BASELINE REPORT

MCC Ghana Impact Evaluation Services

Baseline Data Analysis of Irrigation Schemes

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NORC at the UNIVERSITY of CHICAGO

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Executive Summary

MCC has contracted with NORC to assess the impact of up to five activities under the MCC Program in Ghana, including the Irrigation Activity, which is the focus of this report. The purpose of this report is to present a Baseline Data Analysis of Irrigation Schemes that will be used to assess the impact of improving and creating irrigation schemes on small farmers in terms of income, crop yield, employment, and other important characteristics. This report explores the degree of similarity across the treatment and comparison groups, as well as heterogeneity between the three different irrigation schemes, in order to isolate the effect of the irrigation activities and to examine other factors that may impact the degree of benefit households receive from the activity.

There were three irrigation schemes affected by this activity: two existing irrigation schemes were renovated in Botanga and Golinga, and a new scheme was built in Kpong. Treatment groups involve households with farmers who belong to FBOs within the geographic perimeters of the new/renovated irrigation schemes; these treatment groups are provided contracted access to an anchor farm through which they are able to receive irrigation. Comparison groups are households outside the water supply perimeters of the new/renovated irrigation scheme with characteristics similar to those of households in the treatment groups.

There are three main hypotheses regarding the outcome of the irrigation activity. First, the limited availability of irrigation during the dry season, particularly in Botanga and Golinga, and inadequate farm drainage during the rainy season gives households an average of 1-2 crops per year; the new irrigation schemes could raise this average to three crops per year. Second, irrigation could allow for higher-value crops to be grown in the dry season, allowing for a diversification of crops and potentially higher yields. Third, irrigation farming is much more intensive than normal subsistence farming, potentially imposing a greater labor requirement and raising the demand for labor. From these three hypotheses, there are five indicators that can be used to measure the impact of these irrigation activities: (1) total household income; (2) total household income from crop production; (3) paid employment per household; (4) crop mix – annual production output (kilograms) for each of the five most imported crops per household (i.e. want to observe move from low to high-value crops); and (5) crop yield (i.e. monitor output per unit, kilogram/hectare per crop cycle).

A difference-in-difference approach and an instrumental variable approach based on a distance indicator (i.e. instrument treatment with “farmer’s distance from anchor farm” if we can assume small farms closer to anchor farms are more likely to benefit from activity) will be used to evaluate the impact of the irrigation activity.

In terms of descriptive statistics there is no clear evidence that households in the treatment group are better or worse off than households in the comparison group. There are, however, important differences to consider. While the household head in the treatment group is more likely to be female, slightly less educated, and live in an informal dwelling, they were more likely to have children currently attending school. Households within the treatment group also had, on average, higher income, though the variance was high (as is the case with income in general), and the difference was not statistically significant. With respect to farming activities, there are two important differences to highlight across experimental groups. First, households in treatment

groups were more likely to own their own plots. This is important because the impact of irrigation activities could be confounded if the households in the treatment group are more likely to make long-term investments than households in the comparison group because they are owners of land. Second, households in the treatment group owned smaller plots of land in terms of area, on average.

In addition to the analysis of summary statistics, we conducted a regression analysis that indicated households in the treatment group have more education and fewer members, on average. Education and household size may be relatively stable over time (and thus may not provide a threat to identification in this context), but it is important to keep in mind that positive selection might be a factor to consider for the purpose of estimating the causal effects of providing irrigation.

Finally, there is some heterogeneity across irrigation schemes. Generally, households within the Kpong irrigation scheme are less disadvantaged than households within the Botanga and Golinga, while households in Botanga and Golinga exhibit roughly similar household and agricultural characteristics. Households in Kpong are more educated, more likely to live in a formal dwelling, and more likely to have a higher income on average. Households in Kpong also hold higher-area plots and produce crops at a higher yield, on average. These differences across experimental groups and heterogeneity among irrigation schemes are important to consider when estimating treatment effects. Running separate analyses for Kpong on one side and Botanga and Golinga on the other could possibly be used to sidestep heterogeneity issues.

Section 1: Introduction

Background to the MCC-Ghana and Objectives

MCC has contracted with NORC to assess the impact of up to five activities under the MCC Program in Ghana using the most rigorous methods possible. These activities include:

1. Agriculture Project, Post-Harvest Activity and Community Services Project, Electrification Sub-Activity
2. Agriculture Project, Irrigation Activity
3. Agriculture Project, Credit Activity
4. Rural Development Project, Community Services Activity, Education Sub-Activity
5. Rural Development Project, Financial Services

This report focuses on the Irrigation Activity. NORC proposed a double difference estimate with matching and covariates controls to evaluate the impact of the irrigation activities on small farmers. More specifically, the purpose of this report is to present the Baseline Data Analysis of Irrigation Schemes. It aims to show important characteristics of the treatment and comparison samples, and explore the degree of similarity between experimental groups (using a variety of observable characteristics found in the survey).

