sheller	2%	3%	
Grinding mill (motorized)	0%	0%	
Shovel	16%	18%	
(Broad Bed Maker) Miscellaneous	1%	0%	
Bee hives	5%	3%	
Generator	1%	0%	
Bicycle	1%	0%	
Motor bike	0%	0%	
Radio	16%	15%	
TV set	3%	0%	
Cell phone	18%	21%	
Iron sheet roof	6%	14%	**

Note: t-test on the equality of means: NS = Not Significant, * = 10%, ** = 5% & ***=1% levels of significance
† The criteria for inclusion in the treatment group is that the household purchased an irrigation technology within the past 18 months. Many of the treatment households, therefore claimed to own the technology at baseline, but few of them were utilizing the technology during the baseline crop year where incomes and productivity was estimated.

TECHNOLOGY SERVICE ADOPTION AND USE

When looking at the usage of technologies and services at baseline in Table 6, we see that a greater percentage of control group household use many of the income-generating technologies or services than treatment-group households. This is particularly significant for chemical fertilizers, pesticides, credit services and trainings.

Table 6: Percentage of household using services and technologies at baseline, by experimental group

Technology/Service Type	Treatment	Control	Significant Difference
Market information†	66%	67%	

Technology/Service Type	Treatment	Control	Significant Difference
Producer Marketing Group/Cooperatives†	31%	39%	
Market outlet-District	63%	73%	*
Market outlet-Regional	1%	2%	
Market outlet-Addis	1%	0%	
Use of compost	63%	61%	
Pesticides	41%	53%	**
Cultural control	43%	42%	
Off season product†	28%	22%	
Chemical fertilizer†	45%	72%	***
Use of manure	30%	25%	
Intercropping	6%	8%	
Improved seeds	30%	36%	
Treadle pump†	0%	0%	
Drip system†	0%	0%	
Motorized pump Small	1%	1%	
Motorized pump Large	0%	0%	
Rope and washer pump†	1%	0%	
Water tank/container	0%	0%	
Water reservoir/pond	0%	0%	
Credit services/Group Savings†	13%	28%	**
Training irrigation†	18%	31%	**
Training crop production†	28%	41%	**
Output marketing training†	13%	20%	

Note: t-test on the equality of means: NS = Not Significant, * = 10%, ** = 5% & ***=1% levels of significance
† Each of these technologies/services are components of the iDE service package.

It is important to understand the changes that households make over the course of the intervention period, in order to understand the exact iDE offerings leading to impacts. In many cases, households are adopting a technology, while also taking advantage of a new service offering or agricultural practice. Although many of the control-group households applied these practices, a significant number of households in the treatment group adopted them over the course of the intervention period. Figure 4 shows the difference in percent of households using each technology or service between baseline and endline. You can see quite easily that many of the trainings, services and technologies offered by iDE are adopted by treatment group households. We see a 60 percent change in treatment households applying lessons learned from irrigation training. Similarly, we see significant increases in the number of households using a treadle pump (54%), rope and washer pump (44%), output marketing strategies (42%), credit services (38%), off-season production (34%), improved seeds (17%), use of compost (7%), district market outlets (11%), and intercropping (11%), to name a few. For the majority of these technologies and practices, there was no change observed over time in the control group.

The current sample does not permit us to test the attributable impact for each of these offerings, but we are able to estimate the average treatment effect on the treated (ATET) for an average combination of these services and technologies adopted by the household. This is probably the most reliable way of

measuring iDE impact, because our clients are self-selecting a combination of technologies, trainings and practices – where some clients will adopt more than others.

Figure 4: Change in % of HHs using technology or service between baseline and endline, by experimental group

NON-IRRIGATED CROP PRODUCTION AND INCOME

The average total non-irrigated crop revenue at baseline and endline for the treated and control groups are shown in Table 7. For the purposes of the current evaluation, we present descriptive statistics and impact estimates in CPI-adjusted Ethiopian Birr, as this is the currency that is most useful for our project staff. For final impact estimates, we convert impact estimates in CPI-adjusted Ethiopian Birr to PPP-adjusted USD. There were no significant differences found between treatment and control groups at baseline or at endline.

Table 7: Average total non-irrigated crop revenue in CPI-adjusted Birr, by experimental group and time

Total Non-Irrigated Crop Revenue	Baseline	Endline
Treatment Group	4,943	7,422
Control Group	5,552	7,031

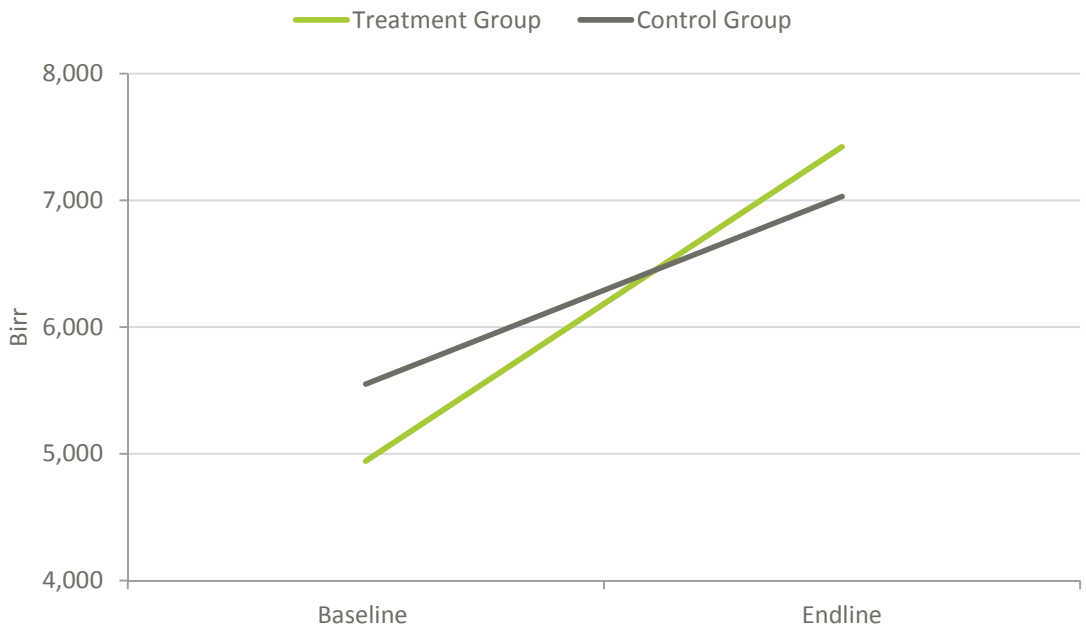


Figure 5: Average total non-irrigated crop revenue in CPI-adjusted Birr

Although there are no significant differences between treatment and control in total non-irrigated crop revenues, there may be a difference in the composition of these revenues. Figure 6 shows the crop revenues earned at baseline across all of the crops that show up in survey responses. We see that lentils are clearly the most profitable for both the treatment and control groups. The only significant difference between the two groups if for teff and bananas, where control group members earn higher revenues for teff than treatment group households, and the opposite is true for banana.

This picture changes quite significantly when we examine the specific crop revenues at endline.[6] First off, the treatment group farmers are growing significantly more crops than what are grown at baseline. Secondly, many of the specific crop revenues increased. For example, average revenue from lentils increases from 5,927 Birr to 9,676 Birr. Our theory here is that the change in field crops is driven by re-investment of horticultural revenues into field crop production, better overall management practices and/or better access to markets. It could also be some combination of the three as well.

With regards to non-irrigated crop productivity, we found that baseline averages between treatment and control are not significantly different, with treatment group earning 4,304 Birr/ha and control group earning 3,078 Birr/ha. Productivity measures at endline are not significantly different with treatment group and control group productivity equal to 4,650 Birr/ha and control group earning 3,5413 Birr/ha, respectively.

[6] Crop-level summary statistics are presented in Annex 1.

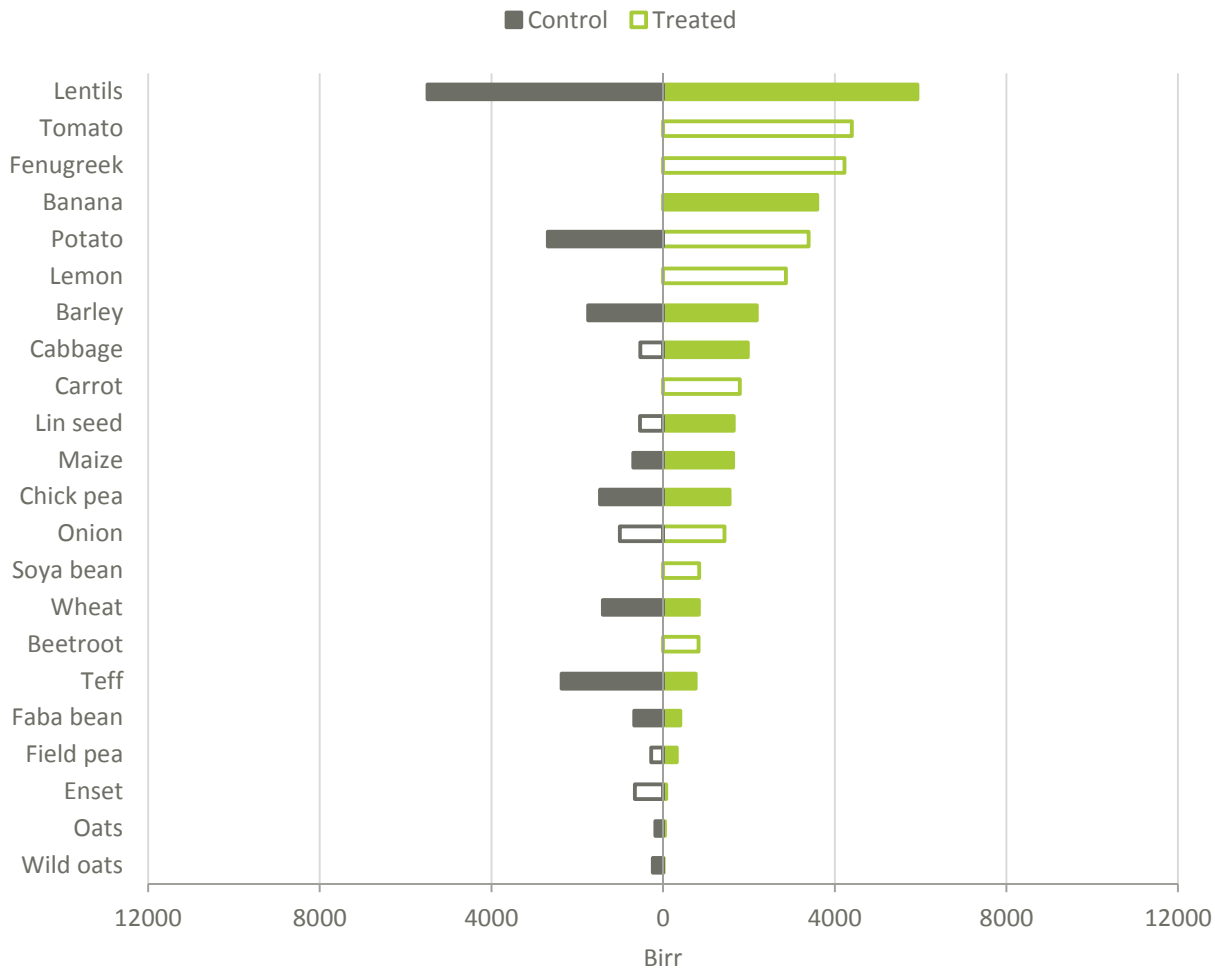


Figure 6: Average non-irrigated crop revenues at baseline, by experimental group and crop type[7]

[7] Crops with fewer than five observations are not filled, and average revenues should be considered suspect.

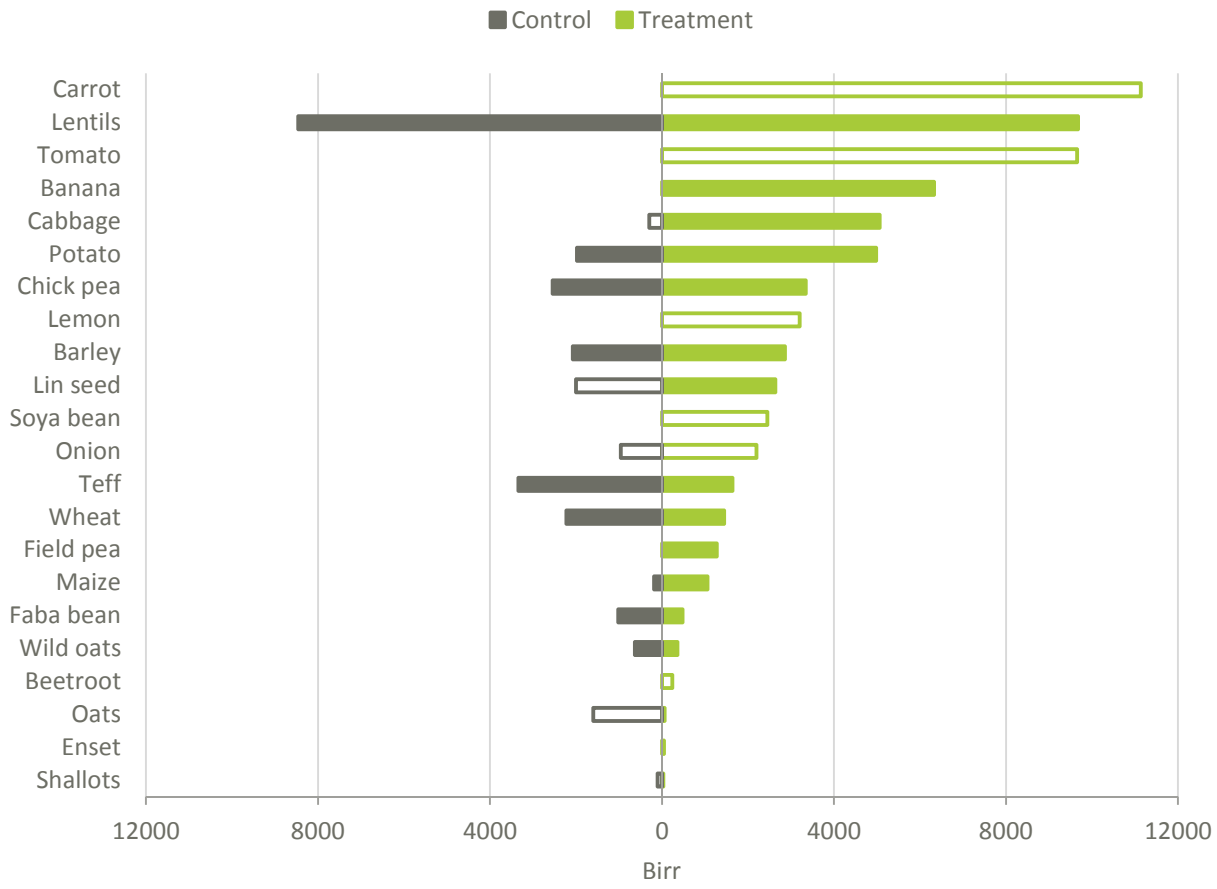


Figure 7: Average non-irrigated crop revenues at endline, by experimental group crop type

IRRIGATED CROP PRODUCTION AND INCOME

The average total irrigated crop revenue at baseline and endline for the treated and control groups are shown in Table 8. Similar to the previous section, we have used CPI-adjusted Birr for the following descriptive statistics. This allows us to make comparisons across the two time periods that are recalled in the one-year impact evaluation. There were significant differences between average baseline total irrigated income at 1 percent level of significance, and at 1 percent level of significance for endline comparison of means.

Table 8: Average total irrigated crop revenue in CPI-adjusted Birr, by experimental group and time

Total Irrigated Crop Revenue	Baseline	Endline
Treatment Group	1,322	3,579
Control Group	299	411

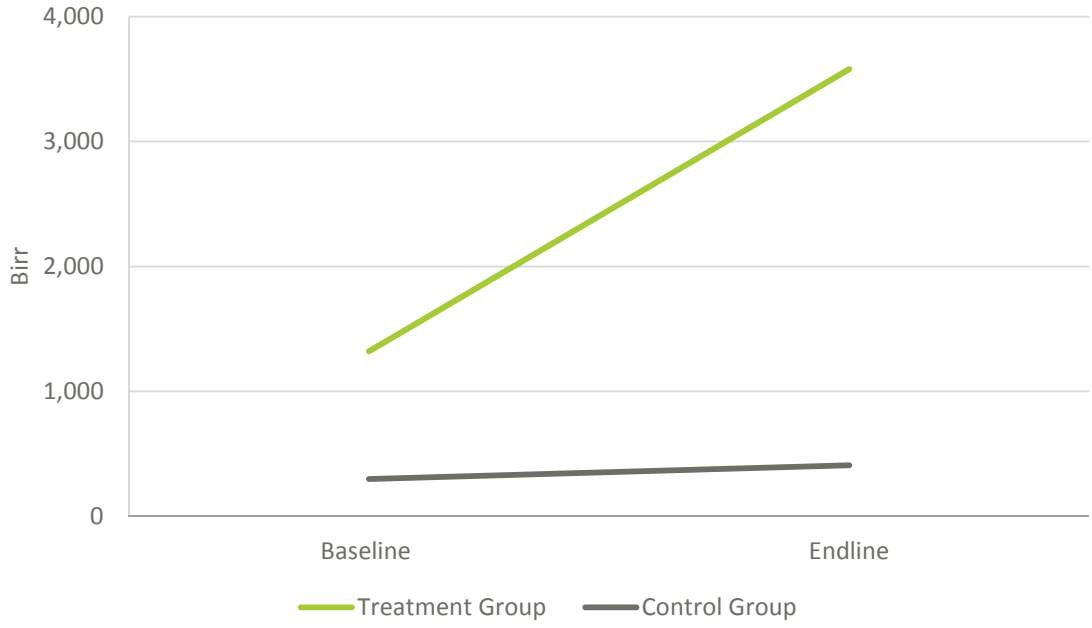


Figure 8: Average total irrigated crop revenue in CPI-adjusted Birr

Figure 9 shows the crop revenues earned at baseline across all of the crops that show up in survey responses. We see that potatoes are clearly the most profitable for both the treatment and control groups. The treatment group households grow significantly more crops at baseline than the control groups, which explains the significant difference in total irrigated revenues.

When we look at the crop revenues from irrigated crops at endline we see a significantly different distribution between treatment and control households.[8] Although there is a difference between treatment and control at baseline, the difference becomes much more apparent by endline, with treatment households earning more than 1,000 Birr from over seven different crops (i.e., red pepper, lemon, banana, garlic, lettuce, beetroot and swiss chard) and the control group earns over 1,000 Birr from only two different crops (i.e., potato and beetroot).[9]

Along similar lines, treatment households increase their crop-specific revenues for nearly every crop that is grown in both baseline and endline, which explains the significantly larger endline total irrigated crop revenue shown in Table 8.

With regards to irrigated crop productivity, we found that baseline averages between treatment and control are not significantly different, with the treatment group earning 2,820 Birr/ha for irrigated crop production and the control group earning 782 Birr/ha. Productivity measures at endline are significantly different.

[8] Crop-level summary statistics are presented in Annex 1.
[9] This is excluding the crops for which we have fewer than five observations for.

