Ruti Irrigation Project
Effectiveness Review – Full Report

Livelihood Support

FINAL

Oxfam GB
Livelihood Global Outcome Indicator

January, 2012

Photo credit: David Bishop

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Executive Summary

As part of Oxfam Great Britain's (OGB) Global Performance Framework (GPF), sufficiently mature projects are being randomly selected each year and their effectiveness rigorously assessed. Zimbabwe's Ruti Irrigation Project was selected to assess the extent that it has promoted change in relation to OGB's global livelihood indicator:

- **% of targeted households living on more than £1.00 per day per capita**

The Ruti Irrigation Project aims to contribute to sustainable livelihoods and resilience to climatic change among poor and vulnerable households in Gutu district, Zimbabwe. The project seeks to do this through the establishment of a 60 hectare surface irrigation scheme in which 240 farmers are directly supported to cultivate individual plots of land. The farmers are provided with start-up seeds, tools, fertilisers and pesticides, and are also supported with complementary training on improved farming methods, agri-business and marketing skills, and soil conservation techniques. The year-round output of crops from this project is further intended to indirectly benefit up to 50,000 people in the surrounding wards by enabling a more diverse and secure source of food.

In October 2011, with the support of Oxfam's Zimbabwe team, a household survey was administered to 232 beneficiary famers from the three phases of the project. Phase 1 beneficiaries were defined as the intervention group, as they had already harvested crops from the project. Phase 2 and 3 beneficiaries, on the other hand, were defined as the comparison group as they were yet to harvest or begin planting. The survey comprised of questions not only relevant to the above indicator but also a number of other measures associated with the project's other intended outcomes. In order to control for observable differences between the intervention and comparison households, statistical analysis of the resulting data was undertaken using propensity score matching (PSM) and multivariable regression (MVR).

The results of the review found that between 8 and 10 per cent more of the intervention households are living above £1 per day per capita (PPP) compared to the comparison households. In addition, the former exhibit a greater increase in asset ownership and report being in a better position to meet household needs. The intervention households were also found to be more food secure than those in the comparison group. These findings are likely to be driven by the average increase in maize production of 240% for the intervention households between 2009 and 2011.

While there is evidence to demonstrate that the support to the beneficiary households has brought about significant positive change, there is scope to strengthen aspects of the project's underlying approach. It is hoped that consideration of the following programme learning considerations will strengthen the support so that greater impact can be achieved:

- Consider increasing efforts to organise the producers and support the marketing of the agricultural commodities in order to maximise the benefit gained from increased production
- Review options to strengthen the health and hygiene interventions and training components of the project
- Consider further research to assess the food security impact of the project on the wider community
- Follow up on some of the specific findings from this report with further qualitative research

1 Introduction and Purpose

Oxfam GB has developed a Global Performance Framework (GPF) as part of its effort to better capture and communicate its effectiveness and enhance learning across the organisation. This framework requires programme/project teams to annually report generic output data across six thematic indicator areas. In addition, a modest sample of sufficiently mature projects (e.g. those closing during a given financial year) associated with each thematic indicator area are being randomly selected each year and rigorously evaluated. One key focus is on the extent they have promoted change in relation to relevant OGB global outcome indicators.

The following global outcome indicator was endorsed for the livelihoods strengthening thematic area:

- **% of targeted households living on more than £1.00 per capita per day**

This report documents the findings of the effectiveness review, focusing on support related to livelihood enhancement.

The conceptual underpinnings of this indicator are presented in Section 3.0 below, and the work that took place in the Gutu district of Zimbabwe in September-October 2011 was part of an effort to capture data on this indicator.

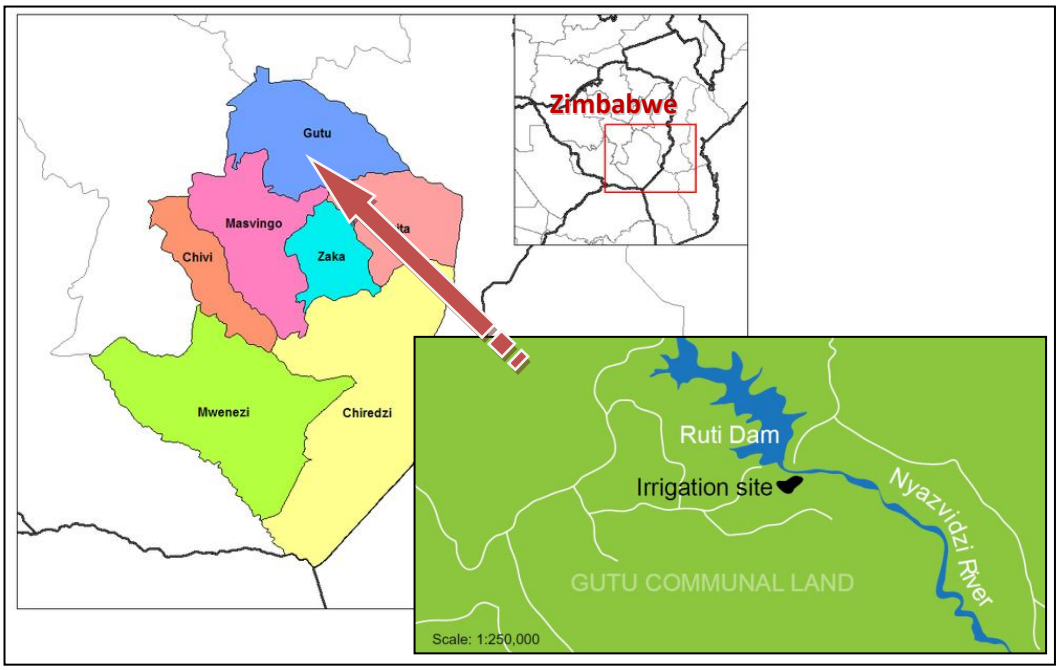
This report presents the findings of the effectiveness review. However, before doing so, Section 2 first provides brief background information on the project and the context in which the support is being provided, while Section 3 explains the intervention logic associated with the Irrigation Project. Section 4, Section 5, and Section 6 follow by presenting the conceptual frameworks underlying the indicators, the impact evaluation design pursued, and the methods of data collection and analysis, respectively. Section 7 is the longest section of this document. Its subsections include those related to basic descriptive statistics, intervention exposure, and finally the overall differences between the targeted women and the women that were selected as comparators. Section 8 concludes the document with general conclusions and suggestions for strengthening livelihoods support in Gutu district.

2 The Ruti Irrigation Project

The aim of the Ruti Irrigation Project is to contribute to sustainable livelihoods and resilience to climatic change in poor and vulnerable households within Gutu district, Zimbabwe. The project seeks to do this through the establishment of a 60 hectare surface irrigation scheme in which 240 farmers are directly supported to cultivate individual plots of land. The farmers are provided with start-up seeds, tools, fertilisers and pesticides, and are also supported with complementary training on improved farming methods, agri-business and marketing skills, and soil conservation techniques. It is further hoped that the year-round output of crops from this project will indirectly benefit up to 50,000 people in the surrounding wards with a more diverse and secure source of food. This is believed to be particularly important due to changing weather patterns in the area in recent years - crop yield per hectare

dropped by 56 per cent between 2007 and 2009[1] due to erratic rainfall and timing of seasons.

Figure 2.1: Location of Ruti Irrigation Project, Gutu, Zimbabwe



The Ruti Irrigation Project provides surface irrigated individual plots of land to 240 farmers in Gutu district, Zimbabwe.

The project is being delivered in 3 distinct phases as the land is cleared, prepared and irrigated, with approximately 80 farmers in each phase. Phase 1 commenced in 2009, with the first group of farmers able to sow in 2010 and harvest maize in 2011. At the time of visiting in September 2011, the farmers in Phase 1 were preparing to harvest their second crop (wheat). The Phase 2 farmers started sowing maize in mid-2011, whilst Phase 3 farmers began the process of clearing and preparing the land for irrigation in September 2011.

The project is due for completion in 2012, at which point the management of the project will be completely devolved to the Irrigation Committee, which is made up of 14 farmers, in order that the work is continued and sustained.

3 Intervention logic of the support provided to targeted households

The following diagrams illustrate simple 'theories of change' for how the project's key interventions are intended to affect improvements in income and food security and improved health outcomes of the supported households. The main focus of this report relates to the former. However, data were also collected on health and hygiene measures, and how water and sanitation facilities used by the household have changed between 2009 and 2011.

[1] Zimbabwe Vulnerability Assessment Committee (ZIMVAC).

Key project interventions include provision of surface irrigated plots, fertiliser and seed, together with training in farming methods.

As outlined above, Oxfam GB has been undertaking a project to irrigate a 60 hectare site in order to directly support 240 farmers. One of the key interventions has been the provision of irrigated land to permit year-round production of crops, together with start up inputs (seeds, fertiliser and tools) and training. So far, 160 farmers in Phase 1 and 2 of the project have each been provided with 25kg of maize seed and 100kg of fertiliser. They were further supported by training, focused on practical demonstrations timed to fall shortly before the skills are used in practice. Thus training started with soil and water conservation, moved on to sowing and planting for the first season, and proceeded to harvesting.