The degree of similarity between experimental groups is a critical aspect of the evaluation design; if observable characteristics indicate that the treatment and comparison groups are very different from each other, it may be more likely that there are also unobserved characteristics that are different between experimental groups that may be correlated with the outcomes of interest. If it is the case that there are *unobserved* characteristics that are correlated with both outcomes of interest and treatment status, then the causal impact estimates may be biased. For this reason, in this report we explore in detail how different or similar the treatment and comparison groups are from each other, based on the baseline data collected.

It is important to keep in mind that the evaluation design of the irrigation scheme is not experimental (the placement of irrigation schemes was based on a number of factors, and were not randomly placed), and as such we do expect the treatment and comparison samples to be different. The proposed design will result in unbiased (true) estimates of the impact of the intervention as long as differences between treatment and comparison groups that are associated with both treatment and outcomes of interest are accounted for.

In Section 1, we discuss the background of the irrigation schemes, evaluation hypotheses and impact indicators. We then describe the evaluation methodology and survey design and implementation (including objectives and questionnaires, sample design and organization of survey and data processing).

In Section 2, we present the main results from the baseline survey by topic. We describe household characteristics, participation in agricultural organizations, interaction with anchor farmers, training received, land use and ownership, and crop production. In Section 3, descriptive

statistics by irrigation scheme are presented to show how heterogeneous households are between the three irrigation schemes under study; this is important in to address possible heterogeneous treatment effects. In Section 4, we use regression analysis to study which observable characteristics are correlated with being in the treatment group. Section 5 presents a summary of the main findings.

Background to the Irrigation Schemes

MIDA's activities include the renovation of two irrigation schemes in the Tolon Kumbungu district in the Northern Agricultural Zone, and the construction of a new scheme in the North Tongu district in the Southeastern Horticultural Belt. The northern schemes are the Bontanga Irrigation Project and the Golinga Irrigation Project, both located near Tamale, the regional capital. The new southeastern scheme, known as the Kpong Left Bank Irrigation Scheme, is located in the Volta Region near the village of Torgorme.

The following table summarizes some important characteristics of the three irrigation schemes[1]:

Table 1. MiDA Construction and Renovation of Irrigation Schemes

Irrigation Scheme	Area, small farmers (Ha.)	Area, anchor farm (Ha.)	No. FBOs	No. Small Farmers	Cost (US $000)
Kpong	450	1070	15	746	10,881
Botanga	495	315	10	528	3,047
Golinga	40	None	5	246	

Source: MiDA and IFDC technical staff

MiDA's irrigation activity was planned such that small farmers operating within each of the three irrigation schemes would have the opportunity to participate in contract farming arrangements with a large, commercial farm known as an "anchor farm" located near the small farmer irrigation scheme. The anchor farmer would have access to irrigation water from the main canal that carries water from the reservoir to the irrigated area for small farmers. The anchor farmers would be required to pump irrigation water onto their farms, since the terrain does not permit gravity flow to these farms.

The anchor farmers would also provide training, technical assistance, and seed to the contracted small farmers through their FBO Unions, for the production of the required crops. In addition to providing market outlets for their designated crops, the anchor farmers will help their small farmers to comply with international standards for export products (eg. GlobalGap).

The Irrigation Schemes

Kpong Left Bank: The Kpong irrigation system is located outside MiDA's targeted intervention area of thirty districts. The anchor farmer at the scheme plans to farm an irrigated area of 1,070 hectares located adjacent to the small farmer irrigation scheme. Construction of this irrigation scheme began on January 21st 2011 and was expected to be completed on January 20th, 2012.

[1] The evaluation design team was informed by MCC that the costs shown in this table (provided by MiDA) include neither the feasibility studies nor construction supervision, nor the investments done for the anchor farmers in the irrigation schemes.

Nevertheless, this activity faced significant delays and only received the Completion Certificate at the end of January 2013.

Bontanga: The Bontanga irrigation project is the largest irrigation scheme in the Northern Region. Its water source is a large reservoir fed by the Bontanga River. MiDA rehabilitated an area of 495 hectares, of a maximum potential area of 800 hectares. The anchor farmer will cultivate an area of 315 hectares that is adjacent to the irrigation scheme. The company will pump irrigation water for its farm from a collection point that is being constructed at the extreme end of the main canal serving the Bontanga small farmers. Construction of this irrigation scheme began on March 15, 2011 and it was completed on January 31st 2012. Operations started shortly thereafter.