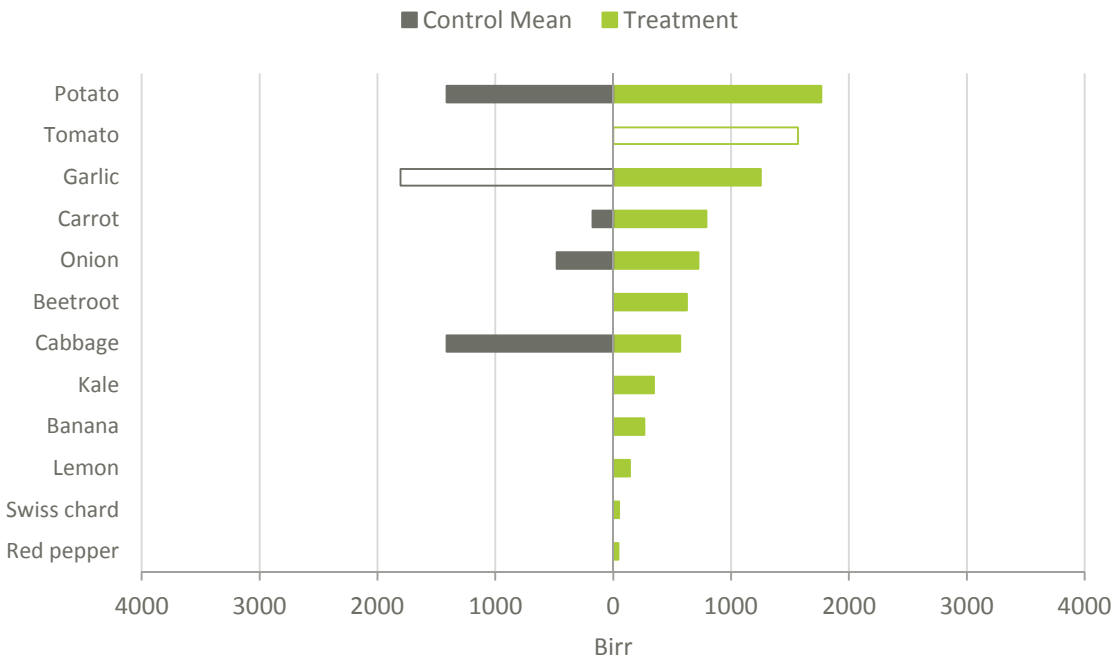


Figure 9: Average irrigated crop revenues at baseline, by experimental group and crop type[10]

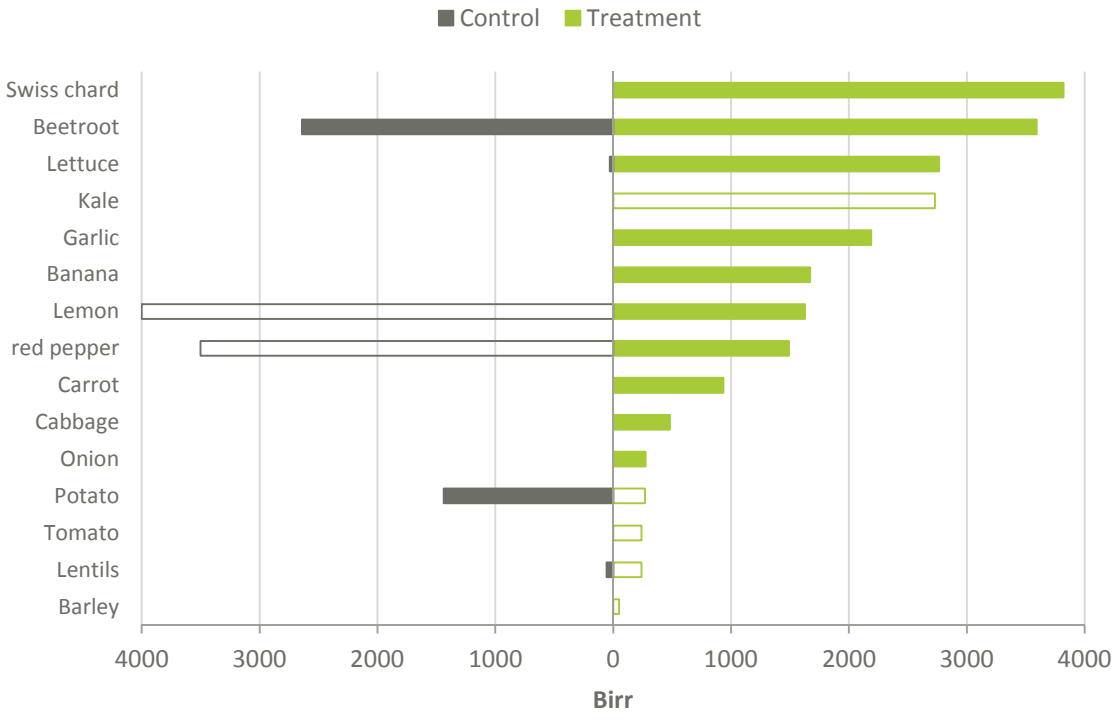


Figure 10: Average irrigated crop revenues at endline, by experimental group and crop type[11]

[10] Crops with fewer than five observations are not filled, and average revenues should be considered suspect.

CROP INPUTS

There were no significant differences between treatment and control groups at baseline for any individual crop input expenditures or for total crop input expenditures.

Table 9: Crop input expenditures in CPI-adjusted Birr, by input type and experimental group

	Treatment		Control	
Product or Service	**Baseline**	**Endline**	**Baseline**	**Endline**
Labour and services	744	694	458	433
Seed & seedlings	188	153	166	149
Seed & seedlings	185	262	235	288
Fertilizers	2,013	2,473	1,538	1,528
Organic fertilizer	44	64	34	30
Pesticides	106	104	110	109
Biological pesticides	0	0	0	0
Rent paid	63	67	130	109
Total Expenditures	3,347	3,831	3,068	2,749

MARKET OUTLETS

In the market outlets and information section of the survey we asked treatment and control households what percentage of their total sales were sold to: traders, consumers, cooperatives and others. There were no significant differences in the proportion of goods being told to each of these entities across time or experimental group.

ON FARM LABOR ALLOCATION

Moving forward, iDE would like to better understand how labour tasks are allocated to male and female members of the household. As the farmer-household becomes more efficient and/or changes their on-farm practices, we would expect men and women to shift responsibilities around. With this in mind, iDE developed a survey module that aims to collect information on whether male or female members are primarily responsible for field preparation, planting, irrigating, weeding, harvesting and selling. Additional evidence from the field also suggests that responsibilities may be allocated to vegetables and staple crops/grains in different ways, but the current survey instrument did not stratify the tasks according to staple crops/ grains versus vegetables.

Figure 11 presents the percentage of households claiming men are primarily responsible, women are primarily responsible or if the task is shared equally. For the most part, the percentage of households claiming women are responsible for a task is consistent across the tasks. This could be due to the number of female respondents in our sample, as we have seen in other evaluations that female respondents claim females are responsible for more tasks than males, and male respondents claim that males are responsible for more tasks than females. For the whole sample, we see that men are primarily responsible for spraying and fertilizing, while marketing and selling, harvesting, sowing/planting and land preparation are shared equally by male and female members of the household.

[11] Crops with fewer than five observations are not filled, and average revenues for these crops should be considered suspect.

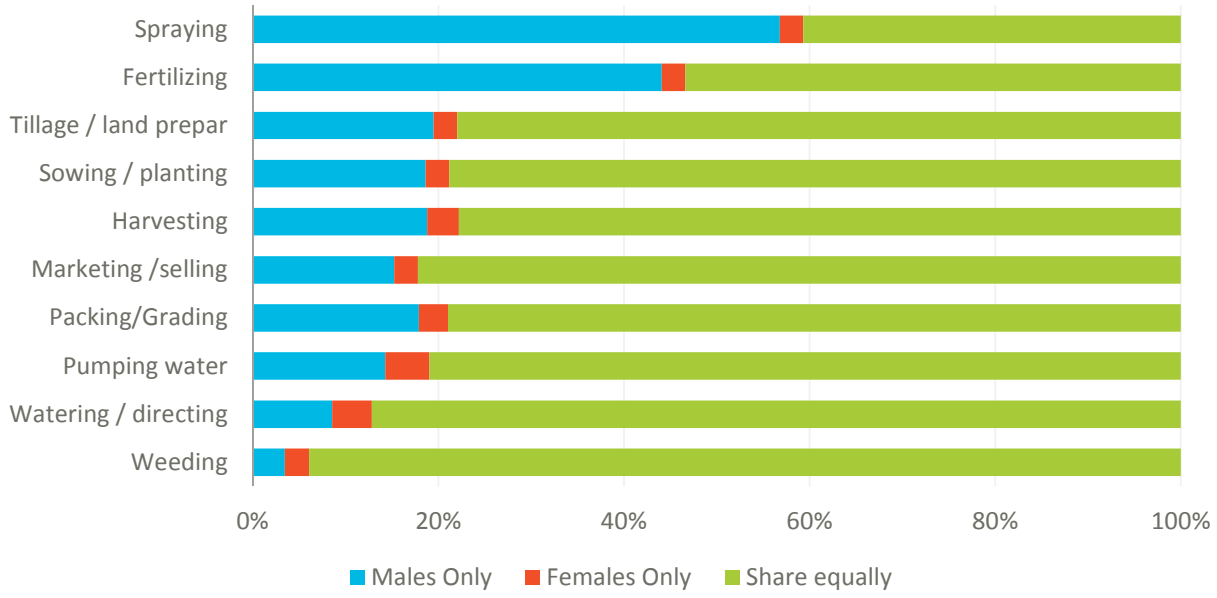


Figure 11: Gender of HH members responsible for farming tasks, full sample

NON-FARM INCOME

In many cases, the household earns additional income from off-farm activities. These could include wages, trading, remittances, etc. Significantly larger treatment-group baseline earnings were found for petty trading and remittances, although the difference in remittances is only equal to $2.

Table 10: Average earnings from non-farm activities in CPI-adjusted Birr, by experimental group

Activity	Treatment	Control	Significant Difference
wages in local smallholder farming	$43	$19	NS
wages in local commercial farming	$1	$0	NS
wages as agricultural service provider	$9	$3	NS
wages in local non-agricultural sectors	$17	$23	NS
other wages	$4	$0	NS
petty trader	$34	$14	*
agro-processing	$0	$0	NS
rent received	$1	$1	NS
remittances within country	$2	$0	*
remittances from outside country	$7	$3	NS
Other Salary	$14	$12	NS
Total	**$133**	**$74**	*

Note: t-test on the equality of means: NS = Not Significant, * = 10%, ** = 5% & ***=1% levels of significance

Although treatment group households earned more money from wages on smallholder farms[12], the difference was not statistically significant. We did, however, find that the total off-farm earnings were significantly greater at 10 percent level of significance for treatment group households at baseline.

Results

The previous section presents a number of relevant descriptive statistics for the treatment and control groups. We present this information for two reasons: first, we can learn a lot about our own programs by seeing how our treatment and control groups compare at baseline and at endline. This information informs future decisions in Ethiopia and supports many of the quantitative data collections, case studies and anecdotal information gathered in the field over the course of the project. Secondly, it is important to test for any significant differences between the experimental groups that are included in our study, so that we can include these differences in our analysis when estimating attributable impacts of the RPI2 program on the key outcome indicators. Evaluation designs will identify a counterfactual group that should, theoretically, be similar to the treatment group in most ways. Any significant differences must be controlled for when estimating treatment effects. All in all, there were very few significant differences between treatment and control groups at baseline – which will allow for a cleaner and simpler analysis.

The provision of services and irrigation technologies to households under the RPI2 project is not determined by randomization, but by standard market access and self-selection. Data have been collected, however, on households in villages where RPI2 is operating and from a matched set of comparison households in nearby, non-RPI2, localities. The dataset design exhibits some of the characteristics of a controlled experiment, in that there are localities and households that have access to technologies and services and some that do not have access, but the decision to adopt is not determined by randomization. Data for the evaluation has been collected at two points in time. Given the overall structure of the dataset, the evaluation design will be referred to as a pretest-posttest-comparison-group quasi-experimental design or a pretest-posttest-nonequivalent-control-group quasi-experimental design.

The impact estimators to be constructed in the data analysis will be propensity score matching (PSM) estimates and regression-model coefficients that are consistent estimators of the double-difference measures of the average treatment effect on the treated (ATET).[13] The latter estimate is a "regression-adjusted (RA)" estimate of the double-difference measure that takes into account the fact that the evaluation design is not an experimental design based on randomized assignment to treatment. We present both the PSM and RA estimates to show that our impact estimates are robust and consistent across the two methods in terms of their magnitude, direction and significance.

IRRIGATED CROP REVENUES

We see positive and robust positive impacts between 2,047-2,079 Birr when using CPI-adjusted Birr and $392-398 USD when using an implied PPP adjustment after the first year of adoption. The results are robust across model specifications and matching estimators and are significant at 1 percent level of significance. These are presented in Table 11.

[12] The question specifically asks for wage/salary labor in local smallholder farming, but we do not know if this was because they were "selling services" or if they were just hired labor.

[13] For each of the impact estimates presented in this section, a number of different selection models were used to test for model-specification bias and/or model sensitivity. All of the impact estimates were robust across multiple model specifications. As such, we have chosen to present the impact estimates from the most theoretically justifiable selection models.

Table 11: Irrigated crop revenue impact estimates in CPI-adjusted Birr, by matching estimator

Matching Estimator	Impact Estimate	Robust Standard Error	Significance
Nearest Neighbor Matching	2,047	393	***
Nearest 3 Neighbors	2,056	392	***
Regression Adjusted	2,079	396	***

Note: NS = Not Significant, * = 10%, ** = 5% & ***=1% levels of significance

Table 12: Irrigated crop revenue impact estimates in USD (ppp), by matching estimator

Matching Estimator	Impact Estimate	Robust Standard Error	Significance
Nearest Neighbor Matching	$392	$75	***
Nearest 3 Neighbors	$394	$75	***
Regression Adjusted	$398	$76	***

Note: NS = Not Significant, * = 10%, ** = 5% & ***=1% levels of significance

We have estimated treatment effects for each Woreda[14], and we see some variance in the impact estimates. All of the Woreda-specific impact estimates were positive and significant. The smallest impacts were in Abichu Guna'a and equaled only 593 Birr ($114) increase in irrigated crop incomes. The largest impacts were in Aleltu and equaled over 5,503 Birr ($1,055).

Table 13: Irrigated crop revenue impact estimates in CPI-adjusted Birr, by Woreda

Woreda	Impact Estimate	Robust Standard Error	Significance
Kore	3,295	654	***
Kofele	3,876	1,088	***
Aleltu	5,503	741	***
Abichu Guna'a	593	105	***

NoteNS = Not Significant, * = 10%, ** = 5% & ***=1% levels of significance=

Table 14: Irrigated crop revenue impact estimates in USD (PPP), by Woreda

Woreda	Impact Estimate	Robust Standard Error	Significance
Kore	$631.52	125.28	***
Kofele	$742.86	208.56	***
Aleltu	$1054.87	142.00	***
Abichu Guna'a	$113.60	20.14	***

Note: NS = Not Significant, * = 10%, ** = 5% & ***=1% levels of significance

Another important stratification tested is whether or not the household used improved seeds over the course of the intervention period, as this can have significant impacts on the efficacy of iDE's technology and service offerings. Not surprisingly, we see very different impact estimates when we stratify our sample by improved seed use (i.e. estimate treatment effects using treatment and control households that use improved seeds and estimate treatment effects using treatment and control households that

[14] We have left Kimbibit out of the Woreda-specific impact estimation because there were not enough treatment observations to estimate treatment effects.

do not use improved seeds). The treatment effect for households that do not use improved seeds is positive and significant and is equal to 788 Birr ($150). The impact on households that do use improved seeds is more than four times larger and is equal to 3,350 Birr ($652). This would suggest that the use of improved seed is a critical component of iDE's program, and should be the starting point of any iDE-Ethiopia program in the future – whether introduced to the farmer by iDE, or another entity.

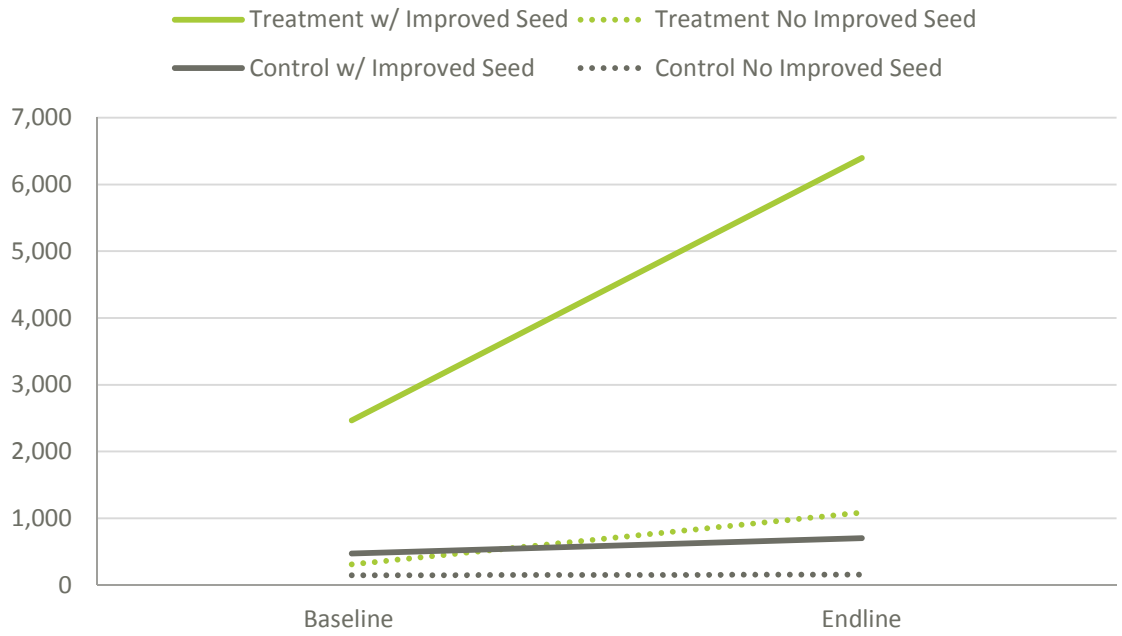


Figure 12: Average irrigated crop income over time in CPI-adjusted Birr, by experimental group and use of improved seed

NON-IRRIGATED CROP REVENUE

The impact estimates for non-irrigated revenue are all positive (622-1,394 Birr), but are not statistically significant. These can be seen in Table 15.

Table 15: Non-irrigated crop revenue impact estimates in CPI-adjusted Birr, by matching estimator

Matching Estimator	Impact Estimate	Robust Standard Error	Significance
Nearest Neighbor Matching	1,394	956	NS
Nearest 3 Neighbors	765	853	NS
Regression Adjusted	622	929	NS

Note: NS = Not Significant, * = 10%, ** = 5% & ***=1% levels of significance

Table 16: Non-irrigated crop revenue impact estimates in USD (PPP), by matching estimator

Matching Estimator	Impact Estimate	Robust Standard Error	Significance
Nearest Neighbor Matching	$267	$183	NS
Nearest 3 Neighbors	$147	$163	NS
Regression Adjusted	$119	$178	NS

Note: NS = Not Significant, * = 10%, ** = 5% & ***=1% levels of significance

When the sample is stratified by Woreda, however, we begin to see statistically significant positive impact estimates for non-irrigated crop income. Similar to the irrigated crop income effects, Aleltu has the largest treatment effect equal to 5,769 Birr ($1,106). Kofele has the smallest positive effect equal to 1,972 Birr ($378). Abichu Guna'a, however, has a large negative impact estimate equal to -3,806 (-$730), but this result is not statistically significant. This suggests that the observations from Abichu Guna'a pull down the ATET for the entire sample making it insignificant. If, however, the observations are excluded from the analysis, we estimate a positive significant effect of 2,834 Birr ($543).[15]

Table 17: Non- irrigated crop revenue impact estimates CPI-adjusted Birr, by Woreda

Woreda - Non-Irrigated	Impact Estimate	Robust Standard Error	Significance
Kore	4,418	1,967	**
Kofele	1,972	1,221	NS
Aleltu	5,769	2,668	**
Abichu Guna'a	-3,806	2,400	NS

Note: NS = Not Significant, * = 10%, ** = 5% & ***=1% levels of significance

Table 18: Non- irrigated crop revenue impact estimates in USD (PPP), by Woreda

Woreda - Non-Irrigated	Impact Estimate	Robust Standard Error	Significance
Kore	$847	377	**
Kofele	$378	234	NS
Aleltu	$1,106	511	**
Abichu Guna'a	-$730	460	NS

Note: NS = Not Significant, * = 10%, ** = 5% & ***=1% levels of significance

Similar to the irrigated crop incomes, we stratified the sample to test the importance of improved seed usage for iDE's impact on non-irrigated crop income after one year of adoption. Impact estimates for iDE households that did not use improved seed over the intervention period, when compared to control households that did not use improved seed, was not statistically significant (i.e., it is not different from zero). For the households that did use improved seed, when compared to control households that also used improved seed, iDE's impact equaled 3,248 Birr ($622).[16] See Figure 12 for the average baseline and endline non-irrigated crop incomes for households using and not using improved seed, before any matching takes place. This would lend further support to the notion that the use of improved seed is of the utmost importance for the iDE offerings to have their intended impact on both irrigated and non-irrigated crop incomes.