Figure 3.1

Intervention Logic: Agricultural land, inputs and support

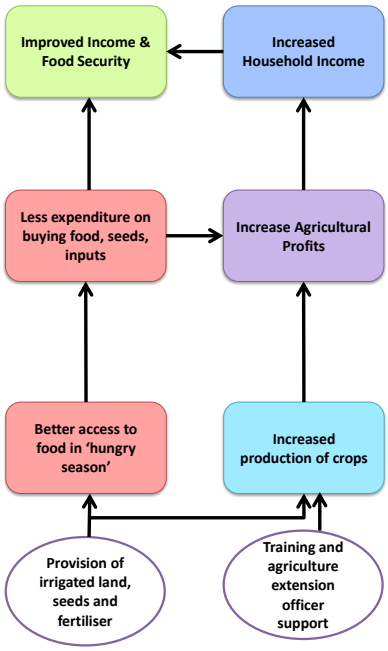
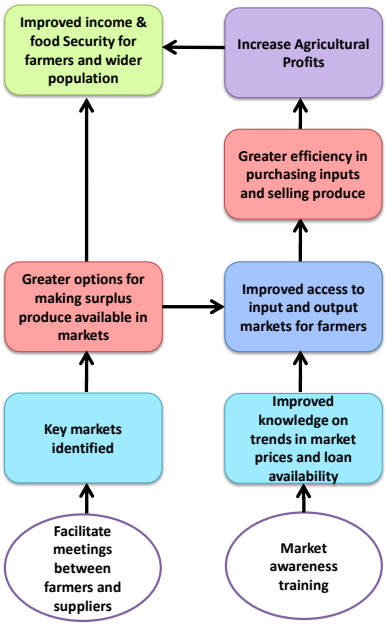


Figure 3.2

Intervention Logic: Improve market awareness and access



At the time of the assessment, the Phase 1 farmers had harvested a crop of maize in early 2011, and were preparing to harvest their second crop of wheat. Phase 2 farmers had planted their first crop of maize, whilst Phase 3 farmers were preparing their land in advance of irrigation. The aim of these interventions is to improve all-year round production of crops, thereby contributing to increased agricultural profits, household income and overall food security.

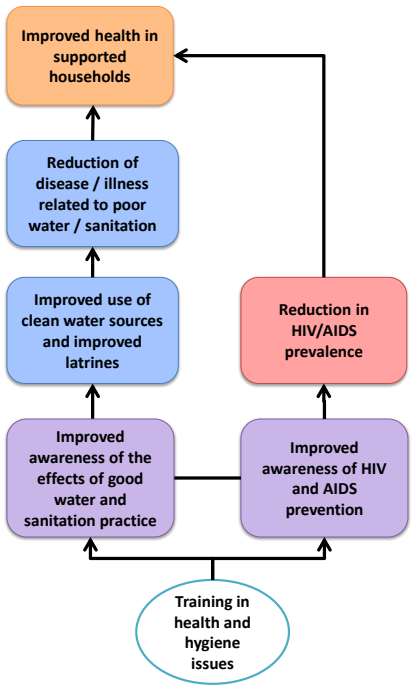
The project has also established a committee of 30 farmers, who have been trained in researching price trends, how to access credit, and how to engage with existing businesses in order to market their crops. Meetings were facilitated between farmers and their suppliers, produce buyers and financiers in order to strengthen the local supply chain for

agricultural produce. Representatives from the committee have made contact with a private bank, ZIMTRADE (appointed by the government to promote trade) and the Grain Marketing Board (a state enterprise responsible for buying agricultural inputs where they are available and distributing them as support). Conversations with the Board focused on accessing subsidised inputs. Through these meetings, a database of potential buyers and investors has been built up and will be developed to use in creating market linkages. The aim of these interventions is to improve efficiency in purchasing inputs, increase agricultural profits in selling produce, and ensure that local markets can access the crops being produced from the project in order to benefit the wider population – particularly in 'hungry season'.

The project has also tagged on several health-related interventions onto its core livelihood work.

One of the complementary activities of the project has been health and hygiene training sessions (Figure 3.3). These have been integrated into the monthly project meetings to ensure beneficiary attendance will be high. Information, education and communication materials have been distributed, with some sessions led by special interest partner organisations. For example, one partner distributed HIV and AIDS awareness T-shirts, pamphlets, posters and condoms. These trainings have supported the introduction of a clean water point and four latrines on the site. The overall aim of these interventions has been to contribute to a reduction in HIV/AIDS prevalence in the immediate vicinity of the project, and reduce disease and illness from unhygienic practices relating to water use and sanitation.

Figure 3.3 **Intervention Logic: Health and Hygiene issues training**



4 Livelihood outcome indicator, other measures used, and their conceptual underpinnings

4.1 The Livelihood outcome indicator

Measuring household wealth or socioeconomic position in low income countries is not straightforward, particularly in rural areas where respondents tend to be self-employed. Self-reported measures of total income are unreliable, given the wide

variety of endeavours such populations engage in to generate income.[2] However, given that there is a widely recognised and strong association between household income and consumption,[3] one popular proxy measure used by the World Bank and other international institutions involves the aggregation of both household consumption and expenditure data.[4] It is through these data that the percentages of households living on more than USD $1.25 per day per capita are estimated.

Household income was measured by collecting data on household expenditure.

To capture data on this indicator, a household survey is administered that contains a consumption and expenditure module. The respondents are asked what types of food they consumed over the previous seven day period, as well as the particular quantity. The quantity is transformed into a monetary value, i.e. either how much they paid for the food item in question or, if the food item was from their own production, how much they would have paid if it was bought from the local market. The respondents are also asked how much they spent on particular regular non-food items and services from a list such as soap, toothpaste, and minibus fares over the past four weeks. Finally, they are asked for any household expenditure on non-regular non-food items such as school and hospital fees, clothes, and home repair over the last 12 months. For non-food items that are gender divisible, data are collected in a gender disaggregated fashion, thereby enabling intra-household consumption inequality to be measured as well.

The basic per capita measure is calculated as follows for each household:

(((expenditure_food_item_1 + expenditure_food_item_2 +… + expenditure_food_item_n)/7) + ((expenditure_regular_item_1 + expenditure_regular_item_2 + … + expenditure_regular_item_n)/30) + ((expenditure_non-regular_item_1 + expenditure_non-regular_item_2 + … + expenditure_non-regular_item_n)/365))/household size

The resulting variable can remain continuous, and the average per capita consumption and expenditure can be calculated for the sample in question. It can also be transformed into a binary variable (e.g. > £1.00), so that the proportion of households living above a certain monetary figure can be calculated. Placing the continuous variation of the variable on a logarithmic scale is also possible, which can improve model fit in regression analysis and reduce the influence of outliers.

While dividing the above equation by household size as the overall denominator is recommended in the literature, using a more nuanced calculation is deemed important to avoid underestimating the wealth status of larger sized households relative to their smaller counterparts. A recommended formula for calculating household size is: HH size where *A* is number of adults in the household; *K* is the number of children; is the cost of a child relative to an adult; and controls the extent of economies of scale. For low income countries, is recommend that be set at .25 or .33 and be set at .9.[5]

[2] Morris, Saul, Calogero Carletto, John Hoddinott, and Luc J. M, Christianensen. (1999) *Validity of Rapid Estimates of Household Wealth and Income for Health Surveys in Rural Africa: FCND Discussion Paper No. 72*. Washington: International Food Policy Research Institute.
[3] See Gujarati, Damodar N. (2003) *Basic Econometrics: Fourth Edition*. New York: McGraw Hill.
[4] Deaton, A and S. Zaidi. 2002. "Guidelines for constructing consumption aggregates for welfare analysis," Working Paper No. 135. The World Bank, Washington, D.C.
[5] Ibid.

4.2 Other Outcome Measures

As reviewed in Section 3 above, the support provided to the targeted households is intended to bring about a number of other outcomes, in addition to strengthening livelihoods. Given this, data were collected on a number of additional outcome measures. These include those relating to household ownership of assets, agricultural production, household food security and change in use of water and sanitation facilities.

The household survey also permits analysis of how a household's ownership of assets has changed since the beginning of the project.

- **Household ownership of assets**
  Household ownership of assets is an alternative way of measuring household wealth and thus complements the consumption and expenditure measure presented above. Households were asked whether they own a number of different assets from lists of various types, e.g. radios, bicycles, and livestock, as well as the materials used to construct the roof, walls, and floors of their homes and size of their agricultural land holdings. It is assumed that ownership of such assets in the past is something that can be reliably recalled. Respondents where then asked to recall this information with respect to the baseline period, thereby, enabling the reconstruction of baseline data for this particular variable. A statistical method known as principal component analysis (PCA) was run on all the assets in the dataset separately for both periods to develop asset indices. This is a data reduction method that transforms a number of possibly correlated variables into a smaller number of uncorrelated variables called principal components. In more simple terms, it narrows in on those assets where there is significant variability in ownership and uses them to assign scores based on the possession of these assets. Hence, households that possess more and less of these assets obtain higher and lower scores, respectively. The first principle component, in particular, accounts for as much variability in the data as possible, and forms the basis of the asset index. The resulting index, itself a continuous measure, can be divided into quantiles (e.g. three groups) to define different wealth groups (e.g. the poor, middle, and rich).

- **Household food security**
  Household food security was measured using the Household Food Insecurity Access Scale (HFIAS) developed by USAID's Food and Nutrition Technical Assistance (FANTA) Programme.[6] The set of questions form a module in a household questionnaire. Respondents are asked to describe behaviours and attitudes that relate to various aspects of the food insecurity experience. For example, a question relating to perceptions of food quantity asks whether anyone in the household had to eat less than normal. The consequence related questions include one about whether anyone in the household went to bed hungry because there was not enough food.

- **Agricultural production**
  Respondents were asked about their production of crops, including maize, in the 12 months leading up to the review compared with 2009 (prior to project intervention). Comparing the difference in production over these two time periods allows analysis of the magnitude of change in production.