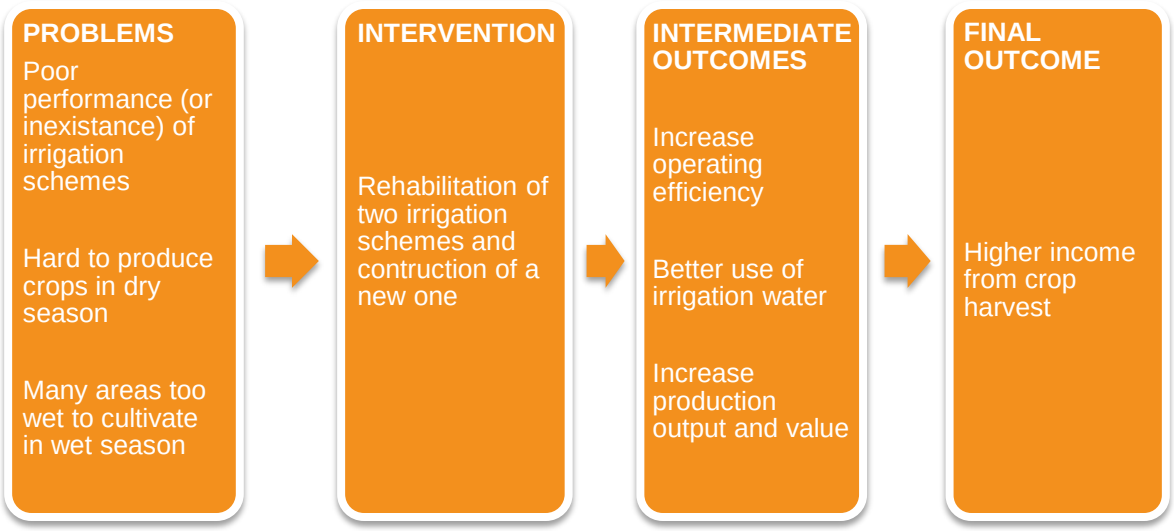
Golinga: The Golinga irrigation scheme was originally built in 1965, with a planned capacity of 100 hectares of irrigated land. The scheme draws water from a small reservoir fed by the Jolo River. Currently, the scheme covers of a total area of 65 hectares, with a net area under cultivation of 60 hectares. MiDA rehabilitated an area of 40 hectares. Due to the relatively small size of the Golinga scheme, there is no large, commercial anchor farm located nearby. However, it was planned that the anchor farmer at the Bontanga irrigation scheme would negotiate supply contracts with the Golinga farmers as well. Construction of this irrigation scheme began on March 15, 2011 and was completed on Jaunary 31st 2013.

The anchor farm, Solar Harvest, has not yet begun commercial farming operations on its concession area at Bontanga. The anchor farm has had access to irrigation water since January 31, 2012, but since that time it has worked to organize its commercial farming operation, clear its concession land area for crop production, and procure and install a center-pivot sprinkler irrigation system that covers 200 hectares. The company is expected to begin crop production of maize, soybeans, and rice grains in the first half of 2014.

Evaluation Hypothesis and Impact Indicators

Due to poor scheme management combined with inadequate maintenance and repair, the performance of the Bontanga and the Golinga schemes declined over time and both schemes were operating at less than half their design capacities. These problems were exacerbated by the failure of farmers to pay the full amount of the assessed irrigation fees. Currently only about 300 hectares are being cultivated in the dry season, with a similar crop area cultivated during the rainy season. During the dry season, the poor condition of the irrigation canals limits the amount of water that can be provided for crop production. During the rainy season, poor soil drainage caused by clogged and silted drainage canals makes a large part of the scheme area too wet to cultivate.

MiDA rehabilitated the existing network of both irrigation and drainage canals. This work was expected to increase operating efficiency and improve the overall performance of the entire scheme. The rehabilitation was also expected to equip the scheme with monitoring equipment for better control and more efficient use of irrigation water. Ultimately, the irrigation activity, once completed, would make it possible for the small farmers on the schemes to cultivate their crops without regard to rainfall patterns, which would substantially increase their production output. Furthermore, contract farming arrangements with the anchor farmer are expected to provide a reliable market outlet for the small producers, as well as access to good-quality seed and to crop production technology.



The main hypotheses regarding outcomes of the irrigation activity are the following:

1. With irrigation water supply and good crop management, it will be possible to grow three crops per year in both the north and south regions. Presently, with the limited availability of irrigation at Botanga and Golinga during the dry season, and given the inadequate farm drainage that limits the use of land in lower producing areas during the rainy season, one to two crops annually is the norm for farmers in both locations. More crops would translate into increased farm production/output and greater farm incomes for small farmers.

2. Irrigation makes it possible to cultivate a mix of higher-value crops. For example, high-value vegetable crops, particularly leafy vegetables are greatly susceptible to losses from pests and diseases during the rainy season. With irrigation, these crops could be successfully grown during the dry season when prices tend to be higher. A higher-value crop mix provides greater farm incomes for small farmers.