[15] This result is significant at 10% level of significance.
[16] This result is significant at 10% level of significance.

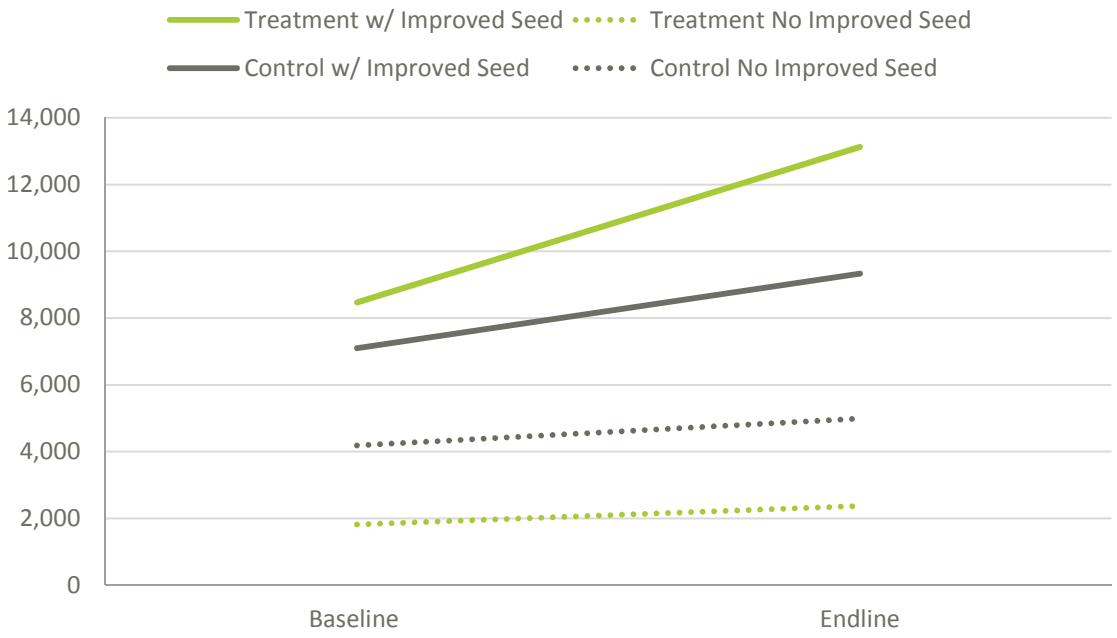


Figure 13: Average non-irrigated crop income over time in CPI-adjusted Birr, by experimental group and use of improved seed

TOTAL CROP REVENUES

Impact Estimates for the total crop revenues are presented in Table 19 and

Table 20. We find positive significant impacts on total crop revenues between 2,700-3,441 Birr ($518-660).

Table 19: Total crop revenue impact estimates in CPI-adjusted Birr, by matching estimator

Matching Estimator	Impact Estimate	Robust Standard Error	Significance
Nearest Neighbor Matching	3,441	1,060	***
Nearest 3 Neighbors	2,820	972	***
Regression Adjusted	2,700	1,029	***

Note: NS = Not Significant, * = 10%, ** = 5% & ***=1% levels of significance

Table 20: Total crop revenue impact estimates in USD (PPP), by matching estimator

Matching Estimator	Impact Estimate	Robust Standard Error	Significance
Nearest Neighbor Matching	$660	$203	***
Nearest 3 Neighbors	$541	$186	***
Regression Adjusted	$518	$197	***

Note: NS = Not Significant, * = 10%, ** = 5% & ***=1% levels of significance

TOTAL CROP PROFITS

We would expect that client farmers spend more on farm inputs than treatment farmers as they scale up their production. Total crop profits are calculated by subtracting all of the crop-level expenditures (i.e., seed costs) and farm-level costs (i.e., fuel, labor, chemicals, fertilizers, etc.) from total crop revenue. Impact estimates for total crop profit are shown in Table 21 and Table 22. In many other cases, we find that the total crop profit impact estimates are smaller than the impacts on total crop revenues. In this case, however, we find that the control group actually spent considerably more on inputs over the intervention period, but they did not experience a proportional increase in crop revenues. Therefore, the total crop profit impact estimates are actually larger in the present case.

Table 21: Total crop profit impact estimates in CPI-adjusted Birr, by matching estimator

Matching Estimator	Impact Estimate	Robust Standard Error	Significance
Nearest Neighbor Matching	3,981	985	***
Nearest 3 Neighbors	3,515	914	***
Regression Adjusted	3,440	1,012	***

Note: NS = Not Significant, * = 10%, ** = 5% & ***=1% levels of significance

Table 22: Total crop profit impact estimates in USD (PPP), by matching estimator

Matching Estimator	Impact Estimate	Robust Standard Error	Significance
Nearest Neighbor Matching	$763	$189	***
Nearest 3 Neighbors	$674	$175	***
Regression Adjusted	$659	$194	***

Note: NS = Not Significant, * = 10%, ** = 5% & ***=1% levels of significance

CROP PRODUCTIVITY

In addition to measuring irrigated crop incomes, iDE is interested in increasing the productivity of its clients. This information is shown in Figure 14 as the change in average productivity for unmatched treatment and control households, for both irrigated and non-irrigated crop productivity.

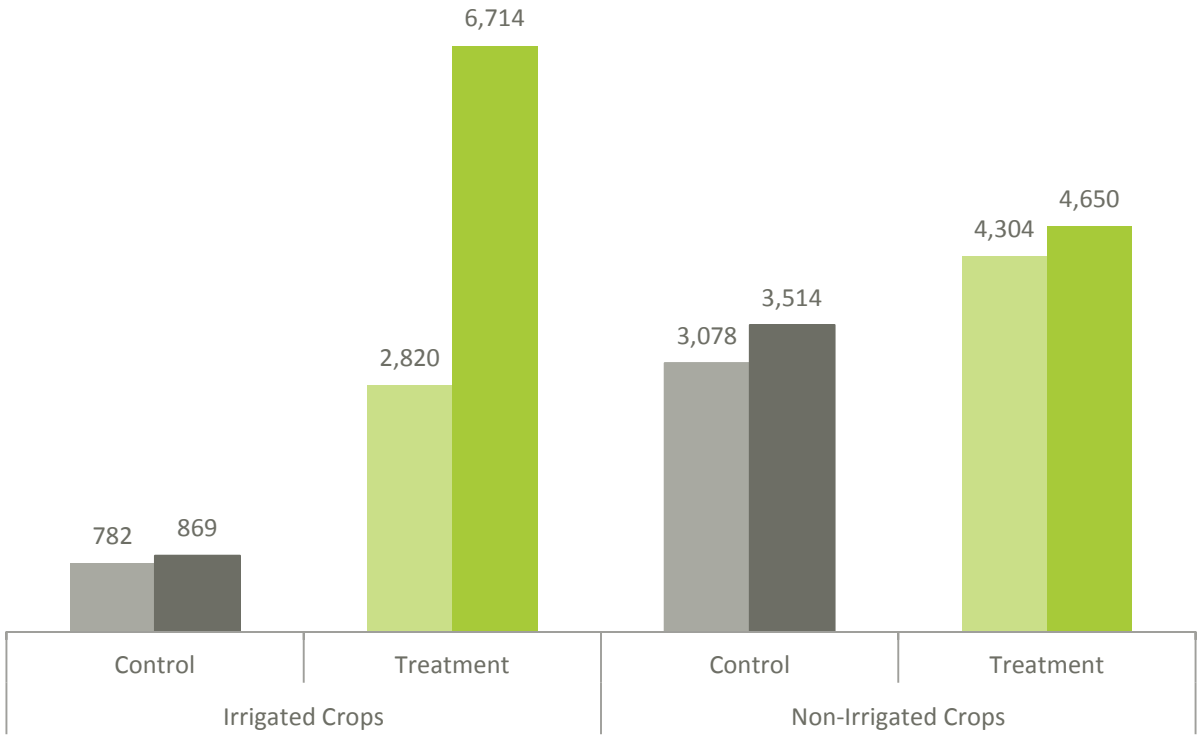


Figure 14: Changes in unmatched irrigated crop and non-irrigated crop production in CPI-adjusted Birr

Using the baseline and endline irrigated and non-irrigated crop productivity estimates, we estimate treatment effects of access to iDE's technologies and services for crop productivity, shown in Table 23. There was a significant impact on irrigated crop productivity over time equal to 3,350 Birr/ha. As for non-irrigated crop productivity, we do not see any significant increases in productivity for iDE farmers. Although the impact estimate is positive, it is not significantly different from zero. This is largely due to large variances found in the productivity indicators.

Table 23: Impact estimates of irrigated and non-irrigated crop productivity in CPI-adjusted Birr/hectare

Crop Type	Impact Estimate	Robust Standard Error	Significance
Irrigated	3,350	2,017	*
Non-Irrigated	28	917	NS

Note: NS = Not Significant, * = 10%, ** = 5% & ***=1% levels of significance

Table 24: Impact estimates of irrigated and non-irrigated crop productivity in CPI adjusted USD/hectare

Crop Type	Impact Estimate	Robust Standard Error	Significance
Irrigated	$642	387	*
Non-Irrigated	$5	176	NS

Note: NS = Not Significant, * = 10%, ** = 5% & ***=1% levels of significance

OFF-FARM INCOME

In previous impact evaluations conducted by iDE, we have found negative significant impacts for off-farm income. This is typically driven by the household shifting labor away from non-farm income opportunities and allocating labor to crop production. For the current evaluation, however, we see small positive impacts on off-farm income. Although the non-farm impacts are always positive, their statistical significance is not as robust and consistent across all three matching estimators. The results are presented below in Table 25 and Table 22.

Table 25: Off-farm income impact estimates in CPI-adjusted Birr, by matching estimator

Matching Estimator	Impact Estimate	Robust Standard Error	Significance
Nearest Neighbor Matching	341	181	*
Nearest 3 Neighbors	371	171	**
Regression Adjusted	287	175	NS

Note: NS = Not Significant, * = 10%, ** = 5% & ***=1% levels of significance

Table 26: Off-farm income impact estimates in USD (PPP), by matching estimator

Matching Estimator	Impact Estimate	Robust Standard Error	Significance
Nearest Neighbor Matching	$65	35	*
Nearest 3 Neighbors	$71	33	**
Regression Adjusted	$55	34	NS

Note: = Not Significant, * = 10%, ** = 5% & ***=1% levels of significance

Conclusion

Across all analyses, we have found consistent evidence of significant impacts of iDE's interventions on cash income from irrigated crop production (the result we would expect to be most closely tied to the nature of iDE's program). This effect appears to be strongly influenced by the use of improved seed varieties, with households using improved seeds experiencing higher gains in income than those that do not use improved seeds in conjunction with the other technologies and services that are being offered by iDE. As with the improved irrigated crop incomes, we see significant improvements in irrigated crop productivity as well.

As for non-irrigated crop incomes, the picture is not as clear. When we estimate impacts for the whole sample, the positive impact on non-irrigated crop incomes is not statistically significant. When we estimate treatment effects for each Woreda, however, we see significant increases in non-irrigated crop incomes for Kore, Kofele and Aleltu, but negative impacts in Abichu Gnua'a that are not statistically significant. As with the irrigated crop income, the effect of access to and adoption of iDE technology and services is much greater for those households that also use improved seed varieties for non-irrigated crop production as well, which suggests that increased adoption of improved seed use is a necessary component for future iDE programs to have their intended impact.

Five-year Impact on RPI1 Woredas

The five-year impact evaluation uses a quasi-experimental design to measure the changes in household income between iDE clients and non-clients over a five year period. This evaluation builds on the Rolling Baseline Surveys (RBS) that were conducted in the original RPI1 project Woredas, including Adami Tulu, Arsi Negelle & Dugda.[17] By conducting follow-up surveys with the first cohort of RBS survey respondents we completed a panel dataset spanning five years for 200 iDE clients and 75 non-clients.

Description of Treatment Group – The treatment group for the five-year impact evaluation is those farmers that completed the 2008 Rolling Baseline Survey. Farmers that completed the 2008 RBS survey adopted an irrigation technology sometime in the 2007 crop year. We followed up with as many of the 200 respondents that completed the 2008 RBS survey as possible. For these clients, we have pre-adoption income/crop production information from 2007 crop year, post-adoption information from the 2008 crop year and post-adoption information from the 2012 crop year.

Description of Control Group – The control group for the five-year impact evaluation were the non-client farmers that completed the 2008 Consumer Characteristics survey (CCS). These farmers were in the same community as the iDE clients included in the 2008 RBS, but did not adopt the technology during the 2007-2008 intervention period. We attempted to follow up with all 75 of the 2008 CCS respondents, giving us income/crop production information for the 2007, 2008 and 2013 crop years.

When we conducted the follow-up survey of the client and non-client households for the five-year follow up, we found that over 50 percent of non-clients in 2008 CCS sample became iDE clients sometime in the past five years. This severely limits our ability to estimate causal impacts for the iDE intervention, because such a significant percentage of our comparison group has self-selected treatment.

Description of Panel Dataset

The 2007/2008 Rolling Baseline Survey contained 200 iDE clients, and the 2007/2008 Consumer Characteristics survey contained 75 non-iDE clients. For the 2013 follow-up survey we were able to interview 166 of the original 275 households, resulting in an attrition rate of 39.6%. See Table 27 for a summary of these figures.

Table 27: Experimental group sizes across time

Experimental Group	2007	2008	2013
Treatment	200	200	128
Control	75	75	38
Total	**275**	**275**	**166**

For the purposes of the following analysis, any comparisons made between 2007 and 2008 will include the full 275 household sample, and components of the analysis that include 2013 will only include the 166 households that are included in all three rounds of the survey (i.e., 2007, 2008, 2012).

[17] The 2008 RBS and CCS survey report is included in Annex 3. In this report, the reader may find descriptive statistics of the original sample, as well as one-year impact estimates.

Evidence of Spill-over

Although we were able to follow up with 38 of the original control group (CCS) households, many of them have self-selected to adopt an iDE irrigation technology over the course of the RPI1 and RPI2 projects. Although this is problematic for the current evaluation, this is a promising finding for iDE and the market-based approach we have taken in Ethiopia. After disengaging from an area we continue to see growth and adoption in iDE technologies and services. Figure 15 the percentage of households in each experimental group that own an irrigation technology over time.

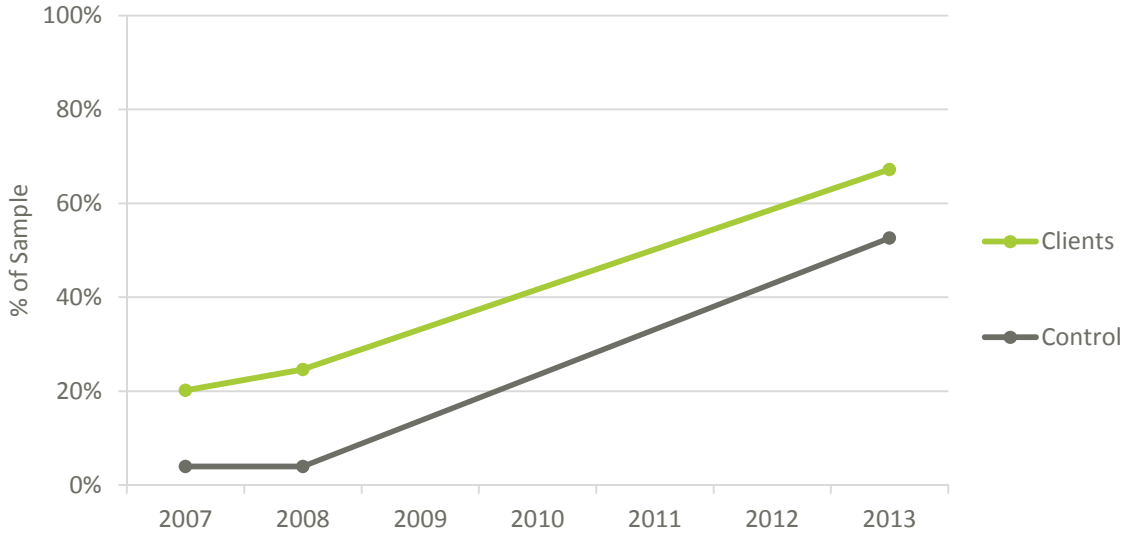


Figure 15: Change in irrigation technology ownership, by experimental group

We see that there are very few irrigation sales in the control group over the initial evaluation. After the initial evaluation in 2008, control-group households began self-selecting (purchasing technology) at a similar rate as the original treatment group. Since there was very little individualized "treatment", the controls were really "treated" households who just hadn't adopted yet. Thus, the fact that overall adoption rates were similar is logical. One would expect a slightly lower rate among controls, since their early non-adoption may generally signal less readiness to invest. By the time the 2013 follow-up survey was conducted, over half of the original control-group households had self-selected an irrigation technology. In many respects, this is not very surprising as the original control group was made up of neighboring households that did not invest in an irrigation technology or set of services over the intervention period. Over time, we expected that there would be significant spillover and that after a couple of profitable crop seasons, many farmers would adopt techniques and technologies that they saw their neighbors using successfully.

When we look at the specific irrigation technologies that are being adopted by the treatment and control households over time, we see that the largest change is found in rope and washer pumps. The control group households did not have any rope and washer pumps ion 2007 and 2008, but by 2013, 29 percent of control-group households invested in a rope and washer pump – and approximately 88 percent of households that own a rope and washer pump in 2013 used it for agricultural purposes. Other large changes were found for large and small diesel pump technologies. Although iDE did not introduce diesel pumps to the market in these communities, iDE did introduce dry-season farming to

many of these areas, and with the decrease in price for diesel pump technologies it is natural to see an increased investment in them.

Table 28: Percent of HHs owning irrigation technology, by experimental group, time and experimental group

Irrigation Tech.	Experimental Group	2007	2008	2013
Treadle Pump	Treatment	3%	5%	11%
	Control	0%	0%	8%
Big Diesel Pump	Treatment	0%	1%	23%
	Control	0%	0%	16%
Micro-Diesel Pump	Treatment	19%	20%	30%
	Control	8%	5%	11%
Rope and Washer Pump	Treatment	1%	3%	20%
	Control	0%	0%	29%
Drip Kit	Treatment	5%	5%	1%
	Control	3%	0%	0%

Farmers are being introduced to more than just irrigation technologies by iDE. We were interested to see how many households adopted advanced agricultural practices over time. We expect to see a similar set of curves for services and practices as what we see for irrigation technologies. Namely, once the initial 2007-2008 evaluation was over, control-group farmers self-selected to access agricultural services and replicated their neighbors in terms of adoption of best agricultural practices.

Table 29: Percent of HHs using various agricultural practices and services over time, by experimental group

Ag. Practice/Service	Experimental Group	2007	2008	Change
Market Information	Treatment	76%	91%	16%
	Control	29%	79%	50%
PMG/Cooperatives	Treatment	84%	74%	-9%
	Control	16%	53%	37%
Selling at Regional Mkt	Treatment	17%	23%	5%
	Control	11%	0%	-11%
Selling at Addis Ababa Mkt	Treatment	29%	24%	-5%
	Control	16%	3%	-13%
Use of Compost	Treatment	42%	61%	18%
	Control	52%	81%	29%
Use of Pesticides	Treatment	80%	63%	-17%
	Control	68%	79%	11%
Use of IPM	Treatment	61%	52%	-9%
	Control	71%	50%	-21%
Chemical Fertilizers	Treatment	71%	62%	-9%
	Control	21%	61%	39%
Use of Manure	Treatment	61%	88%	27%

Ag. Practice/Service	Experimental Group	2007	2008	Change
	Control	58%	76%	18%
Intercropping	Treatment	25%	54%	29%
	Control	11%	29%	18%
Use of Improved Seeds	Treatment	74%	92%	18%
	Control	32%	74%	42%
Utilize Credit Service	Treatment	59%	83%	24%
	Control	34%	66%	32%
Irrigation Training	Treatment	65%	84%	20%
	Control	21%	53%	32%
Crop Production Training	Treatment	56%	87%	30%
	Control	13%	61%	47%
Marketing Training	Treatment	65%	84%	19%
	Control	3%	53%	50%

The pattern among treatment and control households is easily identified in Figure 16.