- **Water and sanitation facilities used by the household**
  Respondents were asked to record the principal type of toilet facility and the

[6] http://www.fantaproject.org/publications/hfias_intro.shtml

principal source of drinking water for the household both in 2009 and 2011. Examining these findings enabled analysis of changing patterns in water/sanitation behaviour by the respondents.

4.3 Measuring Intervention Exposure

There was a desire to also assess the extent to which the respondents were exposed to different types of support targeted at the households. As such, the respondents were asked the extent they or any other members of their households had received agricultural inputs or training or support from an agricultural extension worker. As the project also provided training on health and hygiene issues, specific questions were asked about exposure to these interventions. For each support measure, whether inputs or training, respondents were asked either how many times it had been received, or the number of household members trained, since 2009.

5 Impact Assessment Design

5.1 Limitations in Pursuing the Gold Standard

The core challenge of a social impact evaluation is to credibly estimate the net effect of an intervention or programme on its participants. An intervention's net effect is typically defined as the average gain participants realise in outcome (e.g. income) from their participation. In other words:

The aim of the review was to estimate what would have happened to the Phase 1 farmers had they never been supported.

Impact = average post-programme outcome of participants – what the average post-programme outcome of these same participants would have been had they never participated

This formula seems straightforward enough. However, *directly* obtaining data on the latter part of the equation – commonly referred to as the counterfactual – is logically impossible. This is because a person, household, community, etc. cannot *simultaneously* both participate and not participate in a programme. The counterfactual state of a programme's participants can therefore never be observed directly; it can only be estimated.

The randomised experiment is regarded by many as the most credible way of estimating the counterfactual, particularly when the number of units (e.g. people, households, or, in some cases, communities) that are being targeted is large. The random assignment of a sufficiently large number of such units to intervention and control groups should ensure that the statistical attributes of the two resulting groups are similar in terms of a) their pre-programmes outcomes (e.g. both groups have the same average incomes); and b) their observed characteristics (e.g. education levels) and unobserved characteristics (e.g. motivation) that affect the outcome variables of interest. In other words, randomisation works to ensure that the *potential outcomes* of both groups are the same. As a result – provided that threats such differential attrition and intervention spill-over are minimal – any observed outcome differences found at follow-up between the groups can be attributed to the workings of the programme.

Unfortunately – outside the context of specially designed pilot studies – randomised evaluation designs are seldom implemented in the context of social programmes,

particularly in low-income countries. There can be cost, feasibility, and/or ethical constraints that militate against their use or simply the desire among implementing agencies to work with purposively chosen populations. Moreover, there are often cases where the *opportunity* to participate in a programme is put in place – as would be the case with the setting up of a micro-credit programme – and people *choose* whether to participate. Those that choose to participate are likely to be different than those that do not, including in characteristics that are intrinsically difficult to measure (e.g. motivation).

5.2 Alternative Evaluation Design Pursued

Two popular methods were used to address selection bias – propensity score matching and multivariable regression.

There are several evaluation designs when the comparison group is non-equivalent that can – particularly when certain assumptions are made – identify reasonably precise intervention effect estimates. One solution is offered by matching. This involves finding people in an external comparison group that possess the same characteristics (e.g. ethnicity, age, and sex) as those of the intervention group and match them on these characteristics. If matching is done properly in this way, the observed characteristics of the matched comparison group will be identical to those of the intervention group. The problem, however, with conventional matching methods is that with large numbers of characteristics on which to match, it is difficult to find comparators with similar combinations of characteristics for each of the units in the intervention group. The end result, typically, is that only a few units from the intervention and comparison groups get matched up, thereby, not only significantly reducing the size of the sample but also limiting the extent to which the findings can be generalised to all programme participants (referred to as the "curse of dimensionality" in the literature).

Fortunately, matching on the basis of the propensity score – the conditional probability of being assigned to the programme group, given particular background variables or observed characteristics – offers a way out. The way propensity score matching (PSM) works is a follows: Units from both the intervention and comparison groups are pooled together. A statistical probability model is estimated, typically through logit or probit regression. This is used to estimate programme participation probabilities for all units in the pooled sample. Intervention and comparison units are then matched within certain ranges of their conditional probability scores. Tests are further carried out to assess whether the distributions of characteristics are similar in both groups after matching. If not, the matching bandwidth or calliper is repeatedly narrowed until the observed characteristics of the groups are statistically similar. Provided that a) the dataset in question is rich and of good quality; b) the groups possess many units with common characteristics (i.e. there is a large area of common support); and c) there are no unobserved differences lurking among the groups, particularly those associated with the outcomes of interest, PSM can produce good intervention effect estimates.

Multivariable regression is another approach that is also used to control for measured differences between intervention and comparison groups. It operates differently from PSM in that it seeks to isolate the variation in the outcome variable explained by being in the intervention group *net of other explanatory variables* (key factors that explain variability in outcome) included the model. In this way, multivariable regression controls for measured differences between the intervention and comparison group. The validity of both PSM and multivariable regression are founded heavily on the "selection on observables" assumption, and therefore treatment effect estimates can be biased if there are unmeasured (or improperly

measured) but relevant differences existing between the groups. Both PSM and multivariable regression were employed during data analysis, and efforts were made to capture key explanatory variables believed to be relevant in terms of the assessed outcomes, for example sex and age of household head (see Section 6.0 below).

While no baseline data were available, efforts were made reconstruct it through respondent recall. This method does have limitations (e.g. memory failure, confusion between time periods, etc). However, for data that can be sensibly recalled, e.g. ownership of particular household assets, it can serve to enhance the validity of a cross-sectional impact evaluation design. The reconstructed baseline data were used in two ways. First, several of the variables included in the PSM and regression procedures were baseline variables constructed from recalled baseline data. One set of variables, for example, was related to the respondents wealth status at baseline, e.g. whether they were asset rich, asset poor, or somewhere in between. This was done in attempt to control for baseline wealth differences between the intervention and comparison groups. The second way it was used was to derive pseudo difference-in-differences intervention effect estimates. With longitudinal or panel data, this is implemented by subtracting each unit's baseline measure of outcome from its endline measure of outcome (endline outcome status minus baseline outcome status). The intention here is to control for time invariant differences between the groups. Bearing in mind the limitations associated with recalled baseline data, using PSM and/or regression and the difference-in-differences approaches together is considered to be a strong evaluation design.

The evaluation design involved comparing farmers targeted by the project that had and had not received support at the time of data collection.

5.3 The Comparison Group

A key factor in ensuring the validity of any non-randomised impact evaluation design is to employ an appropriate comparison group. This is particularly true for ex-post, cross-sectional designs. Comparators that differ in relation to the baseline status of the outcome variable(s) of interest and/or who are subjected to different external events and influences will likely result in misleading conclusions about programme impact. Identifying a plausible comparison group is therefore critically important and is, generally speaking, not an easy task.

Due to the phased nature of the Ruti Irrigation project, we are provided with an opportunity to assess the impact of the project on Phase 1 beneficiaries by comparing them with those beneficiaries who are part of Phases 2 and 3. At the time of data collection, only Phase 1 beneficiaries had harvested a crop from the project. Phase 2 beneficiaries had recently sown their first crop and Phase 3 beneficiaries were in the process of preparing their land for irrigation. Therefore, only Phase 1 beneficiaries had benefited from the project's key intervention (i.e. provision of irrigated land, agricultural inputs and training). While Phase 2 beneficiaries had been exposed to these same interventions, they had not as yet harvested any benefit from them. As all the beneficiaries were from the same broad location, we expected that observable differences between participants in each phase would be minimal apart from the benefits they had derived from the project.

Given that the number of beneficiaries in each phase was relatively small, we decided to interview all beneficiaries from each of the three phases, and use the Phase 2 and 3 beneficiaries as our comparison group.

6 Methods of Data Collection and Analysis

6.1 Data Collection

A questionnaire was administered to a total of 232 farmers by 12 trained and locally recruited enumerators.

A household questionnaire was developed and revised locally to capture data on both the outcome variables presented in Section 4 above, as well as other key characteristics of the targeted and comparison farmers to implement the evaluation design described in Section 5. It was pre-tested by the local Oxfam team and subsequently revised. Potential enumerators were identified by Oxfam team and 15 completed a two-day training course, which was led by the Oxfam Monitoring and Evaluation advisers and supported by the local Oxfam team. The second day involved a practice run at administering the question in a test community, following which the performance of the enumerators was critically reviewed. This resulted in disengaging three of the enumerator trainees.

Beneficiary listings for each of the three phases were used to ensure that we correctly identified the respondents. The initial plan was to interview all 240 beneficiaries across the three phases. However, eight households were unavailable for the interview. As such, the total number of beneficiaries actually interviewed was 232 in total – **70 in the intervention group (Phase 1) and 162 in the comparison group (Phases 2 and 3).**

6.2 Data Analysis

OGB developed data entry tools in Adobe Acrobat Pro, and OGB's Monitoring and Evaluation Officer in Harare recruited and supervised data entry clerks to enter the data. After identifying and rectifying some minor errors in MS Excel, the data were then imported into Stata for analysis, the results of which are presented in the following sections. Most of the analyses involved group mean comparisons using *t*-tests, as well as PSM with Stata's psmatch2 module and various regression approaches. Kernel and nearest neighbour matching without replacement were the main methods used in implementing PSM. Variables used in the matching process were identified by first using backwards stepwise regression to identifying those variables that are correlated with the outcome measure of interest at a *p*-value of less than 0.20. The short-listed variables were then put into another stepwise regression model to identify those that are correlated with being a member of the intervention group. Covariate balance was checked following the implementation of each matching procedure. When covariate imbalance at *p*-values of 0.20 or less was identified, the bandwidth or calliper was reduced and the PSM procedure and covariate balance test implemented again. This was continued until all covariates were balanced at *p*-values greater than 0.20. Boot-strapped standard errors enabled the generation of confidence intervals to assess the statistical significant of the effect sizes. The covariates as presented in Table 7.1 below were included in the various regression approaches undertaken, i.e. regression with robust standard errors, robust regression (to reduce the influence of outliers), and regression with control functions (to attempt to control for unobserved differences between the intervention and comparison groups).