3. Irrigated, commercial crop production is much more intensive and has a greater labor requirement than subsistence agriculture. Labor requirements for the anchor farms will be substantial – up to seven workers per hectare. In addition even small farmers could need to engage hired labor, especially for harvesting crops. The resulting employment generation at the irrigation schemes could be substantial.

Based on these hypotheses, NORC proposed to use the following indicators to measure impact:

1. Total annual household income

2. Total annual household income from crop production

3. Paid employment per household

4. Crop mix: Annual production output (kilograms) for each of the five most important crops produced per household. We aim to measure the changes from low to high value crops.

5. Crop yield: A crop will be selected as a representative at each irrigation site and its output per unit area (kilograms per acre) will be monitored for each crop cycle.

Evaluation Methodology

NORC proposed a double difference estimate with matching and covariates controls as appropriate to evaluate the impact of irrigation activities on small farmers. The treatment group for each irrigation scheme will be the small farmers that belong to FBOs that operate within the geographic perimeters of the irrigation scheme and will be able to receive irrigation. The comparison group will be composed of the farmers outside the water supply perimeters who do not receive the benefits of the irrigation schemes but are similar in characteristics to the treatment groups given the geographical proximity. Our sample was drawn in two stages: first we selected FBOs to be part of the sample and then we selected a sample of farmers associated with these FBOs.

In order to estimate the effect on paid employment we can use both a difference-in-difference approach and an Instrumental Variable (IV) approach, based on a distance indicator. If we assume that small farmers who live closer to the anchor farmers are more likely to benefit from increased demand for labor on anchor farms, we can instrument treatment by using "farmer's distance to the anchor farmer" either as a continuous variable or as discrete categories defined by distance of, for example, 20km radius and 30km radius as suggested before.

Survey Design and Implementation

The irrigation survey was designed to gather information from households on outcomes or indicators that the project is expected to affect, as well as on factors (such as education) that may influence the magnitude of project impact. The questionnaire, developed by NORC and approved by MCC, is included in Annex 1.

The irrigation and ABC surveys were implemented by NORC's local partner, Panafields. Both surveys took place from September 11th, 2012 to December 9th, 2012. Each team was composed of 1 supervisor and 3 interviewers, supported by a data quality checker assigned to each region. A total of 656 interviews were completed for the irrigation survey.

Table 2. Treatment and Control Samples by Irrigation Scheme

Irrigation Scheme	Control	Treatment	Total
Botanga	97	103	200
Golinga	47	52	99
Kpong	170	187	357
Total	314	342	656

Section 2: Household Characteristics

This section describes the data by treatment groups. Farmers in the treatment group are those that belong to FBOs that operate within the geographic perimeters of the irrigation scheme, and will be able to receive irrigation. Farmers in the comparison group are outside the water supply perimeters, meaning they do not receive the benefits of the irrigation schemes, but are similar in characteristics to the treatment farmers.

Table 3 shows socio-demographic descriptive statistics for the two groups. In Panel A we focus on the demographic characteristics of the household head. We can see that households in the treatment group are 6 percentage points more likely to be headed by a female. The difference is significant at standard levels of confidence. Age of the household head, on the other hand, is similar for the two groups at roughly 51.3 years on average. The education level of the household heads is also relatively similar between treatment and comparison groups. The only significant difference is in the share that reached junior high school, which is higher for the treatment group by 6 percentage points. The comparison group, by contrast, has a larger share of household heads that received senior high school and tertiary education. In other words, household heads in the comparison group have more education than their counterparts in the treatment group, which is corroborated by their mean years of education, which is 4.5 for the comparison group and 4.4 for the treatment group; however, this difference is not statistically significant.

Table 3. Descriptive Statistics by Treatment Group – Socio-demographics

	Comparison	Treatment	Diff.
A. Household head characteristics			
Female	0.10	0.16	-0.06**
Age in years	51.2	51.5	-0.2
Highest education level achieved			
No Education	0.51	0.51	0.01
Primary	0.09	0.09	0
Junior High School	0.07	0.13	-0.06**
Senior High School	0.19	0.17	0.01
Tertiary Education	0.14	0.10	0.04
Years of education (mean)	4.53	4.37	0.16
B. Household characteristics			
Number of household members			
Less than 5	0.09	0.13	-0.04
Between 5 and 8	0.41	0.44	0
Between 9 and 11	0.21	0.19	0.02
More than 11	0.28	0.24	0.04
Fraction of children 7-14 that is in school	0.85	0.90	-0.05**
Hungry season	0.23	0.26	-0.03
Always lived in the same village	0.96	0.98	-0.01
Formal dwelling	0.43	0.21	0.23***
Number of household assets	7.95	8.07	-0.12
C. Mean annual income (USD^)			
Income from crops	3,815	4,610	-795
Other income	1,144	1,889	-745
Total income	4,958	6,498	-1,540
N	**311**	**342**	

* p<.1 ** p<.05 *** p<.01

Notes: Three outliers with agricultural income greater than USD 1M are dropped.