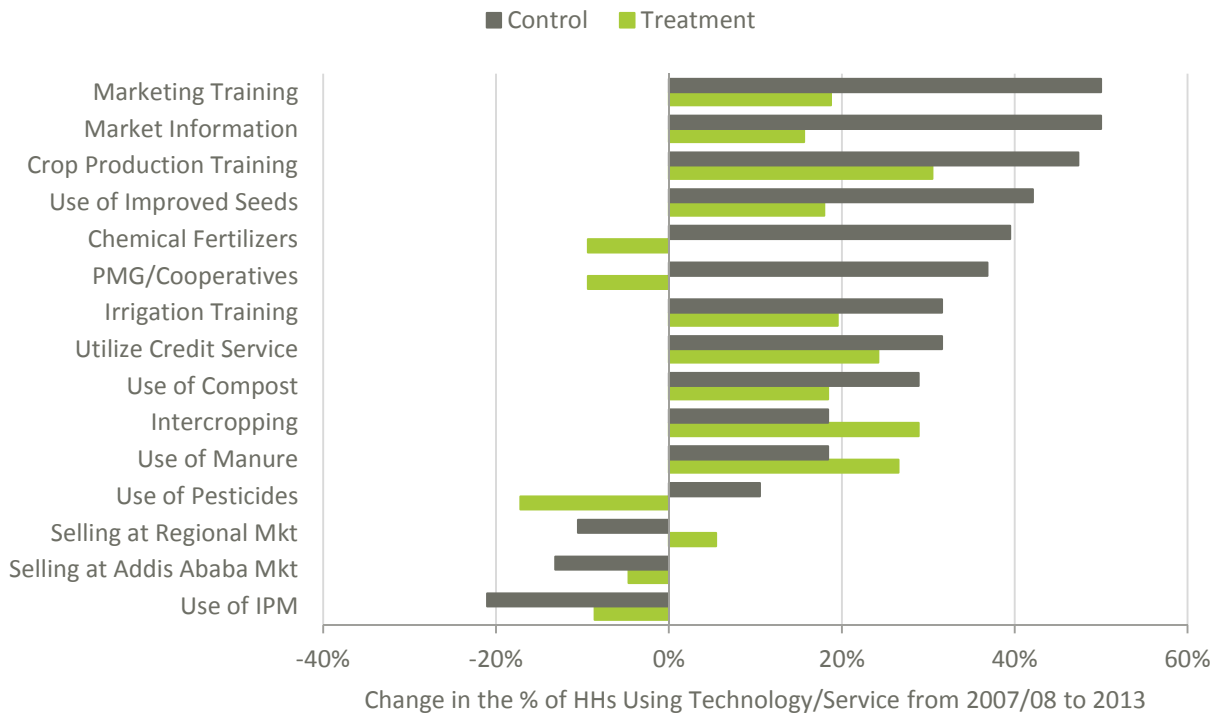


Figure 16: Change in the percent of HHs using technology or service, by experimental group

Not surprisingly, the technologies and services that the control group households adopted the most were the basic trainings that iDE offers on marketing, using market information and crop production. In addition, there was a very large increase in households that used improved seeds and chemical fertilizers, which according to the one-year impact evaluation, presented earlier in this report, are

necessary components for significant income impacts. Interestingly, there was a decrease in the use of integrated pest management and/or organic pesticide use for both the treatment and control farmers over the period of interest.

Income Changes Over Time

The original design of the five-year impact evaluation was to use a quasi-experimental design and conduct ex-post propensity score matching on the treatment and control households. After losing nearly 40 percent of our sample from attrition and discovering that over 50 percent of the remaining control-group households self-selected an irrigation technology, we decided that this approach was not feasible for the current evaluation. Instead, we will be presenting mean incomes and revenues, as well as differences-in-differences estimates, between treatment and control households, households that adopted early versus households that did not adopt a technology over the period of interest, and between households that adopted early (between 2007-2008) versus households that adopted later (between 2008-2013).

Due to the fact that we are making comparisons of crop revenues and income over a large period of time, we present the results using CPI-Adjusted Birr and their PPP-Adjusted US dollar equivalent.[18]

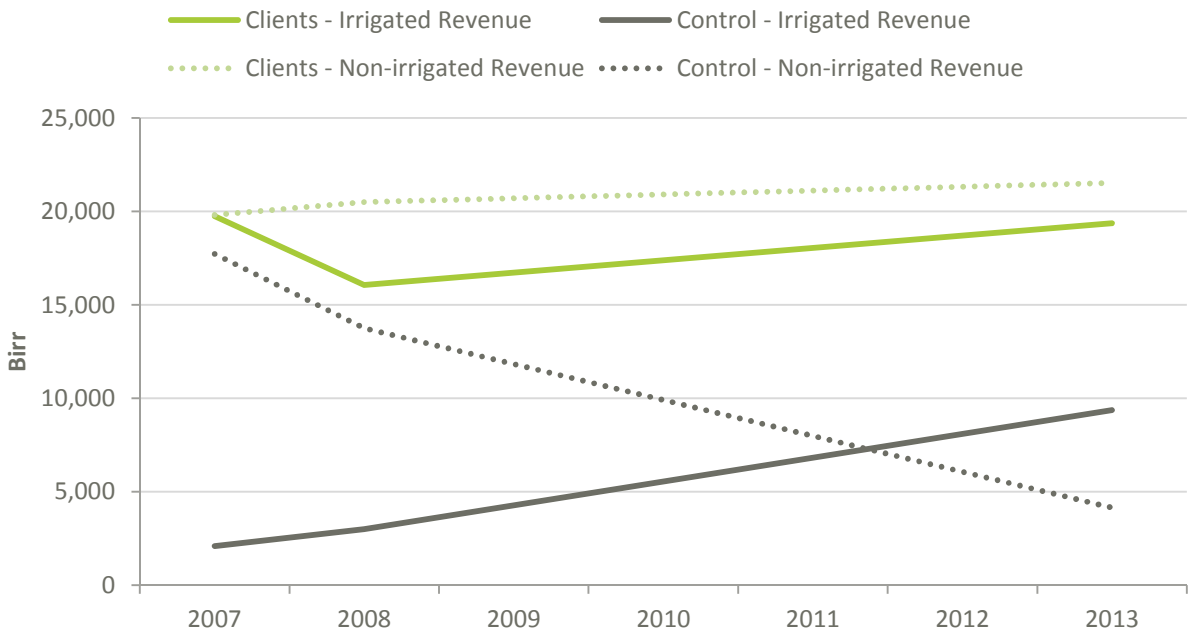


Figure 17: Irrigated and non-irrigated incomes over time in CPI-adjusted Birr

When looking at the experimental groups, without controlling for the adoption of irrigation technologies in Figure 17 we see that the there is a significant difference between non-irrigated average revenues for the treatment farmers and non-irrigated control revenues from control farmers over the entire time period. For the irrigated crop revenues, we see that the control farmers and the treatment farmers grow

[18] PPP Conversion rates are found here: http://www.tradingeconomics.com/Ethiopia/implied-purchasing-power-parity-ppp-conversion-rate-imf-data.html
PPP Conversion Rates for 2013 Birr = 5.217
CPI Conversion Rates: 2007 : 142.08; 2008 : 198; 2013 : 402.6

at a similar rate over time, but that the control farmer began at a lower point than the treated farmer. This indicates that the original experimental design employed for the evaluation in 2007 was inappropriate, as there were baseline differences between treatment and control households prior to the intervention.

We have chosen to use a difference-in-differences estimator to test for significant income impacts over time in the experimental group. In so doing, we have tested for three different income impacts: income impacts occurring over the first year of adoption (2007 vs. 2008); income impacts between treatment and control after the one-year impact evaluation (2007 vs. 2013); and income impacts over the entire five-year RPI1 and RPI2 projects (2007-2013). It is important to note that we have not controlled for self-selection of an irrigation technology or for the adoption of improved agricultural practices by using PSM or regression-adjusted matching estimators. The following estimates are for treatment and control farmers, as they were identified in the 2007-2008 evaluation, which did not prevent them from investing in an irrigation technology or participating in iDE training after the evaluation took place.

Table 30: Difference-in-differences estimates of irrigated and non-irrigated crop revenues, by experimental group and currency type

	Treatment	Control	Diff-in-Diff	Std. Err.	Significance
Irrigated Revenues (CPI-Adjusted Birr)					
2007-2008	-3,696	913	-4,609	4,120	NS
2008-2013	2,656	6,760	-4,104	7,225	NS
2007-2013	-5,655	6,459	-12,114	7,566	NS
Irrigated Revenues in USD (PPP)					
2007-2008	-$708	$175	-$883	$790	NS
2008-2013	$509	$1,296	-$787	$1,385	NS
2007-2013	-$1,084	$1,238	-$2,322	$1,450	NS
Non-Irrigated Revenues (CPI-Adjusted Birr)					
2007-2008	690	-3,963	4,653	2,857	*
2008-2013	3,175	-5,473	8,648	5,873	NS
2007-2013	2,643	-9,326	11,969	6,942	**
Non-Irrigated Revenues in USD (PPP)					
2007-2008	$132	-$760	$892	$548	*
2008-2013	$609	-$1,049	$1,658	$1,126	NS
2007-2013	$507	-$1,788	$2,294	$1,331	**
Total Crop Revenues (CPI-Adjusted Birr)					
2007-2008	-3,006	-3,050	44	5,467	NS
2008-2013	5,832	1,288	4,544	9,175	NS
2007-2013	-3,012	-2,867	-145	1,331	NS
Total Crop Revenues in USD (PPP)					

	Treatment	Control	Diff-in-Diff	Std. Err.	Significance
2007-2008	-$576	-$585	$8	$1,048	NS
2008-2013	$1,118	$247	$871	$1,759	NS
2007-2013	-$577	-$550	-$28	$255	NS
Total Crop Profit (CPI-Adjusted Birr)					
2007-2008	-1,949	-2,733	785	5,455	NS
2008-2013	9,360	588	8,772	8,907	NS
2007-2013	2,523	-3,026	5,549	11,086	NS
Total Crop Profit in USD (PPP)					
2007-2008	-$374	-$524	$150	$1,046	NS
2008-2013	$1,794	$113	$1,682	$1,707	NS
2007-2013	$484	-$580	$1,064	$2,125	NS

Note: t-test on the mean = 0: NS = Not Significant, * = 10%, ** = 5% & ***=1% levels of significance

Somewhat surprisingly, we find that there are no statistically significant impacts when looking at irrigated crop revenues over time. The primary reason for the insignificance in these results is in the very large amount of variance in our difference in difference estimates. Instead, we find that there is a significant difference between treatment and control farmer households in non-irrigated crop revenues for almost two of the three different impact estimates, across both the CPI-adjusted Birr and PPP-adjusted estimates.

As a next step in this analysis, we are interested in understanding whether the actual investment in an irrigation technology leads to increased incomes over time. Similar to the previous set of impact estimates, the impact estimates presented in Table 31 have very high variances. The magnitude and direction of the impacts is what we would expect, and confirms what we have found in qualitative investigations and case studies, but the results are not statistically significant. Nonetheless, we do see that the households that invested in an irrigation technology continue to earn more income than households that did not invest in an irrigation technology. Further, the annual income impact continues to increase over time, as indicated by the red dashed line in Figure 18.

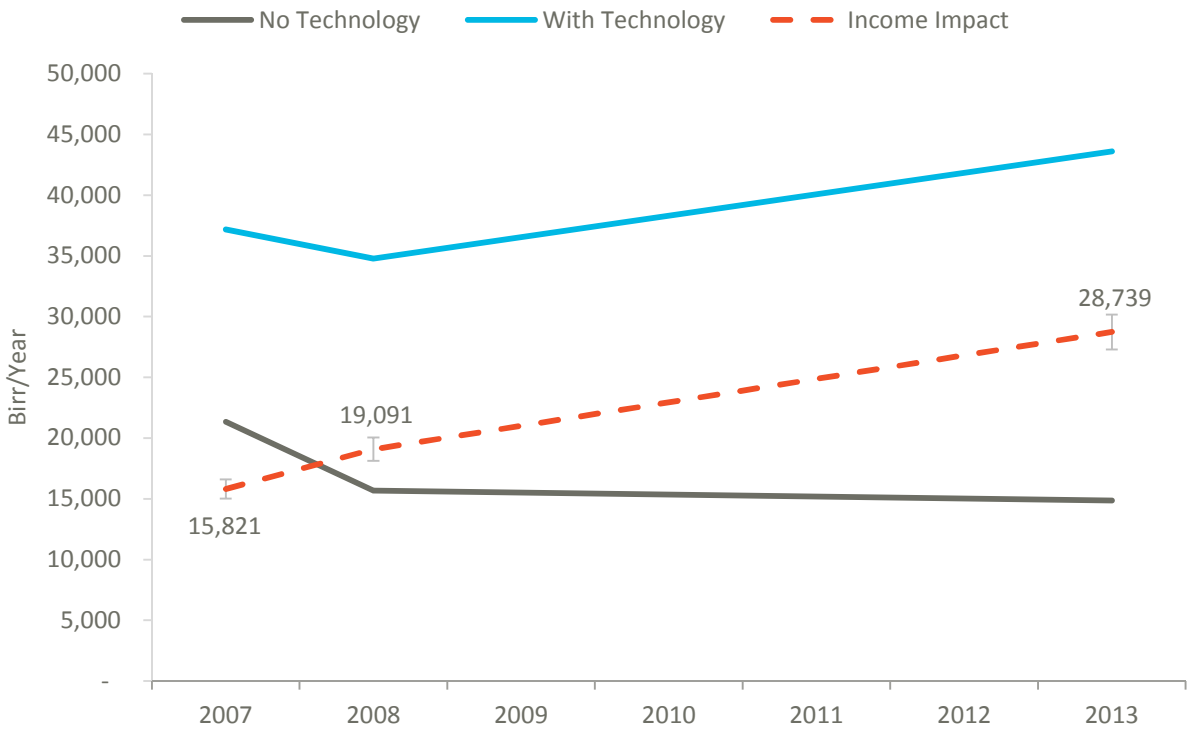


Figure 18: Change in total crop revenues over time in CPI-adjusted Birr, by irrigation technology ownership

Table 31: Difference in differences estimates, by irrigation technology ownership

	Irrigation Tech	No Irrigation Tech	Diff-in-Diff	Std. Err.	Significance
Irrigated Revenues (CPI-Adjusted Birr)					
2007-2008	-1,889	-4,797	2,907	4,694	NS
2008-2013	4,906	724	4,182	6,543	NS
2007-2013	-2,339	-4,072	1,733	6,905	NS
Irrigated Revenues in USD (PPP)					
2007-2008	-$362	-$919	$557	$900	NS
2008-2013	$940	$139	$802	$1,254	NS
2007-2013	-$448	-$781	$332	$1,324	NS
Non-Irrigated Revenues (CPI-Adjusted Birr)					
2007-2008	-510	-874	363	3,265	NS
2008-2013	2,449	-1,551	4,000	5,346	NS
2007-2013	965	-2,425	3,390	6,339	NS
Non-Irrigated Revenues in USD (PPP)					
2007-2008	-$98	-$167	$70	$626	NS

	Irrigation Tech	No Irrigation Tech	Diff-in-Diff	Std. Err.	Significance
2008-2013	$469	-$297	$767	$1,025	NS
2007-2013	$185	-$465	$650	$1,215	NS
Total Crop Revenues (CPI-Adjusted Birr)					
2007-2008	-2,400	-5,670	3,270	6,215	NS
2008-2013	7,354	-827	8,181	8,293	NS
2007-2013	-1,374	-6,497	5,123	10,363	NS
Total Crop Revenues in USD (PPP)					
2007-2008	-$460	-$1,087	$627	$1,191	NS
2008-2013	$1,410	-$159	$1,568	$1,590	NS
2007-2013	-$263	-$1,245	$982	$1,986	NS
Total Crop Profit (CPI-Adjusted Birr)					
2007-2008	-1,574	-4,689	3,115	6,202	NS
2008-2013	10,424	618	9,805	8,056	NS
2007-2013	3,681	-4,070	7,752	10,031	NS
Total Crop Profit in USD (PPP)					
2007-2008	-$302	-$899	$597	$1,189	NS
2008-2013	$1,998	$119	$1,879	$1,544	NS
2007-2013	$706	-$780	$1,486	$1,923	NS

Note: t-test on the mean = 0: NS = Not Significant, * = 10%, ** = 5% & ***=1% levels of significance

We conducted a similar set of analyses by comparing households that chose to use an improved agronomic practice and/or improved seeds over the evaluation period with those households that did not use an improved practice. Due to the limited sample size and the large variances in our impact estimates, we did not see any significant impacts in the positive or negative direction for any of the impact estimates. However, with a larger sample size, we would expect to see a significant difference between these households.

Annex 1: Crop Level Analysis

Table 32: Baseline non-irrigated crop level analysis, by crop type and experimental group

Crop	# of Households	Area (Ha)	Total Quantity (kg)	Price per kg	Crop Revenue (Birr)
Banana	**15**	**0.18**	**1,220**	**2.8**	**3,351**
Control	1	0.00	0	0.0	0
Treated	14	0.20	1,307	3.0	3,590
Barley	**250**	**0.64**	**952**	**6.1**	**2,048**
Control	78	0.60	937	5.7	1,748
Treated	172	0.66	958	6.3	2,182
Beetroot	**3**	**0.13**	**350**	**1.0**	**550**
Control	1	0.13	50	1.3	0
Treated	2		500	0.8	825
Cabbage	**16**	**0.15**	**2,200**	**0.8**	**1,639**
Control	5	0.15	1,660	0.4	528
Treated	11		2,445	0.9	1,972
Carrot	**3**		**1,633**	**2.8**	**1,788**
Treated	3		1,633	2.8	1,788
Chick pea	**24**	**0.30**	**317**	**4.7**	**1,518**
Control	10	0.38	400	4.7	1,472
Treated	14	0.25	257	4.8	1,552
Enset	**18**	**0.47**	**271**	**2.5**	**307**
Control	8	0.31	365	2.2	660
Treated	10	0.59	196	2.7	72
Faba bean	**149**	**0.44**	**292**	**7.2**	**494**
Control	51	0.56	415	7.7	669
Treated	98	0.38	228	7.0	404
Fenugreek	**1**	**1.00**	**800**	**6.6**	**4,224**
Treated	1	1.00	800	6.6	4,224
Field pea	**20**	**0.26**	**365**	**6.5**	**310**
Control	4	0.09	75	4.1	275
Treated	16	0.30	438	7.0	319
Lemon	**1**		**200**	**14.3**	**2,860**
Treated	1		200	14.3	2,860
Lentils	**40**	**0.63**	**476**	**13.7**	**5,686**
Control	22	0.68	495	11.6	5,489
Treated	18	0.58	453	16.1	5,927
Lettuce	**1**	**0.50**	**250**	**3.3**	**0**
Treated	1	0.50	250	3.3	0
Linseed	**22**	**0.25**	**275**	**5.8**	**1,448**
Control	4	0.19	100	5.0	539
Treated	18	0.26	314	6.0	1,650
Maize	**48**	**0.33**	**583**	**4.0**	**1,341**

Control	15	0.32	467	3.9	696
Treated	33	0.34	636	4.0	1,634
Oats	**11**	**0.26**	**250**	**5.9**	**83**
Control	3	0.42	450	4.9	183
Treated	8	0.20	175	6.3	46
Onion	**6**	**0.13**	**500**	**3.9**	**1,218**
Control	4	0.13	600	3.4	1,007
Treated	2		300	5.0	1,430
Peanut	**1**	**0.00**	**0**	**0.0**	**0**
Treated	1	0.00	0	0.0	0
Potato	**59**	**0.39**	**3,161**	**1.4**	**3,104**
Control	26	0.39	2,719	1.5	2,688
Treated	33		3,509	1.3	3,390
Shallot	**12**	**0.75**	**375**	**3.7**	**0**
Control	3	0.50	100	2.2	0
Treated	9	0.83	467	4.2	0
Sorghum	**1**	**0.13**	**150**	**9.4**	**0**
Treated	1	0.13	150	9.4	0
Soya bean	**6**	**0.34**	**217**	**6.1**	**559**
Control	2	0.63	400	3.3	0
Treated	4	0.20	125	7.6	839
Sunflower	**1**	**0.25**	**200**	**14.3**	**0**
Treated	1	0.25	200	14.3	0
Teff	**105**	**0.57**	**367**	**10.2**	**1,296**
Control	35	0.64	509	9.9	2,367
Treated	70	0.54	296	10.3	761
Tomato	**2**	**0.19**	**1,500**	**4.4**	**4,400**
Treated	2	0.19	1,500	4.4	4,400
Vetch	**4**	**0.56**	**450**	**5.1**	**894**
Control	4	0.56	450	5.1	894
Wheat	**151**	**0.54**	**543**	**7.6**	**1,055**
Control	59	0.68	673	7.7	1,403
Treated	92	0.46	460	7.5	831
Wild oats	**49**	**0.51**	**315**	**3.5**	**56**
Control	9	0.19	189	3.5	242
Treated	40	0.58	344	3.5	14