6.3 Main Problems and Constraints Encountered

Overall, despite the usual difficulties encountered when undertaking such intensive work, the data collection process went well. The only challenge was not being able to interview all of the beneficiaries. Due to the system used to irrigate the site, beneficiaries from different phases attend the site on different days. As the data

collection took place on the irrigation site (in order to reduce travel and logistical issues), we relied upon the beneficiaries coming to the site in the week we were there. While communications had been disseminated to the beneficiaries regarding the survey, we were not able to interview six beneficiaries from Phase 1, one beneficiary from Phase 2 and one beneficiary from Phase 3.

Several significant differences were identified between the intervention and comparison households.

7 Results

7.1 General Characteristics

Table 7.1 presents mean statistics for general household characteristics obtained through the administration of the questionnaire among the respondents from both the intervention and comparison groups. Given that the data comprise of the total population, it was not necessary to test how statistically significant the differences are. Nevertheless, *t*-tests were still carried out to aid in interpreting the magnitude of these differences. The stars beside the number indicate differences between the two groups that are statistically significant at a 90 percent confidence level or greater.

Table 7.1: Descriptive Statistics: Intervention and Comparison Respondents Interviewed

	Overall mean	Intervention mean	Comparison mean	Difference	t-statistic
HH Size	6.2069	5.9429	6.3210	-0.3781	-1.19
# of adults	2.8276	2.7286	2.8704	-0.1418	-0.75
# of children	3.3793	3.2143	3.4506	-0.2363	-0.93
# of young children	2.0948	2.0571	2.1111	-0.0540	-0.25
# of dependents	2.2155	2.2143	2.2160	-0.0018	-0.01
# of productive adults	2.7069	2.5714	2.7654	-0.1940	-1.07
# of unproductive adults	0.1207	0.1571	0.1049	0.0522	1.00
Single adult HH	0.0647	0.0286	0.0802	-0.0517	-1.47
Female headed HH	0.2457	0.1143	0.3025	-0.1882***	-3.11
Elderly headed HH	0.2500	0.3286	0.2160	0.1125*	1.82
Age of HH head	50.3233	52.1857	49.5185	2.6672	1.36
HH head has sec educ	0.5388	0.5857	0.5185	0.0672	0.94
HH adult with sec educ	0.8405	0.8143	0.8519	-0.0376	-0.72
HH farms	0.9914	0.9857	0.9938	-0.0081	-0.61
HH rears livestock	0.8750	0.8429	0.8889	-0.0460	-0.97
HH runs IGA	0.2198	0.1857	0.2346	-0.0489	-0.82
HH does casual labour	0.7198	0.7000	0.7284	-0.0284	-0.44
HH does waged labour	0.0517	0.0143	0.0679	-0.0536*	-1.70
Asset poor baseline	0.3362	0.2571	0.3704	-0.1132*	-1.68
Asset middle baseline	0.3319	0.3143	0.3395	-0.0252	-0.37
Asset rich baseline	0.3319	0.4286	0.2901	0.1384**	2.07
Observations	***232***	***70***	***162***		

* p<0.10, ** p<0.05, *** p<0.01

As is evident, there are several significant differences between the groups, including those related to:

- *Female headed households*. Overall, the households of the intervention group are less likely to be headed by a female. Approximately 11 per cent of households in the intervention group are headed by a female compared to 30 per cent in the intervention group.
- *Elderly headed households*. Approximately one-third of households in the intervention group are headed by an adult over 60 years of age, compared to 22 per cent in the comparison group.

- *Household is involved in waged labour.* A household in the comparison group is more likely to have an adult involved in waged labour.
- *Baseline wealth status.* The intervention group is both more likely to be in the asset rich group at baseline and less likely to be in the asset poor group.

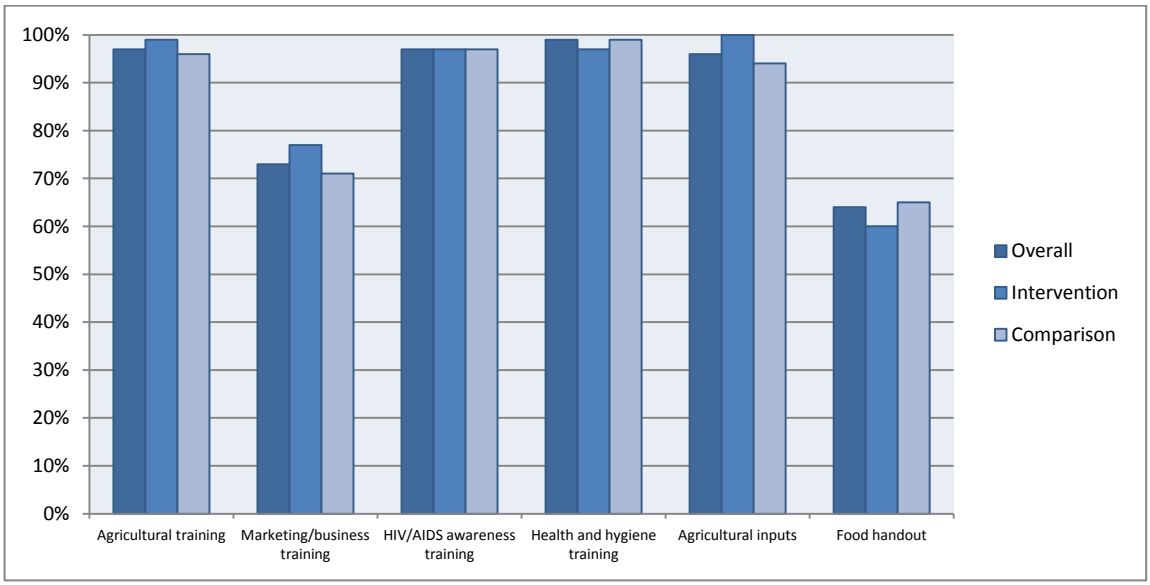
Apart from the % of households receiving agricultural inputs, there were no significant differences in the support received.

7.2 Intervention Exposure

The respondents were asked a number of questions about the extent they were exposed to the Oxfam supported interventions since 2009. Figure 7.1 presents the percentage of respondents that reported making use of the following types of support provided by external organisations:

- Agricultural training
- Marketing/business training
- HIV/AIDS awareness training
- Health and hygiene training
- Agricultural inputs
- Food handout

Figure 7.1: % of households receiving support from external organisations since 2009



As is apparent for all types of external support, there are generally very small differences between the households of the intervention and comparison groups. While it appears that the agricultural inputs (seeds and fertiliser) have been largely distributed to all phases of the project, the difference in the proportion of households receiving inputs between the intervention and comparison group is significant at the 95% confidence level.

Table 7.2 confirms that apart from the agricultural inputs, the small differences in exposure would not be statistically significant if the data were based on a random sample.

Table 7.2: Differences in support received from external organisations since 2009

	Overall mean	Intervention mean	Comparison mean	Difference	t-statistic
Agricultural training	0.9655	0.9857	0.9568	0.0289	1.11
Marketing/business training	0.7284	0.7714	0.7099	0.0616	0.97
HIV/AIDS awareness training	0.9698	0.9714	0.9691	0.0023	0.09
Health and hygiene training	0.9871	0.9714	0.9938	-0.0224	-1.39
Agricultural inputs	0.9569	1.0000	0.9383	0.0617**	2.14
Food handout	0.6404	0.6029	0.6563	-0.0533	-0.76
Observations	***232***	***70***	***162***		

* p<0.1, ** p<0.05, *** p<0.01

Table 7.3 presents the differences in the number of times a household has received agricultural inputs and food handouts. As is apparent from the table, households in the intervention group benefited to a greater extent in terms of the number of times they have received agricultural inputs – an average of 2.3 times, compared to 1.6 in the comparison group. This difference would be highly statistically significant. Conversely, households in the intervention group had received fewer food handouts compared to households in the comparison group – again this difference is statistically significant.

Table 7.3: Differences in number of times support received from external organisations, or household members trained since 2009

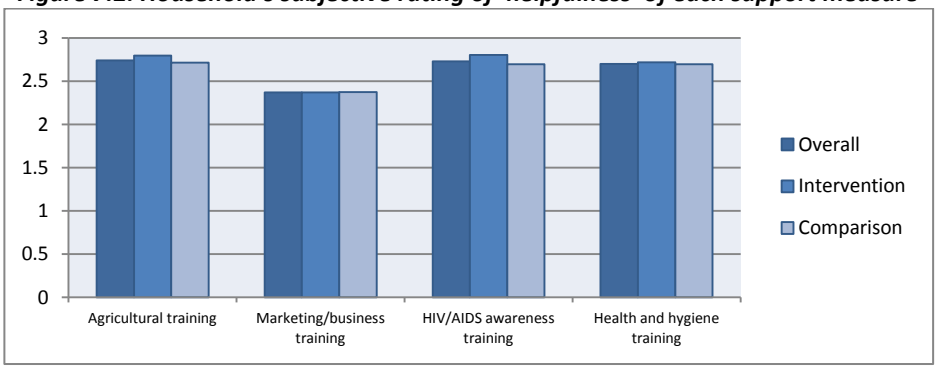
	Overall mean	Intervention mean	Comparison mean	Difference	t-statistic
# of times receiving agriculture inputs	1.7716	2.2571	1.5617	0.6954***	5.15
# of times receiving food handout	2.7629	1.9857	3.0988	-1.1131**	-2.26
Observations	***232***	***70***	***162***		

* p<0.1, ** p<0.05, *** p<0.01

Of the various services offered to supported households, the marketing / business training was rated as the least helpful.