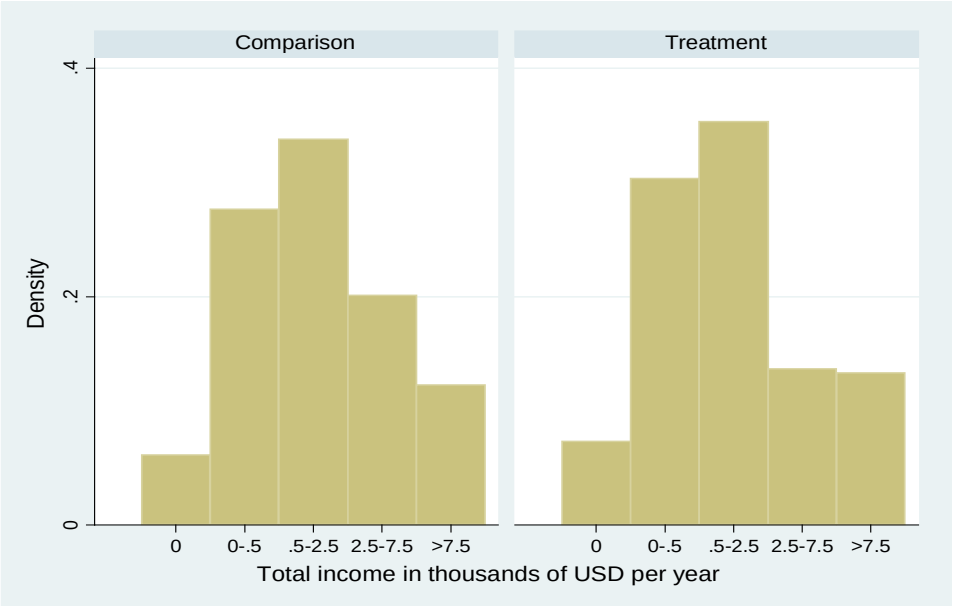
^Annual income in US dollars calculated using an exchange rate of 0.5 USD=1 Cedis.

Panel B presents characteristics of the household. There are no major differences in the number of household members. The fraction of children 7 to 14 years of age that are in school is 90 percent for the treatment group and 85 percent for the comparison group; the difference of 5 percentage points is significant. Households in the treatment group are slightly more likely to have suffered hunger and to have always lived in the same village, but these differences are not significant. On the other hand, there is a substantial difference in the fraction of households living in a formal dwelling, as opposed to a shack or a hut: 21 percent in the treatment group and 43 percent in the comparison group.

We show descriptive statistics for income in Panel C. Income from crops is USD 795 per year (21 percent) higher for the treatment group than for the comparisons. Other income, which includes off-farm labor income and non-labor income, is also higher for the treatment group than for the comparison households. Consequently, total income is higher among households in the treatment group than for their counterparts in the comparison group. Although the differences are substantial, they are not significant, which is not surprising given the small sample and that income, in general, has high variance.

A more detailed description of the total income distribution can be observed in Figure 1. We can see that roughly 7 percent of households in both groups report no income, and that the majority of households report income between 0 and USD 2,500 per year. Although the distributions are relatively similar, most of the mass for the households in the treatment group is in the bins 0 to USD 500 and USD 500 to USD 2,500, while the distribution for households in the comparison group is slightly more dispersed.

Figure 1. Total Income Distribution



Characteristics related to agricultural production, training and interaction with agricultural organizations are presented in Table 4

Table 4. Ninety-five percent of households in the treatment group owned at least one of the plots they hold, while only 77 percent of households in the comparison group do. This difference, of 18 percentage points, is large compared to the mean and is statistically significant. In addition, households in the treatment group hold more plots than their counterparts in the comparison group. The distribution of plots is also a little different between the two study groups. As can be seen in Figure 2, the majority of households in the comparison group are clustered at 1, 2 or 3 plots, and very few hold more than that, while the tail is slightly longer for the treatment group.