Table 33: Endline non-irrigated crop level analysis, by crop type and group

experimental

Row Labels	# of Households	Area (Ha)	Total Quantity (kg)	Price per kg	Crop Revenue (Birr)
Banana	**15**	**0**	**1,973**	**3.3**	**6,325**
Control	1	0	0	4.0	
Treated	14	0	2,114	3.2	6,325
Barley	**250**	**1**	**1,154**	**6.9**	**2,620**
Control	78	1	1,040	6.3	2,075
Treated	172	1	1,206	7.1	2,859
Beetroot	**3**	**0**	**267**	**0.9**	**160**
Control	1	0	400	1.4	0
Treated	2		200	0.6	240
Cabbage	**16**	**0**	**2,269**	**1.3**	**4,042**
Control	5	0	1,280	0.5	300
Treated	11		2,718	1.7	5,063
Carrot	**3**		**1,800**	**5.5**	**11,133**
Treated	3		1,800	5.5	11,133
Chick pea	**24**	**0**	**504**	**8.3**	**2,981**
Control	10	1	565	8.0	2,546
Treated	14	0	461	8.4	3,343
Enset	**18**	**0**	**288**	**2.5**	**38**
Control	8	0	428	2.2	0
Treated	10	1	176	2.8	47
Faba bean	**149**	**0**	**405**	**8.4**	**660**
Control	51	1	529	8.2	1,019
Treated	98	0	341	8.5	477
Fenugreek	**1**	**1**	**400**	**8.0**	
Treated	1	1	400	8.0	
Field pea	**20**	**0**	**450**	**6.9**	**1,008**
Control	4	0	75	4.5	0
Treated	16	0	544	7.5	1,276
Lemon	**1**		**200**	**16.0**	**3,200**
Treated	1		200	16.0	3,200
Lentils	**40**	**1**	**621**	**14.2**	**9,002**
Control	22	1	661	15.0	8,456
Treated	18	1	572	13.3	9,676
Lettuce	**1**	**1**	**500**	**4.0**	**0**
Treated	1	1	500	4.0	0
Linseed	**22**	**0**	**330**	**6.9**	**2,512**
Control	4	1	225	7.0	2,000
Treated	18	0	353	6.9	2,633
Maize	**48**	**0**	**783**	**4.8**	**786**
Control	15	0	493	4.6	182

Treated	33	0	915	4.9	1,061
Oats	**11**	**0**	**305**	**7.6**	**480**
Control	3	0	400	6.0	1,600
Treated	8	0	269	8.3	60
Onion	**6**	**0**	**467**	**5.0**	**1,580**
Control	4	0	550	4.0	960
Treated	2		300	7.0	2,200
Peanut	**1**	**0**	**100**	**10.0**	
Treated	1	0	100	10.0	
Potato	**59**	**0**	**2,909**	**1.6**	**3,860**
Control	26	0	2,288	1.4	1,978
Treated	33		3,379	1.8	4,977
Shallot	**12**	**1**	**663**	**5.6**	**48**
Control	3	1	867	5.0	100
Treated	9	1	594	5.8	31
Sorghum	**1**	**0**	**300**	**9.0**	**0**
Treated	1	0	300	9.0	0
Soya bean	**6**	**1**	**450**	**9.0**	**1,633**
Control	2	1	750	7.0	0
Treated	4	0	300	10.0	2,450
Sunflower	**1**	**0**	**200**	**13.0**	**0**
Treated	1	0	200	13.0	0
Teff	**105**	**1**	**530**	**12.8**	**2,183**
Control	35	1	585	12.3	3,339
Treated	70	1	502	13.0	1,639
Tomato	**2**	**0**	**1,850**	**6.0**	**9,650**
Treated	2	0	1,850	6.0	9,650
Vetch	**4**	**0**	**375**	**12.0**	**1,680**
Control	4	0	375	12.0	1,680
Wheat	**151**	**1**	**723**	**8.5**	**1,752**
Control	59	1	781	8.0	2,222
Treated	92	1	687	8.7	1,446
Wild oats	**49**	**1**	**545**	**5.1**	**400**
Control	9	0	533	5.6	634
Treated	40	1	548	5.0	355

Table 34: Baseline irrigated crop level analysis, by crop type and experimental group

Row Labels	# of Households	Area (Ha)	Total Quantity (kg)	Price per kg	Crop Revenue (Birr)
Banana	**1**	**0.06**	**400**	**3.3**	**264**
Treated	1	0.06	400	3.3	264
Barley	**7**	**0.25**	**336**	**6.0**	**0**
Treated	7	0.25	336	6.0	0
Beetroot	**38**	**0.01**	**534**	**0.9**	**608**
Control	2	0.00	0	0.6	0
Treated	36	0.01	549	0.9	624
Cabbage	**86**	**0.11**	**654**	**1.1**	**648**
Control	8	0.23	725	3.2	1,413
Treated	78	0.09	647	0.9	569
Carrot	**51**	**0.01**	**338**	**1.7**	**767**
Control	2	0.08	75	4.4	176
Treated	49	0.00	349	1.6	791
Chick pea	**1**	**0.13**	**50**	**9.9**	**0**
Treated	1	0.13	50	9.9	0
Faba bean	**2**	**0.19**	**25**	**8.8**	**0**
Treated	2	0.19	25	8.8	0
Garlic	**20**	**0.14**	**145**	**7.5**	**1,335**
Control	3	0.68	333	14.3	1,804
Treated	17	0.05	112	6.3	1,252
Green/ red pepper	**5**	**0.01**	**30**	**4.0**	**28**
Control	2	0.01	25	2.8	0
Treated	3	0.00	33	4.8	46
Kale	**14**		**1,014**	**0.7**	**345**
Treated	14		1,014	0.7	345
Lemon	**1**		**10**	**14.3**	**143**
Treated	1		10	14.3	143
Lentils	**3**	**0.00**	**0**	**0.0**	**0**
Control	1	0.00	0	0.0	0
Treated	2	0.00	0	0.0	0
Lettuce	**9**	**0.03**	**150**	**0.7**	**0**
Treated	9	0.03	150	0.7	0
Linseed	**1**	**0.00**	**0**	**0.0**	**0**
Control	1	0.00	0	0.0	0
Onion	**109**	**0.09**	**138**	**2.6**	**708**
Control	7	0.20	114	3.8	479
Treated	102	0.08	139	2.5	724
Potato	**33**	**0.09**	**1,030**	**1.6**	**1,713**
Control	5	0.11	480	1.4	1,412
Treated	28	0.09	1,129	1.6	1,767

Rape seed	**1**	**0.13**	**400**	**6.6**	**2,376**
Control	1	0.13	400	6.6	2,376
Shallot	**2**	**0.28**	**150**	**3.6**	**0**
Treated	2	0.28	150	3.6	0
Swiss chard	**11**	**0.08**	**248**	**0.9**	**50**
Treated	11	0.08	248	0.9	50
Tomato	**3**	**0.01**	**333**	**2.9**	**1,045**
Control	1	0.00	0	0.0	0
Treated	2	0.02	500	4.4	1,568
Wheat	**1**	**0.25**	**50**	**8.8**	**0**
Treated	1	0.25	50	8.8	0

Table 35: Endline irrigated crop level analysis, by crop type and experimental group

	# of Households	Area (Ha)	Total Quantity (kg)	Price per kg	Crop Revenue (Birr)
Banana	**1**	**0.06**	**400**	**3.0**	**240**
Treated	1	0.06	400	3.0	240
Barley	**7**	**0.29**	**500**	**7.2**	**276**
Treated	7	0.29	500	7.2	276
Beetroot	**38**	**0.18**	**806**	**2.4**	**1,460**
Control	2	0.04	505	2.9	902
Treated	36	0.20	823	2.4	1,491
Cabbage	**86**	**0.20**	**1,119**	**2.4**	**1,651**
Control	8	0.21	854	3.1	1,439
Treated	78	0.20	1,146	2.4	1,671
Carrot	**51**	**0.16**	**702**	**4.2**	**3,520**
Control	2	0.01	10	2.0	0
Treated	49	0.19	730	4.3	3,594
Chick pea	**1**	**0.25**	**100**	**10.0**	**0**
Treated	1	0.25	100	10.0	0
Faba bean	**2**	**0.13**	**50**	**5.0**	**0**
Treated	2	0.13	50	5.0	0
Garlic	**20**	**0.23**	**208**	**11.4**	**2,848**
Control	3	0.71	367	15.7	3,500
Treated	17	0.14	180	10.6	2,766
Green/ red pepper	**5**	**0.02**	**70**	**7.6**	**135**
Control	2	0.04	50	7.0	30
Treated	3	0.01	83	8.0	240
Kale	**14**		**1,157**	**0.7**	**481**
Treated	14		1,157	0.7	481
Lemon	**1**		**15**	**18.0**	**270**
Treated	1		15	18.0	270
Lentils	**3**	**0.46**	**367**	**12.0**	**3,153**
Control	1	0.13	500	10.0	4,000
Treated	2	0.63	300	13.0	2,730
Lettuce	**9**	**0.18**	**400**	**4.7**	**1,952**
Treated	9	0.18	400	4.7	1,952
Linseed	**1**	**0.50**	**300**	**10.0**	**3,000**
Control	1	0.50	300	10.0	3,000
Onion	**109**	**0.74**	**272**	**7.1**	**1,534**
Control	7	7.36	253	4.8	57
Treated	102	0.21	273	7.3	1,627
Potato	**33**	**0.28**	**1,903**	**3.4**	**3,638**
Control	5	0.35	880	4.2	2,640
Treated	28	0.26	2,086	3.3	3,822

Rape seed	**1**	**0.13**	**300**	**6.0**	**1,620**
Control	1	0.13	300	6.0	1,620
Shallot	**2**	**0.03**	**250**	**2.0**	**0**
Treated	2	0.03	250	2.0	0
Swiss chard	**11**	**0.21**	**468**	**3.5**	**935**
Treated	11	0.21	468	3.5	935
Tomato	**3**	**0.11**	**437**	**7.0**	**2,969**
Control	1	0.01	10	8.0	8
Treated	2	0.16	650	6.5	4,450
Wheat	**1**	**0.00**	**0**	**9.5**	**0**
Treated	1	0.00	0	9.5	0

Annex 2: Survey Instrument

Ethiopia: survey (version 2013.v01)

1a Farm identification and interview

Household code	_ ET__ __ __ __ __
Name household head (see also 2a)	
Registration date of HH as adopter	_ _/_ _/_ _ (DD/MM/YY)
Date of interview	_ _/_ _/_ _ (DD/MM/YY)
Name of enumerator	
Name person(s) interviewed	(Male/Female/Both)
2013* 2012*	1-Nov-2012 - 31-Oct-2013 ➔ **2013*** 1-Nov-2011 - 31-Oct-2012 ➔ **2012*** * indicates **agricultural year** as opposed to calendar year
To be done by supervisor Survey purpose: **CCS** / **RBS** [ ] unreliable 2012* income data explanation:	Location identifiers Region : Woreda (District) : Kebele (Village) : Phone Numbers: _____ Coordinates: ……..ºN, . ……. ºE Distance to the most relevant market: . . . . km (…….. Hrs) (where you sell most of your produce during in dry season, in value)

2 Household

2a Household heads

#	Full name	Gender (M/F)	Age	Relation to HHH	Education no. of years (level ①)
1				*Household head*	
2				*Spouse*	
3				*Main Participant in the SPI Program*	

2b Household composition

	No. of men	No. of women	total
> 50 years			
15- 49 years			
5- 14 years			
< 5 years			
Check total>>			

① Checklist for table 2a: Education levels
- Illiterate (0 years)
- Informal (adult literacy) (1 year)
- Primary (grade 1-6)
- Junior secondary (grade 7-8)
- Senior Secondary (grade 9-12)
- Tertiary (13-17)

3 Land and irrigation

								2012*	2013*
#	Land having as source a ..	Ownership of land (see list)	Reliability of water source (no. months)	Depth of water (meters)	Distance to water source (meters)	Control of water source (see list)	Unit of area	Area	Area
1	Rainfed								
2	River								
3	Pond								
4	Well								
5	Borehole								
6	Lake								
7									
8									
9									
10									
							Total >>	①	②
	Options: • Rainfed • River • Pond • Well • Bore hole • Lake/dam • Harvested rain water • Spring	**Options:** • Owned • Rented/ borrowed • Rented out/lent out	Months per year (max 12)		Put zero (0) if on land unit	• LL: local leadership • FA: farmer group • HH: household /self • NC: Not controlled	Area Measure as reported by farmer, e.g. hectare, m^2, $yard^2$ Same for both years.		

Guiding questions form 3

1) What was the **total size of your land** in 2012* and in 2013* (fill out the Totals for both years at ① and ②)
2) How much of that total land **can not be irrigated?** (enter information on line #1 rainfed)
3) Do you use a **single source of water** for irrigation?
    a. **YES >>**
    What is the **source of water** for the irrigated land (complete the information on the appropriate line) (go to 4)
    b. **NO >>**
    Are the different water sources used to irrigate the same piece of land?
        i. **YES >>**
        enter information for the main (most reliable) source of water on the appropriate line, ignore the other source. (go to 4)
        ii. **NO >>**
        enter the information for both (or more) sources on the appropriate lines. Take care that you are describing separate (not overlapping) tracks of land. (go to 4)
4) Check that the land recorded in the 2012* and 2013* columns is equal to the total amount of land from question 1). If not; try to find out why.

4 Equipment & assets

Equipment type	Total number items	Number of items of purchased	
		2012*	2013*
Irrigation equipment			
River type treadle pump			
Suction only treadle pump			
Big diesel pump			
Micro diesel pump			
Rope and washer pump			
Drip kit	. . . m^2	. . . m^2	. . . m^2
Watering can			
Bucket (20 l)			
Pipes (plastic – lay flat)	. . metres	. . metres	. . metres
Pipes (plastic – high density)	. . metres	. . metres	. . metres
Pipes (metal)	. . metres	. . metres	. . metres
Drum/barrel (plastic)			
Drum/barrel (metal)			
Farming equipment			
Plough (oxen)			
Donkey cart			
Wheelbarrow			
Knapsack Sprayer			
Maize sheller			
Grinding mill (motorized)			
Shovel			
BBM (Broad Bed Maker)			
Miscellaneous			
Bee hives			
Generator			
Bicycle			
Motor bike			
Radio			
TV set			
Cell phone			
Iron sheet roof	. . . . Sheet	. . . . Sheet	. . . . Sheet

Notes:

- *Include only items that are owned by the household (in part or whole).*
- *When an equipment is communally owned then the household owns a fraction of the equipment (for example: a pump owned by 4 other households results in 1/5 partial ownership)*
- *the list was trimmed by removing everything of less than 100 Birr (~10 USD) that was not for irrigation, processing or luxury (i.e most basic generic farm tools were removed).*
- *Count the assets towards the agricultural year when they were used (e.g. e.g drip kit purchased in 2012* but only used in 2013* irrigated season counts towards 2013*).*

5 Technology/service adoption and use *[AQ 5a]*

				C: Adoption facilitated by						
	Technologies/Services	**A:** Did you apply this technology in 2012 or 2013? Yes No	**B: Year of first use?**	IDE	Other NGO *(not allied to IDE)*	*farmers' organisation*	*government agencies/local authorities/extension services*	*neighbours or family*	*others (e.g. traders, traditional practice)*	**D: Use it again in and recommend it to others?** Yes No
Market linkages	Market information	O O		☐	☐	☐	☐	☐	☐	O O
	PMG/Cooperatives/WUA	O O		☐	☐	☐	☐	☐	☐	O O
	Market outlet-District	O O		☐	☐	☐	☐	☐	☐	O O
	Market outlet-Regional	O O		☐	☐	☐	☐	☐	☐	O O
	Market outlet-Addis Ababa	O O		☐	☐	☐	☐	☐	☐	O O
Agricultural practices	Use of compost	O O		☐	☐	☐	☐	☐	☐	O O
	Pesticides	O O		☐	☐	☐	☐	☐	☐	O O
	Cultural control/Organic pesticides /IPM	O O		☐	☐	☐	☐	☐	☐	O O
	Off season production	O O		☐	☐	☐	☐	☐	☐	O O
	Chemical fertilizers	O O		☐	☐	☐	☐	☐	☐	O O
	Use of manure	O O		☐	☐	☐	☐	☐	☐	O O
	Intercropping	O O		☐	☐	☐	☐	☐	☐	O O
Impr. Seeds	Improved seeds	O O		☐	☐	☐	☐	☐	☐	O O
Irrigation	Treadle pump (SOTP or River)	O O		☐	☐	☐	☐	☐	☐	O O
	Drip system	O O		☐	☐	☐	☐	☐	☐	O O
	Motorized pump – small	O O		☐	☐	☐	☐	☐	☐	O O
	Motorized pump – large	O O		☐	☐	☐	☐	☐	☐	O O
	Rope and washer pump	O O		☐	☐	☐	☐	☐	☐	O O
	Water tank/container/mod. Thai Jar	O O		☐	☐	☐	☐	☐	☐	O O
	Water reservoir/pond	O O		☐	☐	☐	☐	☐	☐	O O
Business support services	Credit services/Group saving	O O		☐	☐	☐	☐	☐	☐	O O
	Training irrigation practices	O O		☐	☐	☐	☐	☐	☐	O O
	Training crop production practices	O O		☐	☐	☐	☐	☐	☐	O O
	Output marketing training	O O		☐	☐	☐	☐	☐	☐	O O

- *Relate to the information in tables 3,4 (the presence of certain irrigation technologies and equipments) to skip the non-relevant items in this table.*
- *B: In use since: put "2000" if in use since long time.*

6 Crop production

(6a) Cropping pattern and (6c) crop production for human consumption and sales

		← 2012*					→	← 2013*					→
		Area planted	Harvest →					Area planted	Harvest →				
Crop	grown exclusively by..	Share crop (tick for yes)	Area planted (amount and unit)	Total Quantity produced (Amount and measure)	Price per measure (in Birr)	Total sales(in Birr)	% sold	Share crop (tick for yes)	Area planted (amount and unit)	Total Quantity produced (Amount and measure)	Price per unit/ measure (in Birr)	Total Sales (in Birr)	% sold
Irrigated													
		☐					%	☐					%
		☐					%	☐					%
		☐					%	☐					%
		☐					%	☐					%
		☐					%	☐					%
		☐					%	☐					%
		☐					%	☐					%
		☐					%	☐					%
		☐					%	☐					%
		☐					%	☐					%
Non-irrigated													
		☐					%	☐					%
		☐					%	☐					%
		☐					%	☐					%
		☐					%	☐					%
		☐					%	☐					%
		☐					%	☐					%
		☐					%	☐					%
		☐					%	☐					%
		☐					%	☐					%
		☐					%	☐					%
Note to data-entry → 6a	6a		6a	6c	6c		6c		6a	6c	6c		6c
•	M: men F: women only X: not exclusively /whole family		As reported by farmer, e.g. lima, acre, hectare, m^2, $yard^2$ Same for both years.						To be reported in same unit as same crop (line) in previous year				

- List irrigated crops and non-irrigated crops that were planted on this farm in 2012* and/or 2013*

- Ignore any crops grown on less than **20 m2**
- Support irrigation counts as irrigated crop
- Area planted is the cumulated area (if tomatoes is grown twice a year on 1.5 ha this counts as 3 ha. tomato planted)

6b Crop Inputs (purchased)