As part of the questions on exposure to external support, respondents were asked to rate how helpful or useful each service has been to their household (Figure 7.2). While the differences between the intervention and comparison groups are small, it is interesting to note the relative perceptions of usefulness of each support measure.

Figure 7.2: Household's subjective rating of 'helpfulness' of each support measure



Each respondent was asked to rate whether the service was 'not helpful', 'somewhat helpful' or 'very helpful'. Each response of allocated a score of between 1 (not helpful) and 3 (very helpful), and Figure 7.2 presents the average results. The marketing/business training has been rated least helpful, and this is something that will be revisited in the recommendations section at the end of this report.

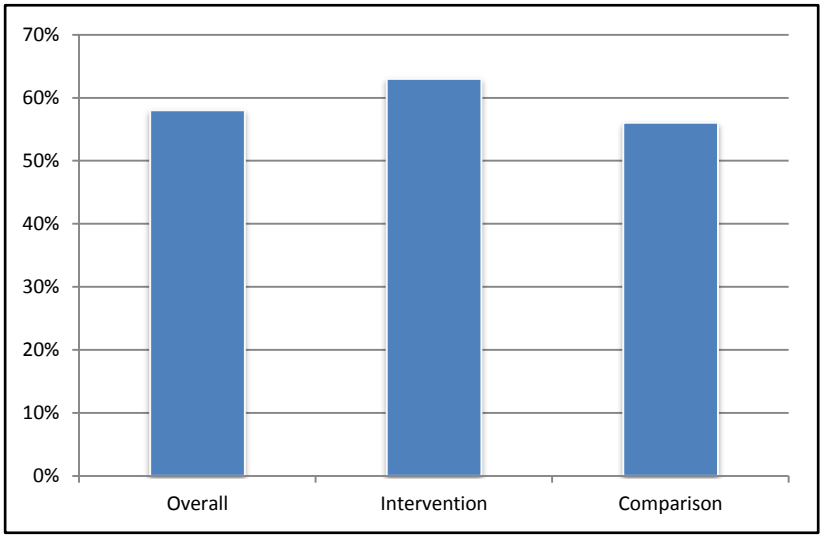
7.3 Global Outcome Indicator for Livelihoods

Section 4.1 provides the detail for this indicator, but as a summary we are analysing:

- **% of targeted households living on more than £1.00 per day per capita**

Figure 7.3 displays the results of the comparison between the intervention and comparison groups in terms of the OGB global livelihood outcome indicator –with the figures adjusted for purchase power parity (PPP). (Note: the IMF sets the PPP for Zimbabwe at £1 = $2.29 (2011))

Figure 7.3: % of households living on more than £1.00 per day per capita (PPP)



Before statistical adjustment, a small difference exists between the intervention and comparison groups.

As is evident, there is an overall difference between the intervention and comparison groups, with a 7 per cent difference in favour of the former.

Table 7.4 presents the unadjusted and adjusted figures (which control for differences between the two groups), which reveal that the four different adjustment methods, which use propensity score matching and multivariable regression, estimate the difference between the groups to be larger. The PSM methods estimate a difference of about 8 per cent between the groups, whilst the MVR methods estimate about 10 per cent. So, if we have correctly captured and controlled for the differences between the groups which may affect this outcome indicator, we can conclude that between 8 and 10 per cent more households are living on more than £1.00 per day per capita in the intervention group as compared with the comparison group.

While the differences in Table 7.4 would not be statistically significant if the data were based on a random sample, the eight to 10 percent adjusted difference was, nevertheless, found between the two groups. This effect size can be interpreted as being modestly significant.

An 8-10% difference was found between the intervention and comparison groups for the global outcome indicator.

Table 7.4: % of households living on more than £1.00 per day per capita (PPP)

	Overall
Unadjusted	
- Sample mean	0.58
- Intervention mean	0.63
- Comparison mean	0.56
- Unadjusted difference	0.073
	(1.03)
Observations	***232***
PSM (ATT)	
- Post matching difference (kernel)	0.0834
	(1.15)
Observations	***232***
- Post matching difference (no replacement)	0.0857
	(1.11)
Observations	***232***
Multivariable regression	
- MVR coefficient (dprobit):	0.1016
	(1.32)
Observations	***232***
- MVR coefficient (dprobit) with control functions:	0.1006
	(1.28)
Observations	***232***

t statistics in parentheses
* p<0.10, ** p<0.05, *** p<0.01
PSM estimates bootstrapped 1000 repetitions

Average expenditure per capita per day

The data associated with the household expenditure indicator can also be analysed in its continuous form. Table 7.5 presents the average expenditure per capita per day in US $, which is currently the principal currency in general use in Zimbabwe. The table shows that the average expenditure per capita per day is $3.27 in the intervention group, compared to $2.79 in the comparison group – a difference of nearly 50 cents.

Four of the five adjustment procedures in Table 7.5, which control for observed differences between the groups, estimate a greater difference between the groups. However, caution should be exercised in interpreting these differences, as the procedure which reduces the influence of outliers in the data (robust regression) estimates the difference to be approximately 27 cents.

The average expenditure per capita per day is $3.27 in the intervention group, compared to $2.79 in the comparison group

Table 7.5: Average expenditure ($) per capita per day

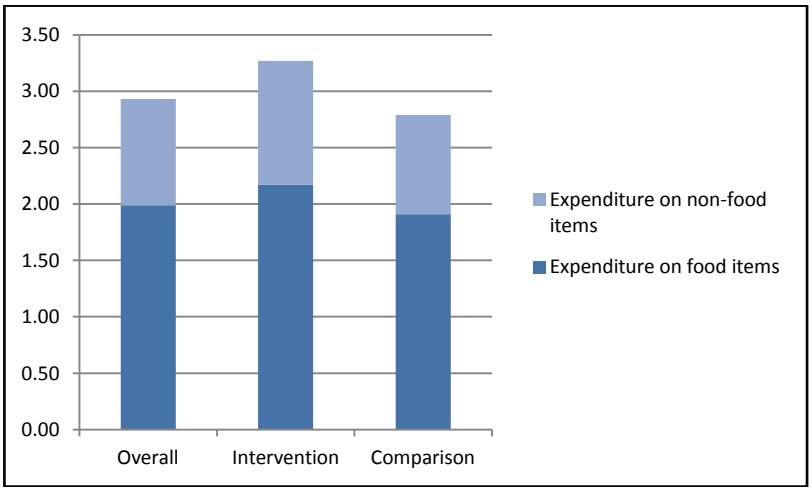
	Overall
Unadjusted	
- Sample mean	2.94
- Intervention mean	3.27
- Comparison mean	2.79
- Unadjusted difference	0.484*
	(1.79)
Observations	***232***
PSM (ATT)	
- Post matching difference (kernel)	0.529*
	(1.82)
Observations	***232***
- Post matching difference (no replacement)	0.552*
	(1.95)
Observations	***232***
Multivariable regression	
- MVR coefficient (robust standard errors):	0.573*
	(1.97)
Observations	***232***
- MVR coefficient (robust regression):	0.272
	(1.52)
Observations	***232***
- MVR coefficient with control functions:	0.577*
	(1.96)
Observations	***232***

t statistics in parentheses
* p<0.10, ** p<0.05, *** p<0.01
PSM estimates bootstrapped 1000 repetitions

Food/non-food expenditure per capita per day

The data can also be broken down to spending on food /non food items. Figure 7.4 illustrates the average per capita per day expenditure ($) on food and non-food items.

Figure 7.4: Average expenditure ($) per capita per day on food / non-food items



The results show that the average expenditure on food and non-food items was $2.17 and $1.10 per capita per day respectively in the intervention group, and $1.91 and $0.88 in the comparison group. The proportions are broadly similar for both groups; however, the proportion of expenditure on non-food items is slightly higher (34%) in the intervention group compared with the comparison group (32%).

Table 7.6 presents the differences in expenditure on food items per capita per day. The unadjusted difference is approximately 26 cents. Four of the five adjustment procedures in Table 7.6, which control for observed differences between the groups, estimate a slightly greater difference between the groups. However, the estimate is, again, lower for the robust regression estimate at 21 cents.

Per capita food expenditure was found to be higher in the intervention group.

Table 7.6: Average expenditure ($) on food items per capita per day

		Overall
Unadjusted		
-	Sample mean	1.99
-	Intervention mean	2.17
-	Comparison mean	1.91
-	Unadjusted difference	0.258
		(1.48)
Observations		***232***
PSM (ATT)		
-	Post matching difference (kernel)	0.272
		(1.52)
Observations		***232***
-	Post matching difference (no replacement)	0.369**
		(2.02)
Observations		***232***
Multivariable regression		
-	MVR coefficient (robust standard errors):	0.341*
		(1.85)
Observations		***232***
-	MVR coefficient (robust regression):	0.214*
		(1.67)
Observations		***232***
-	MVR coefficient with control functions:	0.348*
		(1.87)
Observations		***232***

t statistics in parentheses
* p<0.10, ** p<0.05, *** p<0.01
PSM estimates bootstrapped 1000 repetitions

Table 7.7 presents the differences in expenditure on non-food items per capita per day. The unadjusted difference is approximately 23 cents. Four of the five adjustment procedures in Table 7.6, which control for observed differences between the groups, estimate a similar difference. However, the robust regression estimate indicates that these results are significantly influenced by outliers in the data.