Figure 2. Number of Plots Held by Treatment Group

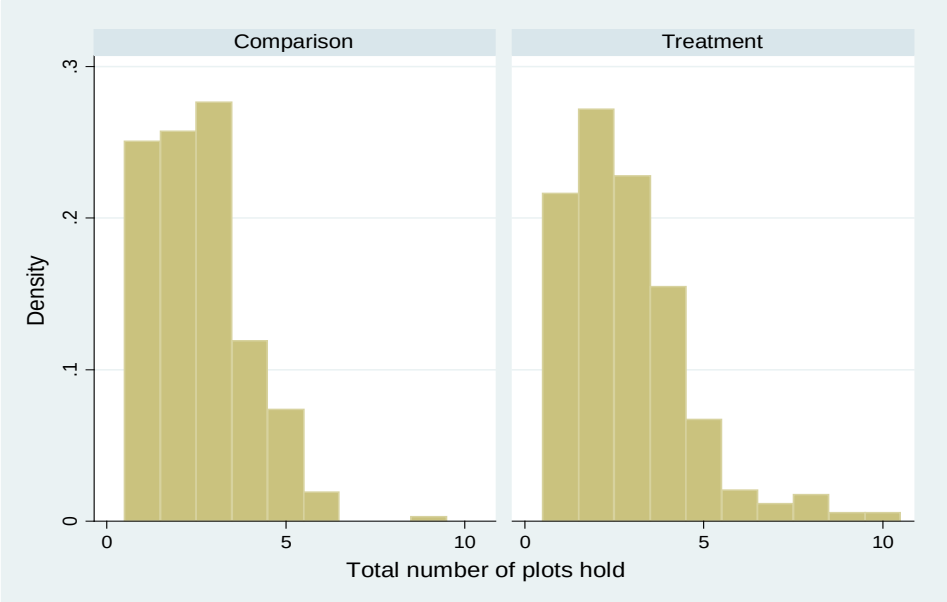


Table 4. Descriptive Statistics by Treatment Group – Agriculture

	Comparison	Treatment	Diff.
A. Agricultural Production			
At least one plot owned	0.77	0.95	-0.18***
Number of plots hold	2.59	2.86	-0.27**
Fraction of area cultivated	0.91	0.88	0.03
Fraction of area irrigated	0.07	0.09	-0.02
- In irrigation scheme	0.22	0.70	-0.47***
Total area in Hectares (GPS)	3.57	2.85	0.72**
Crop production			
Grows kernel maize	0.80	0.70	0.10***
Grows fresh maize	0.12	0.11	0.01
Grows rice	0.31	0.48	-0.17***
Grows peppers	0.20	0.18	0.02
Grows shelled ground nuts	0.13	0.14	0
Yields for those that grow… (Kg/Hectare)			
Kernel maize	1,092	776	315.48**
Fresh maize	710	723	-12.95
Rice	626	1,656	-1,029.43***
Peppers	3,896	693	3,202.78*
Shelled ground nuts	508	476	31.89
B. Agricultural Training			
Farming as a business			
Individuals over 17 receiving training	0.30	0.24	0.06*
For those that received training:			
MiDA provided training	0.89	0.94	-0.05
Individual applied training	0.97	0.94	0.03
Individual thinks training was useful	0.89	0.84	0.05
Crop production			
Individuals over 17 receiving training	0.80	0.63	0.17***
For those that received training:			
MiDA provided training	0.87	0.90	-0.03
Individual applied training	0.98	0.87	0.11***
Individual thinks training was useful	0.85	0.77	0.08**
C. Agricultural Organizations			
FBO member	0.98	0.93	0.05***
Belong to FBO because:			
Access to inputs	0.34	0.36	-0.02
Information about prices	0.18	0.09	0.10***
Access to training	0.66	0.47	0.18***
Sharing of farming techniques	0.33	0.26	0.07*
Sharing of equipment	0.05	0.07	-0.02
Any member has mgmt position	0.26	0.20	0.05
HH interacts with anchor farmer	0.03	0.21	-0.17***
N	**311**	**342**	

* p<.1 ** p<.05 *** p<.01

Notes: Three outliers with agricultural income greater than USD 1M are dropped.

As shown in Panel A of Table 4, most of the land held is cultivated in both treatment and comparison groups. The fraction of land that is irrigated is 9 percent for the treatment group and 7 percent for the control group. This difference is relatively small and not significant. It is important to highlight that most of the irrigation works were not finished when the baseline data was collected, which explains the low likelihood that plots are irrigated even in the treatment group. Of the irrigated area, the fraction that is in an irrigation scheme is 70 percent in the treatment group and 22 percent in the comparison group. Although some farmers in the control group report having plots irrigated by the schemes, this is observed only for 1.5 percent for the households in the comparison group (0.7 * 0.22).

On average the total land area held[2] is greater for the comparison than for the treatment group. This, combined with the fact that households in the treatment groups hold more plots than households in the comparison group, indicates that plots are smaller in the treatment group.

Table 4 also presents descriptive statistics for a few crops that are among the most commonly grown in these areas. The fraction of households growing kernel maize is 70 percent for the treatment group and 80 percent for the comparison group. Rice, on the other hand, is more frequently grown in the treatment than in the comparison group, the fractions being 48 and 31 percent respectively. Both peppers and shelled ground nuts are grown by treatment and comparison households with a relatively similar propensity. Mean yield for kernel maize and peppers are significantly higher for farmers in the comparison group than for the treatment group, while the opposite pattern is observed for mean yield for rice.