Product/service		**2012***		**2013***	
		Total value BIRR	*Notes and comments 2012**	**Total value BIRR**	*Notes and comments 2013**
Labour and services *(hired labour, machinery/tool rent)*					
Seed & seedlings (local)					
Seed & seedlings (improved)					
Fertilizers *(Urea, AN, CAN, NPK, etc)*					
Organic fertilizers *(only if purchased!) (manure, compost, green manure)*					
Pesticides *(herbicides, acaricides, fungicides, etc)*					
Biological pesticides *(only if purchased!)*					
Fuel/Electricity for agriculture only					
Agriculture equipment cost (if purchased in 2012/13)	Irrigation equipment				
	Others (specify)				
Rent paid (if land leased in)					
Other inputs *(not listed above) (wires, plastics, sticks)*					
Total Cost					

Inputs • Consider only inputs that are purchased • Enter the total value (total price) of a certain input for all crops combined for the two agricultural years		

6d Market outlets and information *[AQ 6d]*

		2012*	2013*
Where do you sell your product (What is your market outlet)?	***Type of market***	***% of production***	***% of production***
	On-farm sale	__ %	__ %
	Local market	__ %	__ %
	Regional Market (S &E)	__ %	__ %
	Addis Ababa (Central) market	__ %	__ %
	PMG/Cooperative	__ %	__ %
	Check >>	***100% total***	***100% total***
Who are your buyers?		***% of production***	***% of production***
	Traders	__ %	__ %
	Consumers	__ %	__ %
	PMG/Cooperative	__ %	__ %
	Others	__ %	__ %
	Check >>	***100% total***	***100% total***
Do you have sufficient market outlet for your produce [Single response]		○ Yes ○ No	○ Yes ○ No
How good is your knowledge about produce prices in different markets (score 1= very bad, 2=bad , 3 =moderate, 4=good, 5=very good)			
How do you communicate to know market price? [Multiple response)		☐ 1) Mobile phones ☐ 2) Visit to markets ☐ 3) Radio ☐ 4) TV ☐ 5) Visit to/by source of market information ☐ 6) Extension Officer ☐ 7) Other media (newspapers, internet)	☐ 1) Mobile phones ☐ 2) Visit to markets ☐ 3) Radio ☐ 4) TV ☐ 5) Visit to/by source of market information ☐ 6) Extension Officer ☐ 7) Other media (newspapers, internet)

6e family labour division

*Are there specific **tasks** for all crops in this household that are only performed by*	***men***	***women***	***Shared Equally***
Tillage / land preparations / land clearing	☐	☐	☐
Sowing / planting	☐	☐	☐
Pumping water (1)	☐	☐	☐
Watering / directing water	☐	☐	☐
Weeding	☐	☐	☐

Tasks (continued)	***Men***	***women***	***Sh Eq***
Fertilizing	☐	☐	
Spraying	☐	☐	
Harvesting	☐	☐	
Packing/Grading	☐	☐	
Marketing / selling	☐	☐	

(1) using the technology as in tables 4 and 5

6f family labour input

	0) n.a. ①	1)much less	2)less	3)same as before	4)more	5)much more
Agricultural labour						
Time spent on agricultural activities by **children**	○	○	○	○	○	○
Time spent on agricultural activities by **women**	○	○	○	○	○	○
Time spent on agricultural activities by **men**	○	○	○	○	○	○

Time spent **pumping water** (by all)	○	○	○	○	○	○

7 Livestock production

7 Livestock production: *7a Number of livestock and changes in numbers*

	2012* (start)	Purchased (+)		Sold (-)		Born (+)	Died (-)	Consumed (-)	Other in (+)	Other out (-)	2012* (end)
Type	No.	No.	Total value	No.	Total value	No.	No.	No.	No.	No.	No.
Cattle											
Sheep/goats											
Mule											
Horse											
Donkeys											
Poultry											
Others:..											
	2013* (start)	**Purchased**		**Sold**		**Born**	**Died**	**Consumed**	**Other in**	**Other out**	**2013* (end)**
Type	No.	No.	Total value	No.	Total value	No.	No.	No.	No.	No.	No.
Cattle											
Sheep/goats											
Mule											
Horse											
Donkeys											
Poultry											
Others:..											

Note 1: that [2013 no.] should equal the [2012* (end) no.]*
Note 2: no at start + purchase + born + other in - sold - died - consumed - other out = No. at end.

7b Livestock Inputs (purchased)

	2012*	2013*
Product/service name	**Total value**	**Total value**
Animal feed		
Supplements (minerals)		
Veterinary services		
Bull service		
Shepherd		
Others		
Total livestock input cost		

7c Livestock production and service (for human consumption and sales)

	2012*					2013*				
Product name	**Quantity + measure**		**Price per measure**	**Total sales (in Birr)**	**% sold**	**Quantity + measure**		**Price per measure**	**Total Sales (in Birr)**	**% sold**
Manure (sold!)					100%					100%
Milk					. . . %					. . . %
Cheese					. . . %					. . . %
Butter					. . . %					. . . %
Yogurt					. . . %					. . . %
Eggs					. . . %					. . . %
Honey/wax					. . . %					. . . %
Skins/hides					100%					100%
Traction/transport					100%					100%
Others					100%					100%

- *Included are all flows of:*
  - *Products for consumption by the household (milk and eggs)*
- *Excluded are all flows of:*
  - *life animals and meat (can be derived from table 7a)*
  - *products for own use that is not human consumption (e.g. manure, wool)*
- *Guide your questions for 7b and 7c based on the information in 7a*

8a Other sources of income (over 12 month period)

	2012*		2013*	
Type of activity	Net earnings ① Per year	Earned by (m/f/b)	Net earnings ① Per year	Earned by (m/f/b)
Wage/salary labour				
in local *smallholder* agriculture				
in local *commercial* agriculture				
in agricultural service providers (extension, input supplier, processor, etc.)*				
in local non-agricultural sectors (salary, pension, etc)				
Others (specify)				
Non wage/salary labour				
Petty trader*				
Agro-processing*				
Rent received (land, capital, social allowances, aid, etc.)				
remittances within the country				
remittances from outside country				
Others				
Total Other Income				

- m/f/b: m=mainly males, f=mainly females, b=both male and female
- ① **Net earnings: income minus costs to generate income.**

9 Membership farmer organizations

Are you or someone in your household a registered member of any farmers' organisations? *[AQ 9b]*

Farmer organization	2012*	2013*
Farmers Group	○ 1) No, not a member ○ 2) Yes, male member only ○ 3) Yes, female member only ○ 4) Yes, both male and female members	○ 1) No, not a member ○ 2) Yes, male member only ○ 3) Yes, female member only ○ 4) Yes, both male and female members
Cooperative	○ 1) No, not a member ○ 2) Yes, male member only ○ 3) Yes, female member only ○ 4) Yes, both male and female members	○ 1) No, not a member ○ 2) Yes, male member only ○ 3) Yes, female member only ○ 4) Yes, both male and female members

10 Social Provisioning (past year) 2013* compared to (previous year) 2012*

To what extent were you able to provide your family with the following expenditures/services this year (2013*) compared to the previous year (2012*) ?

Expenditure/social provision	0) n.a. ①	1)much worse	2)worse	3)same as before	4)better	5)much better
Food (amount and availability)	○	○	○	○	○	○
Food diversity	○	○	○	○	○	○
Other basic needs (housing, clothing)	○	○	○	○	○	○
Health care and sanitation	○	○	○	○	○	○
Education for boys	○	○	○	○	○	○
Education for girls	○	○	○	○	○	○
Productive tools/equipment, agricultural inputs, land	○	○	○	○	○	○
Communication, transport	○	○	○	○	○	○
Other goods/services (social obligations, entertainment and luxury items)	○	○	○	○	○	○
Savings	○	○	○	○	○	○

① Use "n.a." = does Not Apply when e.g. no children, no boys or girls in the household. Relate to table 2b for presence of children, boys and girls

11 Value chain relationships *[AQ 11]*

	1. disagree ☹	2. Indifferent / don't know 😐	3. agree ☺
I am happy to be a farmer	○	○	○
The economic situation is getting better in our country	○	○	○
In the future, my children will have opportunity to make money with farming	○	○	○
I want/expect my children to become farmers too.	○	○	○
I like to try new crops on my farm	○	○	○
I like to try new irrigation equipment on my farm	○	○	○
My buyers can usually be trusted (offer me a fair price)	○	○	○
When I produce a better quality, I usually get a better price for my product	○	○	○

My input providers can usually be trusted	○	○	○
The law protects me against those who cheat me	○	○	○
I want to sell my horticultural products privately	○	○	○
I want to sell my horticltural products together with other farmers in an organized way	○	○	○
I want to sell my horticultural products together with other farmers in an organized way through the farmer group (MG) I belong to	○	○	○
Belonging to the farmer group (MG) has been beneficial to me and my family	○	○	○

12 Progress out of Poverty

Do all Children ages 6 to 12 attend school?	NO	
	Yes	
	No children ages 6 to 12	
Excluding Kitchen and toilets, how many rooms does the dwelling unit have?	One	
	Two	
	Three or more	
What is the main construction material of the walls of the dwelling unit?	Wood and grass, mud and stone, or other	
	Wood and mud, reeds and bamboo, cement and hollow rocks, or bricks	
What type of toilet facility does the household use?	Pit latrine (shared), field/forest, container (household utensils), or other	
	Pit latrine (private)	
	Flush toiler (private or shared)	
What is the main source of cooking fuel?	Mainly firewood (purchase or collected), animal dung, or other	
	Crop residue	
	Charcoal, Kerosene, Butane gas, electricity, or does not use fuel	
Does the household currently own any mattresses and/or beds?	No	
	Yes	
Does the household currently own any watches or clocks?	No	
	Yes	
Does the household currently own any cattle, sheep or goats?	No	
	Yes	

13 Farmer advice

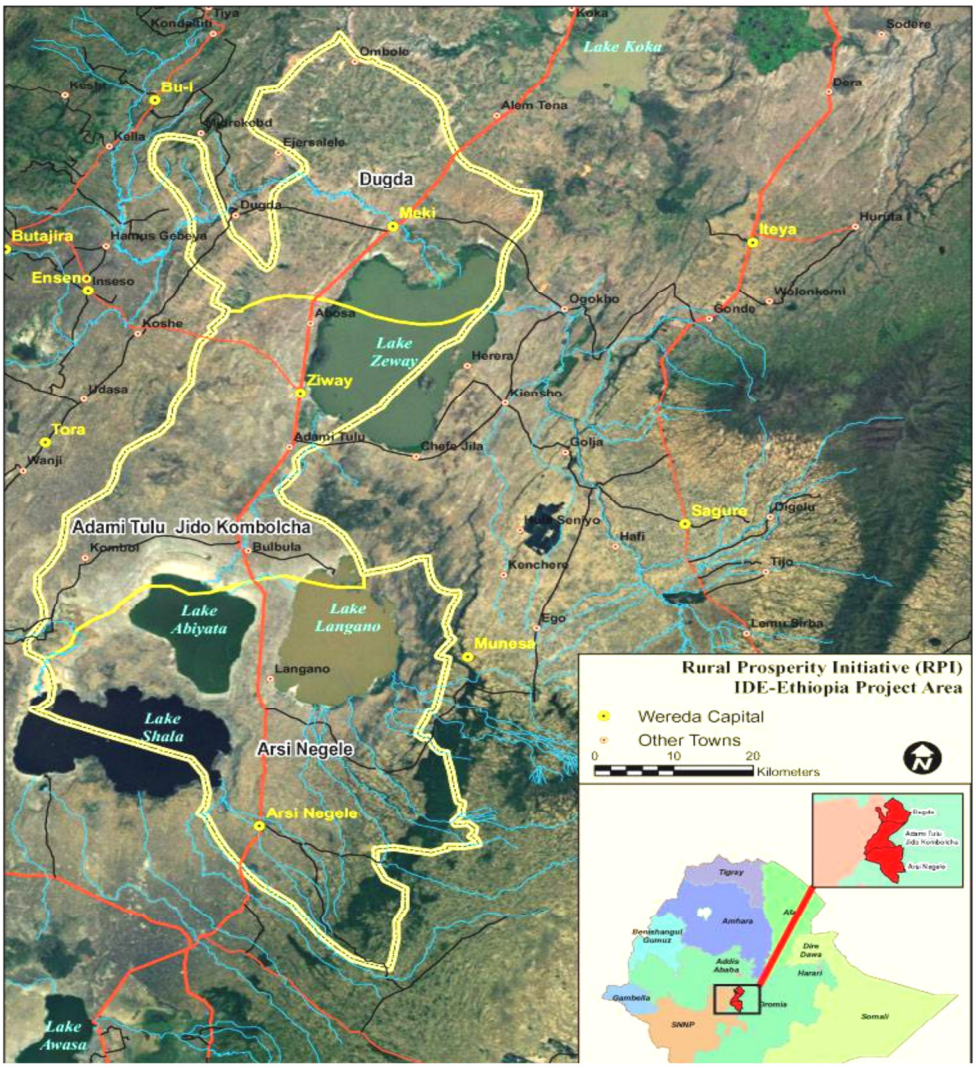
Is there any advice you would like to give to IDE?

…..AND THEN END INTERVIEW. Thank the farmer for participating in the interview.

Data entry:	**Supervisor:**
Name: Date: Signature:	Back checked [ ] Spot checked [ ] Reviewed [ ] Name: Date: Signature:

Ethiopia

Rural Prosperity Initiative (RPI)
Income Survey Report for 2008



By Eden Kassaye
M&E Officer
RPI, Ziway

August 2009

1. Introduction

Ethiopia ranks 105th among 108 developing countries on Human Poverty Index (HPI-1) which is similarly based on dimensions of Human Development index that focuses on proportion of people living a long and healthy life, having access to education and a decent standard of living (2007/2008 Human Development report). This score in turn indicates that the country is characterized by high illiteracy rate, low life expectancy rate and lack of access to an improved water source by most of its people. In addition, 44% of the population lives under $2PPP a day poverty rate out of which most of them live in rural areas (www.ifad.com).

The Rural prosperity initiative project was initiated to increase the net income of those rural farm families who live under $1PP or $2PPP a day and was launched in four countries since January 2007, Ethiopia being one of them. IDE Ethiopia RPI project has started its development intervention in the central rift valley areas (Adami Tulu Jido Kombolcha, Dugda and Arsi Negele Woredas) in October 2007 to attain the IDE Ethiopia RPI goal of improving the livelihoods of 8,000 SHFs who live on less than $1/day or $2/day by increasing their annual Household income level by $250 as a result of IDE's activities. IDE Ethiopia conducted a survey at the end of December 2008 so as to understand the impact of RPI project after first year of implementation.

2. Methodology

This part of the report provides description of the 2008 Rolling Baseline Survey and Customer Characterization Survey and discusses sampling technique, target population and sample size, source of data and data collecting tools and data analysis.

2.1 Description of the survey

The 2008 survey was carried out in order to understand the impact of the RPI project approximately after one year of implementation. IDE Ethiopia has undertaken two types of surveys in December 2008. These were rolling baseline survey (RBS) and customer characterization survey (CCS) with the following intended objectives.

Objective of the RBS

- To monitor the impact of IDE intervention on the net income of the participant smallholder farmers after one year of adoption in the three RPI Woredas (Dugda, Adami Tulu and Arsi-Negelle)

Objective of the CCS

- To assess the economic characteristics of non-RPI participant farmers and make a comparison of their income status with the income gains of the households who adopted IDE technologies, improved production techniques and marketing skills.

The 2008 survey covers two agricultural years, that is, the 2007* (before adoption) and the 2008* (past year, but after adoption). The * indicates that we are referring to an agricultural year (not equal to calendar year) which are defined as the period of November 1 – 31 October and are based on the start of the irrigation season.

Past year and year before adoption

- Past year (2008*): represents the 12 month period (November 1, 2007 – October 31, 2008) in which the households adopted certain technologies and improved agricultural and marketing practices and during which time impact is expected to be seen.
- Before adoption (2007*): represents a 12 month period before adoption that is used as a baseline situation (November 1, 2006 – October 31, 2007). Information is generated through recall process, that is, by asking the farmers to remember their economic activities, income and expenditure of one year before.

2.2 Sampling technique

In order to consider the clients from each RPI Woreda, a stratified random sampling technique was employed for Rolling Baseline Survey. To this end the RPI areas were considered as a separate stratum and with each stratum a random sampling technique was applied from total clients of 1510 (by end of May 2008). However, a simple random sampling technique was used for non adopters. The households for CCS were selected on the basis of a household who is located on the 3rd house to the right or left from the client selected for the RBS.

2.3 Target population and sample size

The 2008 RBS includes a sample of 200 households who were randomly selected from a total of 1510 RPI clients who have purchased or adopted IDE technology/services up to and including May 2008. On the other hand, the CCS consists of a sample of 75 households that were randomly selected and who live in the neighborhood of the adopter households selected for the RBS.

It should be noted that this difference in sampling technique and size have resulted in different results which proved to be difficult to make objective comparison between adopters and non adopters.

Distribution of sample households by Woreda:

Total **RBS** sample: 200 households
Sample population: Households that were registered as RPI customers up to the end of May 2008.

RPI area	AdamiTulu	Arsi Negelle	Dugda	Total
Number of clients until May 2008	536	491	483	1510
RBS 2008 smaple	71	65	64	200
Percent of total sample	35.5	32.5	32	100

Total **CCS** sample: 75 households
Sample population: Households in the IDE intervention area (same areas as from which the RBS sample was taken).

Division: based on potential number of customers (number of rural households) in a Woreda

RPI area	Adami Tulu	Arsi Negelle	Dugda	Total
Estimated target population in area (number of rural households)	20,000	28,900	21,000	69,900
CCS 2008 ample	21	31	23	75
Percent of total sample	28	41.3	30.7	100

2.4. Source of data and data collection tools

The survey mainly relied on primary data gathered through interviews. In order to supplement the primary data and analysis of results, secondary data were also used from World Bank, International Monetary Fund (IMF) and International Fund for Agricultural Development (IFAD) websites.

2.5 Data Analysis and Reporting

A combination of quantitative and qualitative methodologies was used to analyze and present the descriptive survey findings. Analysis of the data was done using SPSS software tool and Excel application. The results are presented using frequency tables and percentage supported by charts and graphs.

3. Household Characteristics

This part of the survey report deals with the general characteristics of the households. This part specifically deals with the adopters and non-adopters age structure, gender, level of education, and household size.

3.1 Household Size of the Target Population.

The table below indicates the total population in terms of households. The table shows that Arsi Negelle Woreda to have the highest population size, next Dugda and Adami Tulu to be the least.

RPI area	Adami Tulu	Arsi Negelle	Dugda
Estimated target population in area (number of rural households)	20,000	28,900	21,000

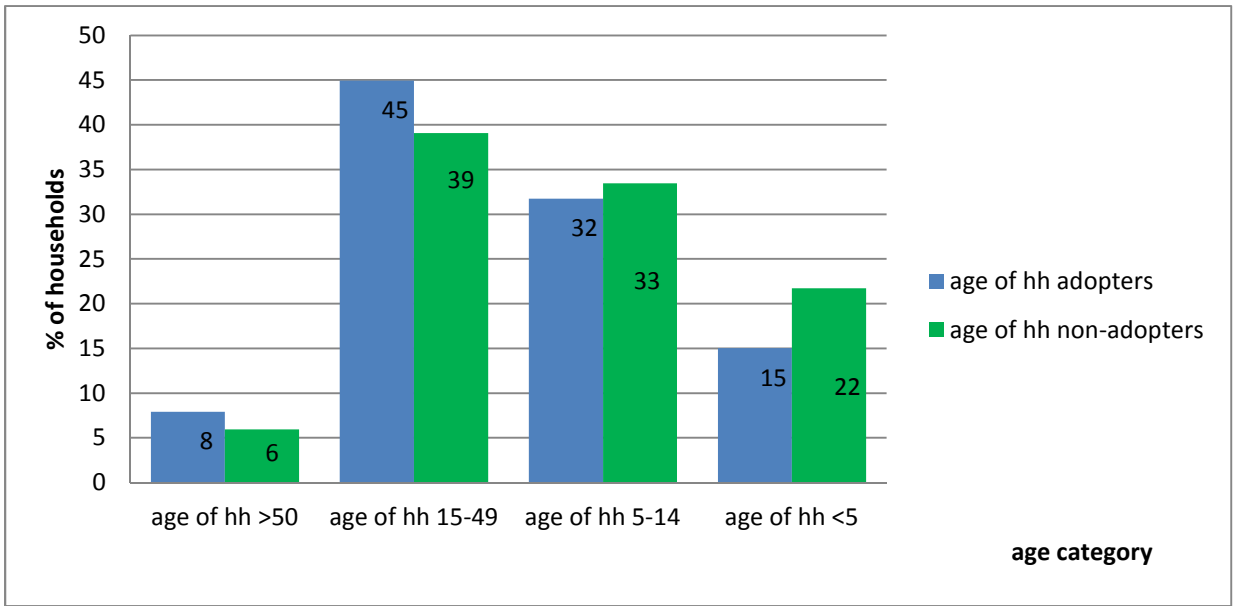
3.2 Age Structure and Gender of Adopters and Non-Adopters.