The project has had little effect thus far for the majority of households on non-food related expenditure.

Table 7.7: Average expenditure ($) on non-food items per capita per day

	Overall
Unadjusted	
- Sample mean	0.94
- Intervention mean	1.10
- Comparison mean	0.88
- Unadjusted difference	0.227
	(1.58)
Observations	***232***
PSM (ATT)	
- Post matching difference (kernel)	0.262*
	(1.84)
Observations	***232***
- Post matching difference (no replacement)	0.200
	(1.37)
Observations	***232***
Multivariable regression	
- MVR coefficient (robust, fe):	0.232
	(1.59)
Observations	***232***
- MVR coefficient (rreg):	0.0583
	(0.89)
Observations	***232***
- MVR coefficient (fe) with control functions:	0.229
	(1.56)
Observations	***232***

t statistics in parentheses
* p<0.10, ** p<0.05, *** p<0.01
PSM estimates bootstrapped 1000 repetitions

Gender differences in expenditure

Where possible, efforts were made to obtain household expenditure data on items that can be sensibly divisible along gender lines (e.g. money spent on men/boys and women/girls clothes). This was to measure the extent there is gender inequality in relation to household spending in general, and whether there is a difference in gender divisible spending between the intervention and comparison groups. The results of the relevant analyses are presented in Table 7.8. The data has been placed on a logarithmic scale to both ensure that the data better takes the shape of a normalised distribution and reduce the influence of influential observations that can result in misleading conclusions.

The unadjusted figures suggest there is very little difference in gender spending inequality between the intervention and comparison groups. However, the adjusted figures from the 5 estimation methods indicate a greater difference in gender spending inequality between the groups, with the intervention group exhibiting less inequality than the comparison group.

Table 7.8: Difference in monthly expenditure between women and men on gender divisible items (logarithmic scale)

	Overall
Unadjusted	
- Sample mean	-0.19
- Intervention mean	-0.18
- Comparison mean	-0.20
- Unadjusted difference	0.020
	(0.11)
Observations	***220***
PSM (ATT)	
- Post matching difference (kernel)	0.112
	(0.63)
Observations	***220***
- Post matching difference (no replacement)	0.133
	(0.69)
Observations	***220***
Multivariable regression	
- MVR coefficient (robust, fe):	0.142
	(0.73)
Observations	***220***
- MVR coefficient (rreg):	0.185
	(1.03)
Observations	***220***
- MVR coefficient (fe) with control functions:	0.142
	(0.73)
Observations	***220***

t statistics in parentheses
* p<0.10, ** p<0.05, *** p<0.01
PSM estimates bootstrapped 1000 repetitions

Little difference was found between the groups on gendered differences in expenditure.

7.4 Household asset ownership

Respondents were asked to report on ownership of various household assets, both for the time of review and baseline (2009).

A supporting measure for analysing household income and wealth is to analyse the change in household assets. Households that are relatively wealthier tend to have more tangible material possessions or other locally relevant wealth indicators, such as livestock, tin roofs (as opposed to grass), bicycles, radios, cemented floors (as opposed to dirt), etc. Efforts were therefore made to capture data on household wealth indicators, particularly in relation to those assumed to relevant to differentiating the better and worse off in the intervention and comparison communities. Respondents were asked to report on the various wealth indicators at both the time of review, as well as for baseline period (2009), thereby, attempting to reconstruct baseline data. The specific household wealth indicators are presented in Table 7.9. Where sensible, efforts were made to capture not only on whether the household had the asset in question, but also the specific number owned. In addition, for indicators such as those related to material used to construct specific features of the respondents' homes, scores were allocated depending on the material in question. For example, 0 points was given for respondents reporting the floor of their homes were made of dirt, 1 point if it was made from cement or unfinished wood, and 2 points for tiles, vinyl, or finished wood.

Table 7.9: List of assets and other wealth indicators used in the measurement of HH asset ownership

Electricity (inc. solar/generator)	Bed	Sewing machine
Lamps – electric, kerosene or other	Phone	Milling machine
Television	Bicycle	Plough
Clock/watch	Motorcycle	Cart
Table	Wheel barrow	Cattle
Radio	Vehicle	Goat
DVD	Hoe	Pig
Iron	Tractor / ploughing machine	Poultry
Jewellery	Solar-powered device	Water source
Toilet type	Material of floors of home	Material of walls of home
Material of roof of home	Area of agricultural land	Number of rooms in household

The numbers of assets owned were then grouped into three quantiles to avoid the analysis being overly influenced by extreme values. Principal Component Analysis (PCA) was then run on all the wealth indicators presented in Table 7.9, and an asset index created based on the first principal component that was generated. This was done for both sets of indicators associated with the endline and baseline periods.

Table 7.1 indicated significant differences between the intervention and comparison group in terms of whether respondents belonged to the 'asset poor' or 'asset rich' group at baseline. However, using matching and the 'difference in difference' method, we are able to analyse the changes in wealth indicators between 2009 and 2011 for both groups to test for significant differences between the two. Once the changes in wealth indicators were calculated, the differences were grouped into three quantiles and PCA was run on these 'difference quantiles'. The results are presented in Table 7.10

Households in the intervention group have shown a significant increase in assets between 2009 and 2011, compared to the comparison group.

Table 7.10: Changes in asset ownership

	Overall
Unadjusted	
- Sample mean	0.00
- Intervention mean	0.55
- Comparison mean	-0.24
- Unadjusted difference	0.790***
	(2.83)
Observations	***232***
PSM (ATT)	
- Post matching difference (kernel)	0.765***
	(2.60)
Observations	***229***
- Post matching difference (no replacement)	0.949***
	(3.02)
Observations	***229***
Multivariable regression	
- MVR coefficient (fe):	0.953***
	(3.34)
Observations	***229***
- MVR coefficient (fe) with control functions:	0.962***
	(3.36)
Observations	***229***

t statistics in parentheses
* p<0.10, ** p<0.05, *** p<0.01, PSM estimates bootstrapped 1000 repetitions

As is apparent, the households in the intervention group have exhibited a highly significant positive change in relation to asset ownership when compared with the comparison group.

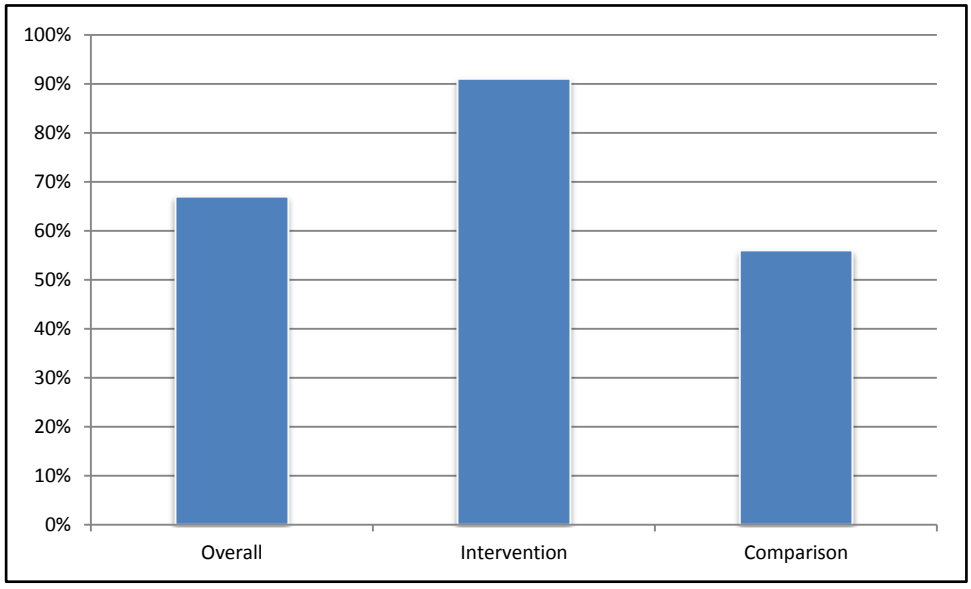
7.5 Perceived ability to meet household needs

During the interviewing process, the respondents were also asked to rank themselves in relation to how well their households were doing with respect to meeting basic needs. In particular, the following statements were read out to them, and they were asked to state which option best applies to their respective households.

1. "Doing well: able to meet household needs by your own efforts, and making some extra for stores, savings, and investment."
2. "Breaking even: Able to meet household needs but with nothing extra to save or invest."
3. "Struggling: Managing to meet household needs, but depleting productive assets and/or sometimes receiving support."
4. "Unable to meet household needs by your own efforts: dependent on support from relatives living outside of your household or the community, government and/or some other organisation – could not survive without this outside support."

Based on these responses, a variable was created to differentiate those that ranked themselves as being in first or second category. The unadjusted results are presented in Figure 7.5 below.

Figure 7.5: % of households who reported they are able to at least meet household needs



Over 90% of households in the intervention group reported being able to at least meet basic needs, compared to 56% of households in the comparison group.

As is apparent, there is a large overall difference: 91 per cent of the intervention group respondents reported being able to at least meet their basic needs, compared to 56 per cent for the comparison group. Table 7.11 presents the unadjusted results together with the results adjusted by the four estimation methods which control for observed differences between the groups. While these methods reduce the

difference between the groups, the difference is still very significant – estimated at between 27 per cent and 34 per cent.