In Panel B we show descriptive statistics related to training. The fraction of households with an adult member that has received training in '*farming as business'*, is 30 percent for the comparison group, and 24 percent for the treatment group. The difference between the two groups is statistically significant. Most of these households got their training from MiDA; they applied what they learned in the previous season, and they found that the training was useful. With respect to crop production, the fraction of households receiving this type of training is 80 percent for the comparison group and 63 percent for the treatment group. Again, the difference is statistically significant. Similarly to what was observed for '*farming as business'*, for training on crop production we can see that most households got training from MiDA, applied the techniques learned, and concluded that the training was useful.

Finally, Panel C shows descriptive statistics related to households interactions with agricultural organizations. The share of households that belong to an FBO is 93 percent for the treatment group and 98 percent for the comparison group. The most frequently mentioned reason for belonging to an FBO is access to training. The fraction of households that report this reason is 47 percent for the treatment group and 66 percent for the comparison group. Other reasons are access to inputs and sharing of farming techniques. Household members in the comparison group are more likely to hold a management position in their FBO, than their counterparts in the treatment group, although the difference is not significant.

Not surprisingly, households in the treatment group are more likely to have interacted with an anchor farmer. In effect, the proportion of households that have interacted with an anchor farmer is 21 percent for the treatment group and 3 percent for the comparison group.

[2] Total area held was calculated using GPS measurements registered in visits to the plots.

In sum, with respect to sociodemographic characteristics, there is no clear evidence that households in the treatment group are more or less disadvantaged than households in the comparison group. The household heads in the treatment group have a little less education, and are less likely to live in a formal dwelling than their counterparts in the comparison group, but their children are more likely to be in school than children in the comparison group. With respect to income, we find large differences in favour of households in the treatment group, although these differences are not statistically significant.

There are a few differences between treatment and comparison groups related to farming activities are worth highlighting. First, households in the comparison group are less likely to own at least one of their plots, which could mean that they are less likely to make long-term investments. This could be problematic for identification. If treated households were more likely to make long term investments, this would confound the effect of the irrigation activities we are trying to estimate. Second, plots in the treatment group are smaller than plots in the comparison group.

Section 3: Heterogeneity

In this section we present summary statistics by irrigation scheme. Analyzing how heterogeneous irrigation schemes are important, because the effect of the treatment may vary according to the baseline characteristics of each project.

Table 5 shows socio-demographic characteristics by irrigation scheme. The share of households headed by a female is very small in both Botanga and Golinga, 4 and 3 percent respectively. In the case of Kpong, 21 percent of households are headed by a female. The mean age of the household head is 52 for Botanga, 46 for Golinga and 52 for Kpong. Similar to what is observed for gender, the education level of the household head in Botanga and Golinga is very different compared to what is observed for Kpong. While most household heads have no education in Botanga and Golinga (85 and 93 percent, respectively), only 20 percent have no education in Kpong, and almost half have senior high school or tertiary education.

Table 5. Descriptive Statistics by Irrigation Scheme – Socio-demographics

	Botanga	Golinga	Kpong
A. Household head characteristics			
Female	0.04	0.03	0.21
Age	52.5	46.5	51.7
Highest education level achieved			
No Education	0.85	0.93	0.20
Primary	0.02	0.02	0.15
Junior High School	0.04	0.01	0.16
Senior High School	0.03	0.00	0.31
Tertiary Education	0.07	0.04	0.17
Years of education (mean)	1.4	0.6	7.2
B. Household characteristics			
Number of household members			
Less than 5	0.05	0.03	0.17
Between 5 and 8	0.21	0.34	0.57
Between 9 and 11	0.22	0.17	0.20
More than 11	0.53	0.45	0.06
Fraction of children 7-14 that is in school	0.79	0.74	0.95
Hungry season	0.26	0.34	0.21
Always lived in the same village	1.00	0.94	0.96
Formal dwelling	0.15	0.13	0.46
Number of household assets	10.84	7.68	6.51
C. Mean annual income (USD^)			
Income from crops	3,533	2,077	5,239
Other income	466	251	2,530
Total income	4,000	2,328	7,769
N	**200**	**99**	**354**

Notes: Three outliers with agricultural income greater than USD 1M are dropped.
^Annual income in US dollars calculated using an exchange rate of 0.5 USD=1 Cedis.