The household head age structure ranges from 17 to 85 years of age for adopters (figure 1). Out of the total 1510 household members (includes only adopters household members), 8% are classified under the age of above 50. Household aging 15-49 represent 45% of total family members which are categorized as active labor force. Household aging 5-14 constitutes 32% of total family members which represent second largest number of households next to households aging 15-49. The rest 15% of total household members comprises of households aging below 5.

Figure 1 also shows the age structure of the non-adopters. The households head age ranges from 18 to 90 years of age. Out of the total 571 household members for non adopters, 6% are classified under the age of above 50, 39% of them with the age range 15-49, the largest households next to the 15-49 age range is 5-14 with 33% of household members and the remaining 22% falls under the category of below 5 years of age.

NB: It should be noticed that if the age of household member found to be the upper boundary in the category plus with more than or equal to six months, then the age of the person is considered as the lower years of age in the next age category; and if it is plus with less than six months, it is considered within the same category of that age group having that upper boundary.

Fig. 1: Age structure of households for adopters and non adopters



The following Figure (Fig. 2) shows the distribution of households with different age category and gender for the adopters. Accordingly, as it is clearly showed for the age range above 50 years of age 4% are male and 3% female, 24% male and 21% females falls under the range of 15-49 years of age, 17% male and 15% female falls under age category of 5-14 and the remaining 8% male and 7% females under 5 years of age.

Fig. 2: Age structure and gender of households for adopters

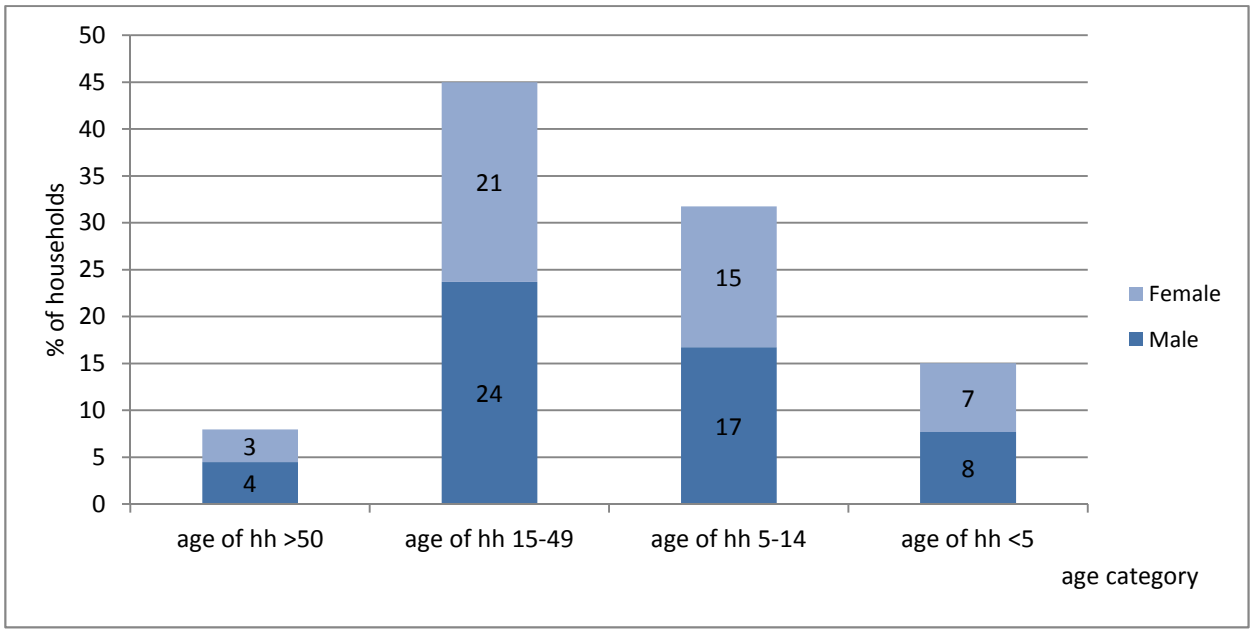
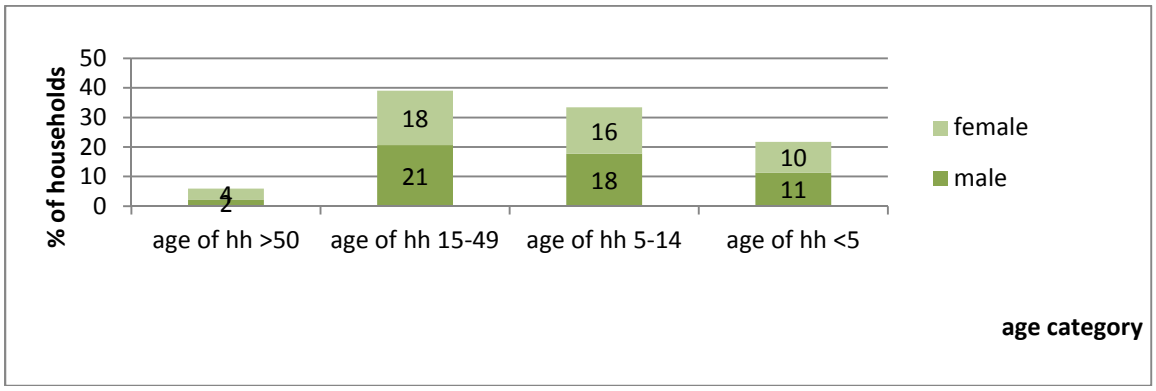


Figure 3 below shows the distribution of households with different age group and gender for the non-adopters. Accordingly, as it is clearly stated for the age range above 50 years of age 2% are male and 4% female, 21% male and 18% females falls under the range of 15-49 years age, 18% male and 16% female falls under age category of 5-14, and the remaining 11% male and 10% females under 5 years of age.

Fig.3: Age structure and gender of households for non-adopters.



3.3. Average Family Size of the Adopters and Non-Adopters

The next table indicates the average family size of adopters and non-adopters in the project areas. Accordingly, for the adopters Arsi Negelle has the largest size followed by Adami Tulu and Dugda Woreda. On the other hand the largest family size for the non-adopters is found in Arsi Negelle and followed by Dugda and Adami Tulu. From the above table we can conclude that Arsi Negelle have large family size in both cases that is for the adopters and the non-adopters. With regard to the average family size for the two groups, namely, for the adopters and non-adopters the non-adopters has larger family size. This result obviously will in turn have an impact on the per head capita income of the households.

Table 1: Average Family Size of the Adopters and Non-Adopters by Woredas & sample Kebele

Woreda	Kebele	Adopters 2008	Non-adopters 2008
Adami Tulu	Abayi Deneba	10.50	-
	Abine Germama	6.33	6
	Abosa	7.00	-
	Bochessa	5.00	-
	Dodicha	6.83	6.25
	Edo Gojola	6.80	5.8
	Elka Chalemo	7.67	6.71
	Negalign	6.65	7.67
Average for Adami Tulu Woreda		**7.2**	**6.48**
Arsi Negelle	Adaba Tita	6.33	-
	Edo Jigessa	5.67	9.5
	Gambeltu	10.00	-
	Gubeta Arjo	5.57	7.5
	Keraru	9.11	7.75
	Sambaro Rogicha	10.09	11.5
	Turge	10.11	5.8
Average for Arsi Negelle Woreda		**8.62**	**8.74**
Dugda	Melka Korma	5.00	-
	Darara Dalecha	6.70	9
	Jewe Bofo	8.00	2
	Shubi Gemo	6.42	6.38
	Tuchi Denbel	15.00	-
	Welda Kelina	8.67	-
	Weyo Gebriel	7.07	8.6
Average for Dugda Woreda		**6.98**	**7.13**
Average for RPI area		**7.59**	**7.61**

The table above depicts the average family size of the kebeles within each Woredas. Accordingly, the survey revealed that within Adami Tulu Woreda Abayi Deneba (10.5) and Negalign (7.67) with the highest size for the adopters and non-adopters respectively, and Bochessa (5.0) and Edo Gojola (5.8) with the lowest for the adopters and non-adopters respectively. In the Woreda of Arsi Negele Turge (10.11) and Sambaro Rogicha (11.5) with the highest size for the adopters and non-adopters respectively, and Gubeta Arjo (5.57) and Turge (5.8) with the lowest for the adopters and non-adopters respectively. In Dugda Woreda, Tuchi Denbel (15.0) and Darara Dalecha (9.0) with the highest size for the adopters and non-adopters respectively, and Melka Korma (5.0) and Jewe Bofa (2) with the lowest for the adopters and non-adopters respectively.

3.4 Level of Education for the Adopters and Non-Adopters.

The following table indicates the educational level of adopters and non-adopters. In line with their educational level the majority of the households, 51% have taken primary education level in the case of adopters and 45% in the case of non adopters. Dugda found to be with the highest primary school enrollment followed by Adami Tulu and Arsi Negelle respectively for both adopters and non adopters. For adopters, 21% of households are illiterate, 14% of the households have reached junior secondary level, and 14% of the households fall under senior secondary level of education and only 1% of the households are at tertiary level (which includes college and university). On the other hand, for non

adopters 27% of the households are at junior secondary level, 19% of the households are illiterate, 9% of the households reached senior secondary level and no one reached tertiary level.

Table 2: Level of education of households

Education Level of Adopters	Adopters				Non adopters			
	Adami Tulu	Dugda	Arsi Negele	% Average	Adami Tulu	Dugda	Arsi Negele	% Average
Iliterate(0 years)	28%	22%	11%	21%	14%	35%	10%	19%
Primary (grade 1-6)	45%	64%	45%	51%	48%	57%	35%	45%
Junior secondary (grade 7-8)	11%	9%	20%	14%	14%	9%	48%	27%
Senior secondary (grade 9-12)	15%	3%	23%	14%	24%	0%	6%	9%
Tertiary (College/University)	0%	2%	2%	1%	0%	0%	0%	0%

4. Rural Prosperity

4.1. Introduction

This part of the survey report deals with the level of prosperity of the households interviewed, indicated by the dollar-a-day poverty lines. The dollar-a-day poverty lines are calculated as the total income in 'international dollar terms' divided by the number of household members and to the 365 days of the year. The gross margin in this analysis is calculated as the total gross value of crop and livestock production minus the costs of production, plus off-farm income. This income per capita per day has been adjusted for the purchasing power parity ($PPP) typical for Ethiopia. The conversion rate from Birr to $PPP for 2008 was estimated by the international Monetary Fund (IMF) at 3.368 Birr to 1$PPP (www.imf.org). By converting the daily per capita income to $PPP the results can be compared globally.

Country	Subject	Scale	2007	2008	2009	2010
Ethiopia	Implied PPP conversion rate	Birr/$PPP	2.745	3.368	4.77	5.412
Estimates start after 2008						
International Monetary Fund, World Economic outlook database, April 2009						

4.2 Income distribution

4.2.1 Net income of adopters and non adopters in Birr

Table 3: Net income of adopters in 2007* and 2008*

Woreda	Average net income 2007* in Birr	Average net income 2008* in Birr	Average net incremental income in Birr	Average net incremental income in US$	% increase
Adami Tulu	11,358	12,000	642	62	6%
Dugda	14,065	17,173	3,108	298	22%
Arsi Negelle	9,934	15,788	5,854	562	59%
RPI Average Net Income	**11,761**	**14,887**	**3126**	**300 ***	**27%**

* $1 = Birr 10.42 at the time when the RBS/CCS was conducted

The change in average net income in percentage (average net incremental income) is computed taking the 2007* average net income as a base. The computation is done first by computing the difference of average net income between the two years, then by multiplying the difference by 100 and dividing the result by the 2007* average net income.

As depicted in table, the highest average net income for the year 2007* was recorded in Dugda Woreda, followed by Adami Tulu and Arsi Negele, and for the year 2008* Dugda comes first again followed by Arsi Negele and Adami Tulu. The survey result also revealed that three of the Woredas have shown increment in average net income for the year 2008* after the implementation of the project as compared with the 2007* before implementation scenario. The highest increment in average net income for the year 2008* was recorded in Arsi Negele (59%) followed by Dugda (22%) and Adami Tulu (6%). The increase in average net income in Adami Tulu is lower compared to the other areas due to low productivity of the area. The low productivity arises from erratic rainfall and low soil fertility. The soil type in Adami Tulu Woreda is sandy loam which is less productive compared to the loam clay soil found in Dugda. Overall, we can see that the average incremental income for the three RPI Woredas was Birr 3126 or US$300. It was an increase by 27% for the 2008*agricultural year as compared to the 2007*.

Table 4: Net income of Non-Adopters in 2007* and 2008*

Woreda	Average net income 2007* in Birr	Average net income 2008* in Birr	Average net incremental income in Birr	Average net incremental income in US$	% increase
Adami Tulu	4,924	6,624	1,700	163	35%
Dugda	6,035	5,282	-753	-72	(12%)
Arsi Negelle	8,187	12,524	4,337	416	53%
Average Net Income	**6,614**	**8,651**	**2,037**	**195**	**31%**

The above table shows the average net income of non-adopters for the year 2007* and 2008*. As shown in the table, the highest average net income was achieved in Arsi Negelle (53%) followed by Adami Tulu (35%) and Dugda (-12%). In terms of average net income increment for the year 2008* as compared to the year 2007*, the two Woredas showed an increment with the exception of Dugda Woreda. (NB: percentage in bracket refers to a decrease in net income, that is, a decrease by 12%).

4.2.2. Income distribution for adopters and non-adopters in PPP

Figure 3 (a, b) and Figure 4 (a, b) illustrate income distribution in $PPP for adopter household for 2007* and 2008* respectively. The Figures describe the portion of adopters who fall under the different dollar a day poverty line in year 2007* and 2008*.

As indicated in Figure 3a for the year 2007, 45% of the households lived on less than 1$PPP a day which are classified as “extremely poor” by the World Bank. 27.5% of the households lived on between 1$PPP and 2$PPP a day which are classified as “moderately poor”. And the rest 27.5% accounts for households who lived on greater than $2PPP a day that are classified as “non poor”.

Fig. 3a: No of households under the different dollar a day poverty line for the year 2007

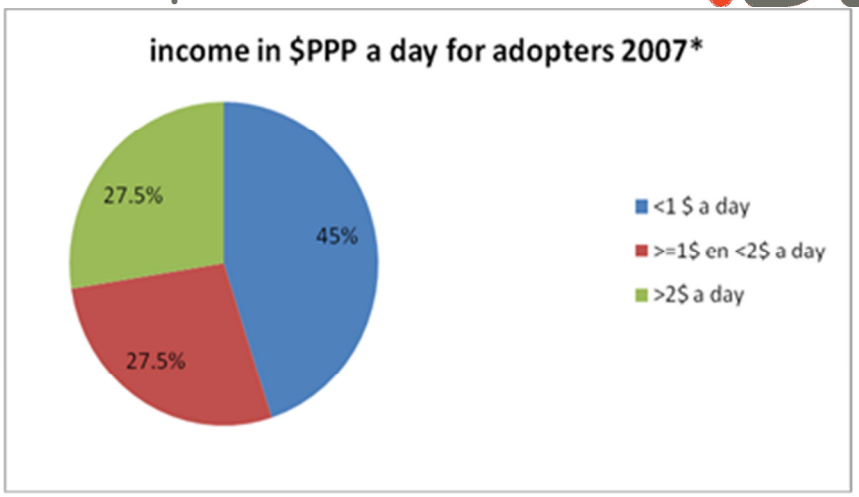
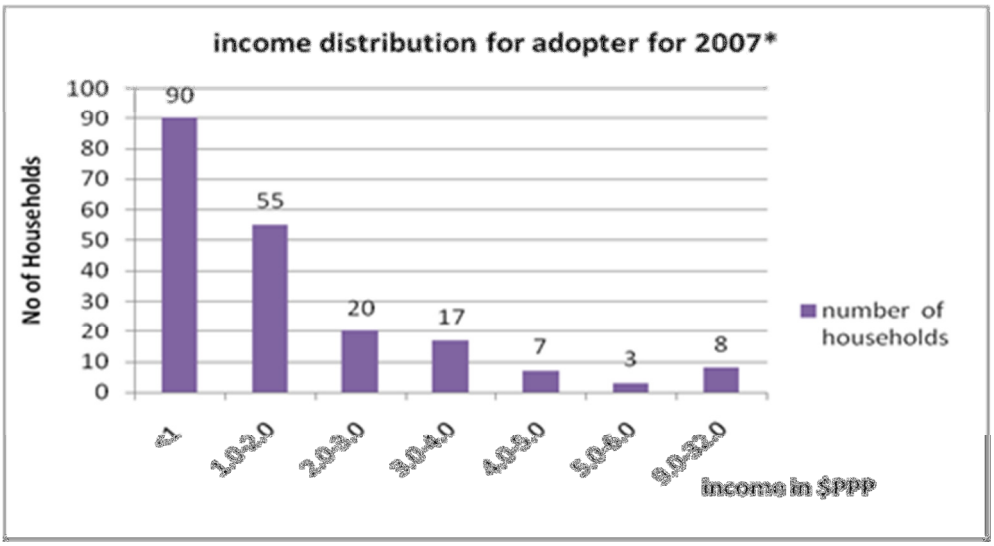


Fig 3b: Number of adopter households per income group for 2007*



As depicted in Figure 3b above, the majority of them (90) fall under less than a dollar a day with extreme poverty status and 55 of them earn between 1 and 2 dollar a day which indicates moderate poverty status. The rest 55 of them are categorized within more than 2 dollar a day. Therefore, we can conclude that the majority of them are under extreme poverty level in the year 2007.

Figure 4a for year 2008 below illustrates that the majority of the households lived on less than 1$PPP a day (that is 45.5% of the households) which are classified as "extremely poor" by the World Bank. 25.5% of the households lived on between 1$PPP and 2$PPP a day which are classified as "moderately poor". And the rest 29% accounts for households who lived on greater than $2PPP a day that are classified as "non poor".

Fig. 4a: No of households under the different dollar a day poverty line for the year 2008

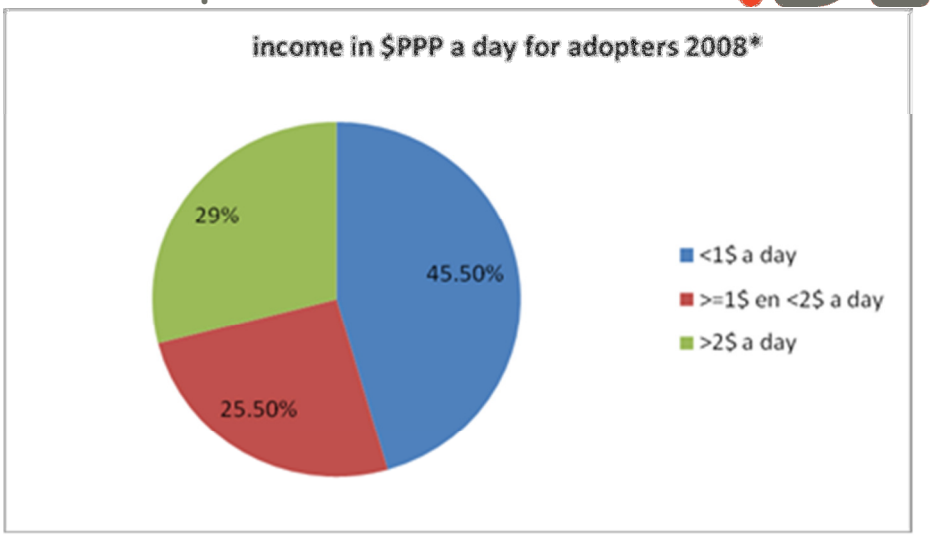
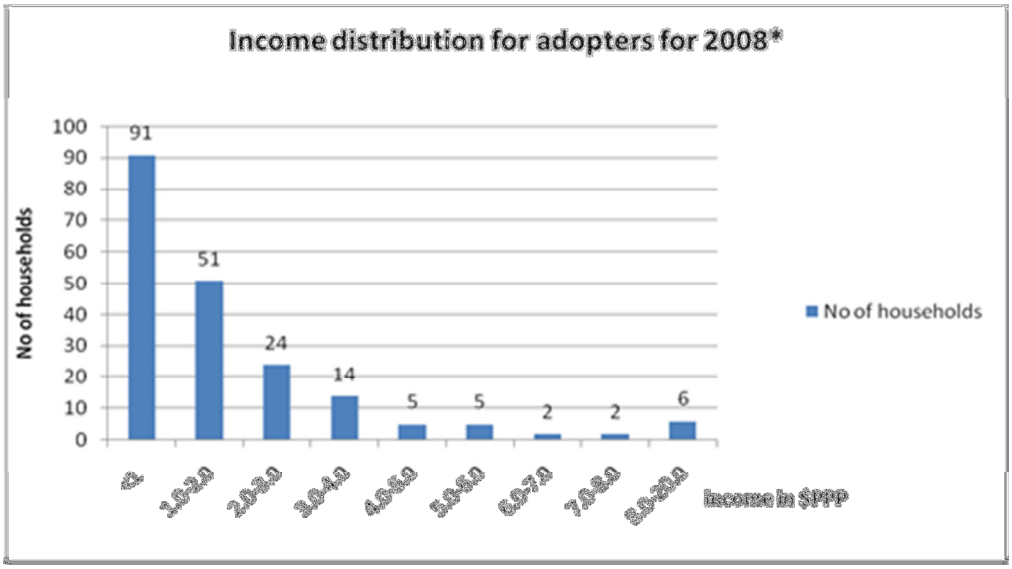


Fig. 4b: Number of adopter households per income group for 2008*



The above figure (Fig 4b) shows that out of the 200 sampled households, the majority of them (91) get less than a dollar a day with extreme poverty status and 51 of them earn between 1 and 2 dollar a day which indicates moderate poverty status. The rest 58 of them earn more than 2 dollar a day.