The difference remains large even after applying the statistical adjustment procedures.

Table 7.11: % of households who reported they are able to at least meet household needs

	Overall
Unadjusted	
- Sample mean	0.67
- Intervention mean	0.91
- Comparison mean	0.56
- Unadjusted difference	0.355***
	(5.16)
Observations	***231***
PSM (ATT)	
- Post matching difference (kernel)	0.301***
	(5.47)
Observations	***231***
- Post matching difference (no replacement)	0.271***
	(5.06)
Observations	***231***
Multivariable regression	
- MVR coefficient with robust standard errors :	0.335***
	(4.84)
Observations	***231***
- MVR coefficient with control functions:	0.336***
	(4.54)
Observations	***231***

t statistics in parentheses
* p<0.10, ** p<0.05, *** p<0.01, PSM estimates bootstrapped 1000 repetitions

7.6 Measures of household food security

As mentioned above, one of the intended impacts of the support being provided to the households is to improve household food security. The Food, Agriculture, and Nutrition Technical Assistance (FANTA) Project's Household Food Insecurity Access Scale (HFIAS) was one of the key measures used to assess whether the support being provided to the households is having a positive effect. Each household is rated on a scale of 18 points, where a higher number of points indicates greater food insecurity.

Figure 7.6: Average Household Food Insecurity Score

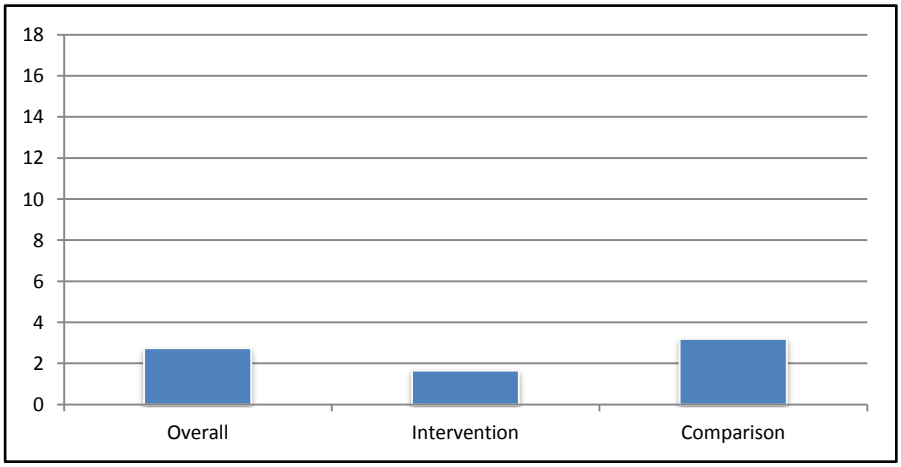


Figure 7.6 presents the average household food insecurity score for the intervention and comparison groups. As is apparent, households in both groups have a very low food insecurity score. However, households in the intervention group have a particularly low average score of 1.7 compared to 3.2 in the comparison group, indicating very high food security in the intervention group. Table 7.12 presents both the unadjusted and adjusted differences between the groups.

The intervention households reported having less food security problems than the comparison households.

Table 7.12: Average household food insecurity score

	Overall
Unadjusted	
- Sample mean	2.75
- Intervention mean	1.66
- Comparison mean	3.22
- Unadjusted difference	-1.559***
	(-4.01)
Observations	***232***
PSM (ATT)	
- Post matching difference (kernel)	-1.314***
	(-3.02)
Observations	***231***
- Post matching difference (no replacement)	-1.246***
	(-2.56)
Observations	***231***
Multivariable regression	
- MVR coefficient (robust standard errors):	-1.482***
	(-3.58)
Observations	***231***
- MVR coefficient (robust regression):	-0.974**
	(-2.35)
Observations	***231***
- MVR coefficient with control functions:	-1.469***
	(-3.61)
Observations	***231***

t statistics in parentheses
* p<0.10, ** p<0.05, *** p<0.01
PSM estimates bootstrapped 1000 repetitions

The adjustment methods estimate the average difference between the intervention and comparison households in the food insecurity score to be slightly lower than the unadjusted difference (-1.6 points), at between -1 and -1.5 points. However, the difference between the groups is still significant, i.e. the households in the intervention group were less likely to report having problems accessing food in their homes.

Respondents were also asked questions related to the number of times they ate during the previous day and the number of different food item types they consumed. Figure 7.7 illustrates the averages for households in the intervention and comparison groups. On average, households in the intervention group had almost one more meal per day than the comparison group, whilst the number of different food types consumed was about the same.

Figure 7.6: Average number of feedings and different types of food consumed during the previous day

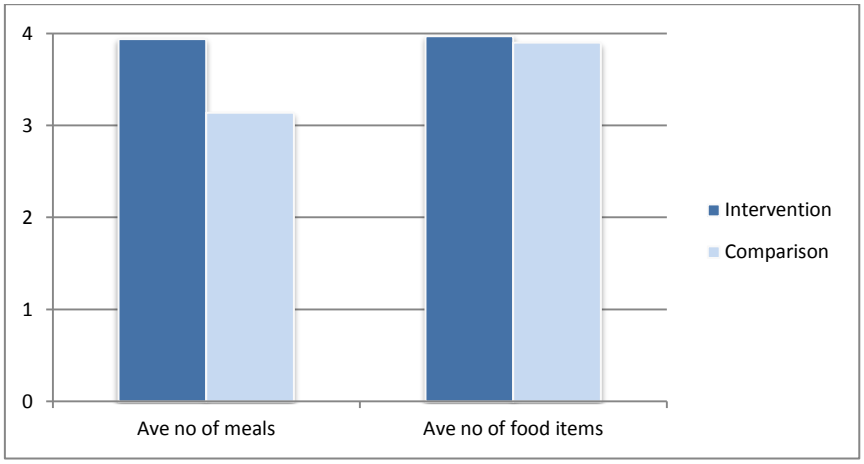


Table 7.13 presents the adjusted and unadjusted analysis for the number of meals/feedings consumed in the previous day by households in the intervention and comparison groups.

The intervention households reported eating more times during the previous day than the comparison households.

Table 7.13: Average number of feedings during the previous day

	Overall
Unadjusted	
- Sample mean	3.38
- Intervention mean	3.94
- Comparison mean	3.14
- Unadjusted difference	0.807***
	(4.18)
Observations	***232***
PSM (ATT)	
- Post matching difference (kernel)	0.763***
	(3.83)
Observations	***232***
- Post matching difference (no replacement)	0.757***
	(3.65)
Observations	***232***
Multivariable regression	
- MVR coefficient (robust standard errors):	0.732***
	(3.84)
Observations	***232***
- MVR coefficient (robust regression):	0.673***
	(3.70)
Observations	***232***
- MVR coefficient with control functions:	0.732***
	(3.84)
Observations	***232***

t statistics in parentheses
* p<0.10, ** p<0.05, *** p<0.01
PSM estimates bootstrapped 1000 repetitions

While the adjustment methods reduce the difference between the intervention and comparison groups in the average number of feedings/meals per day, households in

the intervention group are still more likely to have a greater number of meals per day than households in the comparison group.

Table 7.14 presents the unadjusted and adjusted figures for the average number of different food types consumed during the previous day. The difference between the intervention and comparison groups in the average number of food types consumed is very small (less than 0.1), although the adjustment methods estimate the difference to be slightly greater (between 0.1 and 0.3).

The number of food items consumed during the previous day is about the same in both groups.

Table 7.14: Average number of different food types consumed during the previous day

	Overall
Unadjusted	
- Sample mean	3.92
- Intervention mean	3.97
- Comparison mean	3.90
- Unadjusted difference	0.0702
	(0.39)
Observations	***232***
PSM (ATT)	
- Post matching difference (kernel)	0.137
	(0.79)
Observations	***232***
- Post matching difference (no replacement)	0.300
	(1.60)
Observations	***232***
Multivariable regression	
- MVR coefficient (robust standard errors):	0.175
	(0.95)
Observations	***232***
- MVR coefficient (robust regression):	0.182
	(0.95)
Observations	***232***
- MVR coefficient with control functions:	0.177
	(0.94)
Observations	***232***

t statistics in parentheses
* p<0.10, ** p<0.05, *** p<0.01
PSM estimates bootstrapped 1000 repetitions

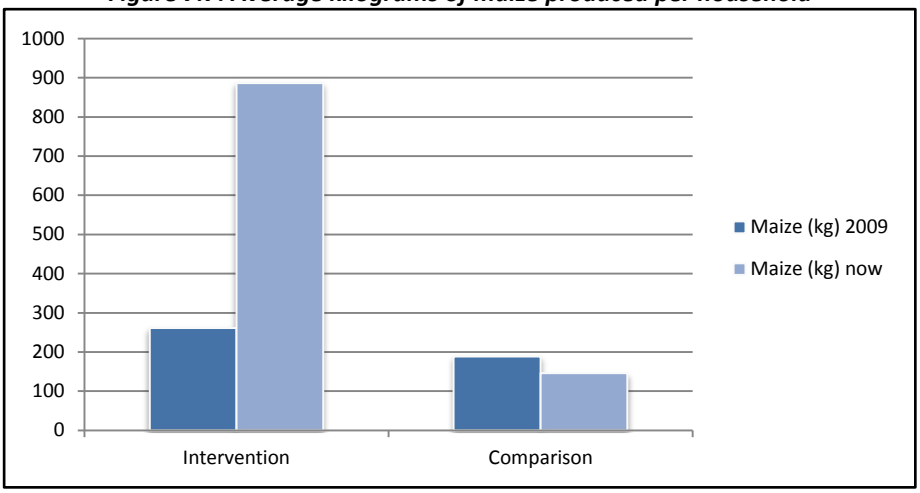
7.7 Agricultural production

One of the specific interventions of the project (see Section 3) was to provide irrigated land, seed and fertiliser, together with agricultural training, in an attempt to boost agricultural production. As part of the questionnaire, all respondents were asked to estimate the kilograms of various crops produced by the household over the last 12 months compared with 2009 (baseline). Using this information we are able to analyse the impact of the project on agricultural production in the intervention group compared with the comparison group.