It is also found that the % of households that live on less than 1 dollar a day are 45% in 2007 and 45.5% in 2008, which indicates that majority of them live under extreme poverty status. The % of households those are classified as moderately poor are 27.5% in 2007 and decreased to 25.5% in 2008. On the other hand, households with non poor status comprises of 27.5% of households in 2007 and increased to 29% of households in 2008 clearly indicating the average net income increase due to IDE's activities.

The following table (table 6) depicts the average poverty status of households in each kebele and Woreda in percentage. Out of the 71 sample households in Adami Tulu, 46% lived on less than 1$PPP a day, 20% were moderately poor and 34% were non poor in 2007. In the year 2008, 53% of the households lived on less than 1$PPP a day (7% more), 20% were still moderately poor and 27% lived on

more than 2$PPP a day (7% gone down to the lower income group). The result indicates that the majority of the households in Adami Tulu were classified as extremely poor for both years (46% in 2007 & 53% in 2008).

Table 5: Distribution of households average $PPP in percentage for Kebeles and Woredas for 2008*

RPI areas	% of hh living on <$1PPP/day/capita		% of hh living on $1PPP & $2PPP/day/capita		% of hh living on >$2PPP/day/capita	
	2007	2008	2007	2008	2007	2008
Adami Tulu						
Abayi Deneba	100%	100.0%	0%	0.0%	0%	0%
Abine Germama	33%	67%	67%	33%	0%	0%
Abosa	0%	0%	100%	100%	0%	0%
Bochessa	100%	100%	0%	0%	0%	0%
Dodicha	50.0%	75%	17%	8%	33%	17%
Edo Gojola	60.0%	60%	20%	20%	20%	20%
Elka Chelemo	47%	57%	23%	27%	30%	17%
Negalign	35%	24%	6%	12%	59%	65%
Average for Adami Tulu	**46%**	**53%**	**20%**	**20%**	**34%**	**27%**
Arsi Negelle						
Adaba Tita	0%	0%	33%	67%	67%	33%
Edo Jigesa	17%	0%	17%	50%	66%	50%
Gambeltu	50%	100%	50%	0%	0%	0%
Gubeta Arjo	57%	29%	43%	57%	0%	14%
Keraru	56%	37%	33%	41%	11%	22%
Senbero Rogicha	36%	36%	45%	36%	18%	27%
Turge	67%	33%	22%	44%	11%	22%
Average for Arsi Negelle	**48%**	**32%**	**34%**	**43%**	**18%**	**25%**
Dugda						
Derara	60%	70%	20%	10%	20%	20%
Jewe Bofo	0%	0%	0%	0%	100%	100%
Melka Korma	100%	100%	0%	0%	0%	0%
Shubi Gemo	46%	64%	27%	9%	27%	27%
Tuchi Denbel	50%	0%	0%	0%	50%	100%
Welda Kelina	0%	0%	100%	67%	0%	33%
Weyo Gebriel	21%	21%	36%	21%	43%	57%
Average for Dugda	**40%**	**50%**	**30%**	**14%**	**30%**	**36%**
Total RPI Average	**45%**	**45.5%**	**27.5%**	**25.5%**	**27.5%**	**29%**

From the total of 65 sampled households in Arsi Negelle, 48% lived on less than a1$PPP a day (extremely poor), 34% lived between 1$PPP and 2$PPP a day (moderately poor) and 18% of the households lived on more than 2$PPP in 2007. The result for 2008 shows that 32% of the households were extremely poor (reduction by 16% from 2007), 43% fall in the moderately poor category (increase by 9% from 2007) and 25% of the households lived on more than 2$PPP a day (7% increase from 2007). The results show that 16% of the households in Arsi Negelle have graduated to the next levels (moderate poor & non poor) in 2008.

The last 64 sampled households were from Dugda. Out of these, 40% were categorized as extremely poor, 30% as moderately and another 30% as non poor in 2007. In 2008, 50% of the households classified as extremely poor (10% more became extremely poor), 14% as moderately poor (reduction by 16% from 2007) and the rest 36% as non poor (increase by 6%). The results show that % of households with moderate income reduced by 16% in 2008 as compared with the 2007 figure (30%). 10% of the households slipped down to the extremely poor category while the rest 6% transformed to the non poor or better of category.

Overall, there was a positive change in Arsi Negelle and Dugda Woredas in the non-poor income category, with improvements from 18% in 2007 to 25% in 2008 (Arsi Negelle) and from 30% in 2007 to 36% in 2008 (Dugda). Average change for all RPI Woredas is 1.5% (27.5% to 29%)

Table 6, below, presents the data generated from the survey about average net income of households in each kebele in Birr and in $PPP, which is computed by applying the IMF implied PPP conversion rate of 2.745 for 2007 and 3.368 for 2008, and their poverty status.

Table 6: Income distribution of households in $PPP at kebele and Woreda for 2007 & 2008

RPI area	2007			2008		
	Average Birr/day/capita	Average $PPP/day/capita	Poverty Status	Average Birr/day/capita	Average $PPP/day/capita	Poverty Status
Adami Tulu						
Abayi Deneba	0.89	0.32	Extreme	1.10	0.33	Extreme
Abine Germama	2.76	1.01	Moderate	3.12	0.93	Extreme
Abosa	5.35	1.95	Moderate	5.45	1.62	Moderate
Bochessa	-0.01	0.00	Extreme	2.07	0.62	Extreme
Dodicha	3.20	1.17	Moderate	3.60	1.07	Moderate
Edo Gojola	2.70	0.98	Extreme	3.23	0.96	Extreme
Elka Chalemo	4.56	1.66	Moderate	4.10	1.22	Moderate
Negalign	6.17	2.25	Non poor	7.57	2.25	Non poor
Average for Adami Tulu	**4.32**	**1.57**	**Moderate**	**4.57**	**1.36**	**Moderate**
Arsi Negelle						
Adaba Tita	6.45	2.35	Non poor	7.58	2.25	Non poor
Edo Jigessa	5.17	1.88	Moderate	11.01	3.27	Non poor
Gambeltu	3.03	1.10	Moderate	2.32	0.69	Extreme
Gubeta Arjo	2.34	0.85	Extreme	4.93	1.46	Moderate
Keraru	2.87	1.05	Moderate	4.46	1.32	Moderate
Sambaro Rogicha	0.68	0.25	Extreme	4.45	1.32	Moderate
Turge	2.31	0.84	Extreme	5.09	1.51	Moderate
Average for Arsi Negelle	**3.16**	**1.15**	**Moderate**	**6.20**	**1.84**	**Moderate**
Dugda						
Melka Korma	0.68	0.25	Extreme	0.80	0.24	Extreme
Darara Dalecha	5.07	1.85	Moderate	9.99	2.97	Non poor
Jewe Bofo	9.24	3.37	Non poor	13.44	3.99	Non poor
Shubi Gemo	6.59	2.40	Non poor	4.33	1.29	Moderate
Tuchi Denbel	5.07	1.85	Moderate	9.61	2.85	Non poor
Welda Kelina	9.24	3.37	Non poor	8.52	2.53	Non poor

Weyo Gebreil	4.07	1.48	Moderate	8.10	2.40	Non poor
Average for Dugda	**5.52**	**2.01**	**Non poor**	**5.46**	**1.62**	**Moderate**
Average	**4.25**	**1.55**	**Moderate**	**5.37**	**1.60**	**Moderate**

Out of the total 22 sampled kebeles for adopters, 8 kebeles were in Adami Tulu , 7 in Dugda and 7 in Arsi Negelle Woredas. Of the total, 7 kebeles were categorized in the extreme poverty status, 10 kebeles in moderate poverty level and the rest 5 in the non-poor level in 2007. Whereas in the year 2008, 6 kebeles were found to be extremely poor (1 kebele less), 8 kebeles moderately poor (2 kebeles less) and another 8 kebeles classified as non-poor (3 kebeles more from 2007). This result indicates that cumulative of the net income increase gained by the RPI clients has resulted in an overall change in the prosperity status of their kebeles.

With regard to the Woredas average $PPP in 2007, Adami Tulu and Arsi Negelle were in the moderately poor status and Dugda being in the non poor level. The highest average $PPP is scored by Dugda (2.01), followed by Adami Tulu (1.57) and Arsi Negele comes last with (1.15). On the other hand, all the three Woredas were in the moderately poor status in 2008. Arsi Negelle was found to be with highest score (1.84), Dugda scores second with 1.62 and Adami Tulu being the last with 1.36 in 2008. It is also found that the RPI area poverty status on average falls under moderate poverty line with 1.55 for 2007 and 1.60 for 2008.

4.3. Net Income and Gender

This part of the survey report describes the net income and gender distribution both for the adopters and the non-adopters. Besides, it also describes the net income distribution in line with gender distribution and the change in terms of Birr and percentage too for the year 2007* and 2008*. The average net income for male and female headed households is calculated separately by dividing the aggregate net income for male and female by the number of male and female headed households respectively.

Table 7: Average net income and Gender for the Adopters for the year 2007* and 2008*

Sex of HH Head	Average net income 2007* in Birr	Average net income 2008* in Birr	change in average net income in Birr	change in average net income in %
Male	12,784	15,770	2,986	23%
Female	6,189	10,073	3,884	63%
Total	**11,761**	**14,887**	**3,126**	**27%**

The above table shows that the average net income for adopters is higher for male-headed household for both years. With regard to the change, the female-headed households showed a significant increment of income (63%) as compared to that of the male-headed households (23%). The higher increase in the average net income of female-headed households is achieved due to our priority and special focus given to women in organizing them into producers and marketing groups, facilitating access to credit, agronomy and market related extension services and trainings.

Table 8: Average daily income per capita in $PPP for males and females HH

Woreda	Number of	Number of	Average	Average

	female HH	male HH	$PPP/day/capita of female hh	$PPP/day/capita of male hh
Adami Tulu	11	60	1.07	1.86
Arsi Negele	8	57	1.63	1.75
Dugda	12	52	0.92	2.53
Total/Average	**31** (15.5%)	**169** (84.5%)	**1.16**	**2.03**

The above table consists of average daily income per capita in $PPP for females and male-headed households, separately. Female-headed households constitute 15.5% of the total sample households. The results reflect the fact that in all RPI areas, male-headed households got higher average daily income per capita than female-headed households.

4.4 Gross margin per activity

This part illustrates the gross margin of different activities such as crop production, livestock production and other activities which is the result of total value of production minus total cost of production. The gross margin for crops, livestock and off-farm activities from the three Woreda is illustrated as follows.

Table 9: Gross margin of adopters and non adopter

Gross Margins	Adopters				Non Adopter			
	Adami Tulu	Arsi Negelle	Dugda	Average Margin	Adami Tulu	Arsi Negelle	Dugda	Average Margin
Gross margin - crops 2007	10,604	8,350	12,876	**10,598**	4,457	7,360	4,617	**5,706**
Gross margin - crops 2008	10,702	13,802	16,002	**13,406**	5,687	9,8510	3,617	**6,773**
Gross margin - livestock 2007	465	709	910	**687**	344	341	311	**333**
Gross margin - livestock 2008	727	599	664	**665**	388	402	502	**429**
Gross margin - off farm 2007	289	874	279	**476**	123	486	1,107	**575**
Gross margin - off farm 2008	571	1,387	508	**816**	550	2,271	1,163	**1,449**
Total net income -2007	11,358	9,934	14,065	**11,761**	4,924	8,187	6,035	**6,614**
Total net income - 2008	12,000	15,788	17,173	**14,887**	6,624	12,524	5,282	**8,651**
% change (2008 –Vs- 2008)	**642**	**5,854**	**3,108**	**3,126**	**1,700**	**4,337**	**-753**	**2,037**

As the table indicates, the gross margin of crops contributes the highest portion to the household income in all RPI Woredas for both years. It is found that Dugda Woreda got the highest gross margin from crops compared to Adami Tulu and Arsi Negelle for both year 2007* and 2008*. The average gross margin of crops in RPI area is Birr 10,598 in 2007* and Birr 13,406 in 2008* showing an increase of Birr 2,808.

The gross margin of livestock production for adopters is higher in Dugda in 2007* and in Adami Tulu in 2008*. However, the average gross margin from livestock has decreased in 2008* compared to 2007*

as the gross margin from livestock in Arsi Negelle and Dugda has significantly decreased. It can be seen from the above table that the gross margin of crops has increased whereas the gross margin of livestock has decreased in Arsi Negelle and Dugda Woredas which might indicate the possibility of trading off between crop production and livestock production.

The gross margin from off-farm activities is found to be higher in Arsi Negelle in both 2007* and 2008*. The average gross margin from-off farm activities has increased from Birr 476 in 2007* to Birrr 816 in 2008*.

5. Marketing

This section indicates where the sample households sell their produce and what percent of their products are sold throug each outlet. Each Woreda's average distance to the nearest market place is also shown so as to capture marketing practices and changes. Households sell their product on their farms, in addition to the different market outlets which includes local, regional, Addis Ababa and producer marketing groups (PMGs)/Cooperatives. The Local market outlet is a market place which mainly works for 2 market days a week and is found in each Woreda towns. The regional market comprises of the market outlets in Eastern and Southern parts of the country. Addis Ababa market constitutes for the central market outlet of the country. The PMG/Cooperative represents for all sales made by PMG/Coop members through the union.

Table 10: Market outlets

	Adami Tulu	Arsi Negelle	Dugda	RPI area
Distance to market	7km	18km	8km	11km
On farm sale 2007	36%	21%	55%	37%
On farm sale 2008	36%	18%	56%	36%
Local market 2007	55%	79%	41%	58%
Local market 2008	57%	77%	40%	58%
Regional market(S&E) 2007	4%	0.0%	0.6%	1.4%
Regional market(S&E) 2008	1%	0.0%	0.3%	0.1%
Addis Ababa 2007	0.3%	0.0%	0.5%	0.3%
Addis Ababa 2008	0.3%	0.0%	0.0%	0.1%
PMG/coop 2007	1%	0.0%	3.1%	1.3%
PMG/coop 2008	1%	3.4%	3.1%	2.4%

It can be seen from the table that RPI clients in Arsi Negelle travel the longest distance to the market center, which is 18kms away on average. The average distance between the production area and market center is 7km and 8km on average for Adami Tulu and Dugda Woreda farmers.

The market outlet that takes highest % of production sales differs in Dugda from the two Woredas for both years. In Dugda, the highest % of production is sold on-farm in both years, where as in Adami Tulu and Arsi Negelle, the highest % of production is sold in local markets. For all RPI areas, the highest % of production is sold in the local markets followed by on-farm sales for both years.

The amount of produce sold to regional markets (Southern and Eastern markets) is found to be higher in Adami Tulu. However, it has reduced from 4% to 1% of production and followed by Dugda, which comprises of 0.6% in 2007 and 0.3% in 2008. % of production sold to Addis Ababa market remained the same in Adami Tulu for both years, where as, it decreased from 0.5% in 2007* to none in 2008* in Dugda. No product was sold to the regional and Addis Ababa markets from Arsi Negelle in both years.

A significant change is observed on % of production sold through PMG/coops in Arsi Negelle which increased from nil to 3.4%. The amount of produce sold through PMG/coops remained the same for Dugda and Adami Tulu (3.1% and 1%, respectively). In general, average % of production sold for all RPI areas through PMG/coops has increased from 1.3% in 2007* to 2.4% in 2008*. Undoubtedly, this is the result of the market linkages created by IDE.

6. Services provided

This part focuses on the services/technologies adopted by RPI customers and shows the facilitators or providers of those services and technologies.

Table 11: Percent of RPI adopted services and facilitator of the different services

Services adopted	% of hh adopted	% of services provided as viewed by farmers					
		IDE	Other NGO	Farmer Org.	Gov.	Neigh/ Family	Others
Credit service/group saving	60%	24%	18%	4%	27%	1%	0%
Irrigation training	71%	46%	26%	4%	18%	2%	1%
Crop training	63%	39%	18%	4%	18%	1%	1%
Market training	70%	63%	8%	2%	3%	0%	0%
Market information	79%	47%	7%	5%	5%	10%	21%
Organizing PMGs/Coops	88%	67%	16%	3%	23%	2%	0%
Contract farming	14%	2%	5%	1%	1%	5%	2%
Market outlet - regional	18%	8%	1%	3%	1%	3%	8%
Market outlet – Addis Ababa	20%	3%	2%	2%	1%	4%	13%
Treadle pump	6%	6%	0%	0%	0%	0%	0%
Drip kit	9%	6%	1%	1%	1%	1%	0%
Small diesel pump	26%	0%	9%	4%	2%	9%	5%
Large diesel pump	45%	0%	30%	2%	13%	3%	0%
Rope and washer pump	4%	4%	0%	0%	0%	0%	0%
Water tank	4%	0%	3%	3%	1%	0%	0%
Water reservoir/pond	16%	1%	2%	1%	11%	3%	0%

Regarding the business support services

- 60% of the households have access to credit which is facilitated to 27% and 24% of the households by government and IDE respectively.
- 71% of the households have got training on irrigation practices and IDE has facilitated to 46% of the households followed by other NGO.

- Households who got training on marketing are 70% which is also mainly facilitated by IDE to 63% of the households.
- IDE is found to be the most important facilitator of business development services support.

In relation to market linkage,

- 79% of RPI households have access to market information. Among these, 47% got the information from IDE and 21% received from others such as traders, brokers, traditional practices, etc.
- 88% of households were members of PMG/coop out of which 67% were supported to establish their organization.
- 14% of the households practice contract farming/out grower scheme. 5% and 4.5% of the households were given the service by other NGO and neighbors or family respectively. Out of these IDE and others, each have assisted 2% of the households.
- 18 % of the households have access to regional market outlet where IDE and others each has facilitated for 8% of the households.
- Households who have access to Addis Ababa market outlet found to be 20%. This was mainly done by others which provides to 13% of the households followed by IDE contribution to 3% of the households.

Regarding irrigation equipment

- 45% of the households have access to large diesel pumps given by other NGOs (30%) and others for communal use, while 26% of the households own small diesel pump acquired from NGOs, farmer organizations, government, family and others/traders.
- Rope and washer was adopted by 4% of the households which is totally facilitated by IDE.
- 9% and 6% of the households used drip kit and treadle pump, respectively, and was facilitated by IDE.
- 16% of the households adopted ponds facilitated by government.
- Water tank is used by 4% of the households which was facilitated by other NGO and farmers organizations.
- IDE was found to be the only facilitator of access to MITs (drip kits, treadle pumps and rope and washer pumps) for the farmers.