As the intervention group (Phase 1 farmers) were initially provided with maize seed and then harvested in early 2011, the analysis focuses on specifically maize production.

Figure 7.7 clearly illustrates the differences in maize production, both between 2009 and in the year leading up to the review, and between the intervention and comparison groups. Average household maize production has increased in the intervention group from 261kg in 2009 to 886kg in the year leading up to the review, whereas production has decreased from 189kg to 146kg in the comparison group.

Figure 7.7: Average kilograms of maize produced per household



The intervention households experienced considerably greater gains in maize production than the comparison households.

Table 7.15: Difference in household maize production (kgs) between 2009 and the year leading up to the review – maize growers only

	Overall
Unadjusted	
- Sample mean	174.58
- Intervention mean	642.87
- Comparison mean	-52.88
- Unadjusted difference	695.7***
	(9.07)
Observations	***208***
PSM (ATT)	
- Post matching difference (kernel)	669.7***
	(9.05)
Observations	***208***
- Post matching difference (no replacement)	672.8***
	(9.29)
Observations	***208***
Multivariable regression	
- MVR coefficient (robust standard errors):	695.7***
	(8.92)
Observations	***208***
- MVR coefficient (robust regression):	709.6***
	(18.76)
Observations	***208***
- MVR coefficient with control functions:	686.8***
	(8.72)
Observations	***208***

t statistics in parentheses
* p<0.10, ** p<0.05, *** p<0.01, PSM estimates bootstrapped 1000 repetitions

Table 7.15 compares the difference in maize production between maize growers in the intervention and comparison groups. After controlling for differences between the groups, the significant difference in production change remains. The five adjustment methods estimate that average production in the intervention group has increased by between 670kg and 710kg more than for households in the comparison group.

7.8 Water and sanitation facilities used by the household

As outlined in Section 3, one of the complementary activities of the project has been implementing health and hygiene training sessions, together with improving water sources and building improved latrines on the project site. Respondents were asked which type of toilet facility was principally used by the household. The household was attributed a score of between 0 and 3 depending on the type of facility used:

3 points – private flush toilet, shared flush toilet
2 points – private VIP latrine, private pit latrine
1 point – shared VIP latrine, shared pit latrine
0 points – other

Table 7.16 presents the average household sanitation score for households in the intervention and comparison groups. The average household sanitation score is higher in the intervention group (0.93) than in the comparison group (0.72).

Only a small difference in sanitation practices between the two groups was observed.

Table 7.16: Average household sanitation 'score'

	Overall
Unadjusted	
- Sample mean	0.78
- Intervention mean	0.93
- Comparison mean	0.72
- Unadjusted difference	0.213*
	(1.83)
Observations	***232***
PSM (ATT)	
- Post matching difference (kernel)	0.169
	(1.33)
Observations	***232***
- Post matching difference (no replacement)	0.329***
	(2.60)
Observations	***232***
Multivariable regression	
- MVR coefficient (robust standard errors):	0.111
	(1.02)
Observations	***232***
- MVR coefficient with control functions:	0.117
	(1.06)
Observations	***232***

t statistics in parentheses
* p<0.10, ** p<0.05, *** p<0.01, PSM estimates bootstrapped 1000 repetitions

The respondents were also asked about the toilet facility used in 2009, and the average score for the intervention group was 0.87, whilst the average score for the

comparison group was 0.74. Therefore we see a slight increase in score between 2009 and 2011 for intervention households and a slight decrease for households in the comparison group.

Similarly respondents were asked about the principal source of drinking water for the household. The household was attributed a score of between 0 and 3 depending on the type of water source used:

3 points – piped water into dwelling / yard or plot
2 points – borehole, protected dug well, protected spring
1 point – public tap, unprotected dug well, unprotected spring
0 points – other

Table 7.17 presents the average household water source score for households in the intervention and comparison groups. The average household water source score is slightly higher in the intervention group (1.70) than in the comparison group (1.64).

Little difference was observed between the two groups in relation to their sources of water as well.

Table 7.17: Average household water source 'score'

	Overall
Unadjusted	
- Sample mean	1.66
- Intervention mean	1.70
- Comparison mean	1.64
- Unadjusted difference	0.0580
	(0.70)
Observations	***232***
PSM (ATT)	
- Post matching difference (kernel)	0.0517
	(0.62)
Observations	***232***
- Post matching difference (no replacement)	0.0857
	(0.98)
Observations	***232***
Multivariable regression	
- MVR coefficient (robust standard errors):	0.0730
	(0.83)
Observations	***232***
- MVR coefficient (fe) with control functions:	0.0704
	(0.80)
Observations	***232***

t statistics in parentheses
* p<0.10, ** p<0.05, *** p<0.01, PSM estimates bootstrapped 1000 repetitions

The differences between the groups are very slight, and the increase in scores between 2009 and 2011 is also small. In 2009, households in the intervention group scored 1.64, whilst households in the comparison group scored 1.62.

8 Conclusion and Programme Learning Considerations

8.1 Conclusions

There is evidence that the project is improving livelihoods but has not brought about water and sanitation-related behaviour change.

Overall, the analysis found a generally positive picture in terms of differences between the Phase 1 beneficiaries (referred to as the intervention group) and their comparators (Phases 2 and 3 beneficiaries) related to the various outcome measures used in the study. For OGB's global outcome-indicator for livelihoods – % of targeted households living on more than £1 per day per capita' – eight to 10 per cent more households in Phase 1 are living on more than £1 per day per capita compared to households in Phases 2 and 3. This provides some evidence of the project's effectiveness on this indicator, despite it being early it its lifespan.

A significant difference for the other measure for household income used – household asset ownership – was also found between the intervention and comparison households. The former group, in particular, experienced more positive changes in asset possession since the project's baseline period. Significant differences between the two groups were further observed in relation to the household food security/consumption and self-reported ability to meet household-needs measures.

The most likely explanation for these changes is due to the fact that the Phase 1 beneficiaries experienced significantly greater gains in maize produced in comparison with their Phase 2 and Phase 3 counterparts. On average, the annual production of maize per supported households has increased from 261kg in 2009 to 886kg in the year leading up to the review – an increase of 625kg per household. After controlling for observable differences between the households, there is evidence that the project has increased maize production by 240 percent among the Phase 1 beneficiaries.

A complementary objective alongside increasing household income, food security and agricultural production was to influence change in water and sanitation behaviour. However, very few differences between the intervention and comparison households were identified in relation to the relevant measures that were used.

8.2 Programme Learning Considerations

The findings and learning considerations in this report are based on the quantitative analyses carried out using household questionnaires. These may benefit from a qualitative understanding of the context and causal factors underlying the reported findings. We would therefore propose a collaborative process between Oxfam advisers and the programme team to discuss the findings and learning considerations in order to forge a way forward which benefits both this project and future work of this type.

Initial learning considerations emerging from the analysis of the data include:

- **Consider how to better support the producers to organise themselves collectively and support the marketing of the agricultural commodities to maximise the benefit gained from increased production**

  While the data reveal striking increases in maize production in the

intervention households, it was unclear how the surplus harvest will be marketed. This area was not explored in detail in the questionnaire. However, when respondents were asked about the 'usefulness' of the various services, the marketing/business training service was rated the least useful. Further anecdotal evidence suggests that this is an area of work which is still underdeveloped. It is therefore suggested that a strategic approach be considered to both coordinate production and the marketing of crop products. This should be informed by an agri-business feasibility study which examines the comparative production advantage of the supported households and market demand for the identified crops. Exploring these approaches would likely promote wider improvements in household food security beyond the project site, and further increase the income available to the producers. Discussion with Oxfam's economic advisers may assist in highlighting specific market linkage interventions which would benefit this project.

- **Review options to strengthen the health and hygiene interventions and training components of the project**

  While not the main focus of the project, there have been several important interventions relating to improving health and hygiene practice amongst beneficiary households. Despite these interventions, the analysis, as described above, shows no significant change in beneficiary household behaviour in terms of water and sanitation use. Further qualitative research with beneficiaries is recommended to explore this issue more deeply. This could prompt the review of project activities in terms of promoting good hygiene practice, and result in strengthened future implementation.

- **Consider further research to assess the food security impact of the project on the wider community**

  As the project matures, it will be interesting to assess how it has impacted wider communities in relation to food security. Within the project logic model there are explicit objectives regarding improving food security conditions for approximately 50,000 households in the wider surrounding areas of the project. It is suggested that the project team consider a similar evaluative approach as in this effectiveness review with neighbouring communities to assess wider impact.

- **Follow up on some of the specific findings from this report with further qualitative research**

  Further qualitative investigation may help to explain why the large change in asset ownership between 2009 and 2011 in the intervention group is not mirrored by large changes in household expenditure. In addition, it would be interesting to find out how the surplus maize produced in the first harvest by Phase 1 (intervention) farmers was specifically used (e.g. storage, provision to family/neighbours, sold at market etc) in the absence of complementary marketing interventions.