Household size also varies between Kpong and the other two irrigation schemes. In effect, roughly half of Botanga and Golinga households have more than 11 members, while only 6 percent of households in Kpong have more than 11 members. Furthermore, the fraction of children in school is higher for Kpong than for Botanga and Golinga, households in Kpong are less likely to have suffered hunger in the last year, and more likely to live in a formal dwelling. By contrast, the number of non-agricultural household assets is actually lower for Kpong than for the other irrigation schemes. Botanga has 10.8 household assets on average, Golinga 7.7 and Kpong only 6.5.

The results for income, displayed in Panel C, confirm that households in Kpong are less disadvantaged than those in Botanga and Golinga. Income from crops as well as other income is higher on average in Kpong than in the other two irrigation schemes. In effect, total income in Kpong is almost double that in Botanga, and more than three times the total income in Golinga.

In Figure 3, we see the distribution of total income for households for the three irrigation schemes. Botanga and Golinga are clustered in the USD 0 – USD 500 and USD 500 – USD

2,500 bins, with very few households reporting more than USD 2,500. Kpong has the smoothest and most symmetric distribution, with most of its mass in the USD 500 – USD 2,500 bin.

Figure 3. Total Income Distribution

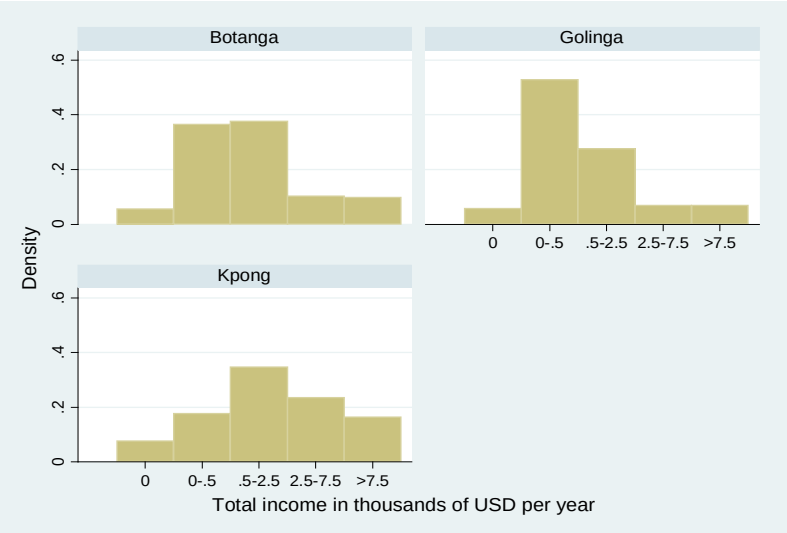


Table 6 presents characteristics related to agricultural production, training and interaction with agricultural organizations. Most households in Botanga and Golinga, 98 and 93 percent, respectively, own at least one plot. In Kpong, on the other hand, only 79 percent of respondents own at least one of the plots they hold. The number of plots held is lower in Kpong compared to Botanga and Golinga, as is the share of land that is cultivated.

The mean fraction of land that is irrigated is 12 percent in Botanga, 8 percent in Golinga and 7 percent in Kpong. We reemphasize here that this is baseline data, hence, the penetration of irrigation is low. Of the irrigated area, the proportion that is in an irrigation scheme is 60 percent in Botanga, 96 percent in Golinga and 19 percent in Kpong (where many farmers were displaced due to construction activities). Total land area held is larger for Kpong than for Botanga and Golinga.

Roughly 86 percent of households in Botanga and Golinga grow kernel maize, while the figure for Kpong is 64 percent. Households in Botanga and Golinga are also more likely to grow rice and shelled ground nuts than households in Kpong, while the opposite is true for fresh maize. With the exception of rice, yields are substantially higher for Kpong than for the other irrigation schemes.

Table 6. Descriptive Statistics by Irrigation Scheme – Agriculture

	Botanga	Golinga	Kpong
A. Agricultural Production			
At least one plot owned	0.98	0.93	0.79
Number of plots hold	3.76	2.88	2.10
Fraction of area cultivated	0.95	0.91	0.86
Fraction of area irrigated	0.12	0.08	0.07
- In irrigation scheme	0.60	0.96	0.19
Total area in Hectares (GPS)	2.78	2.12	3.72
Crop production			
Grows kernel maize	0.88	0.84	0.64
Grows fresh maize	0.03	0.03	0.20
Grows rice	0.72	0.75	0.09
Grows peppers	0.25	0.10	0.17
Grows shelled ground nuts	0.35	0.13	0.01
Yields for those that grow… (Kg/Hectare)			
Kernel maize	568	558	1,443
Fresh maize	733	606	722
Rice	1,061	887	3,328
Peppers	1,276	697	3,567
Shelled ground nuts	492	390	1,084
B. Agricultural Training			
Farming as a business			
Individuals over 17 receiving training	0.45	0.35	0.14
For those that received training:			
MiDA provided training	0.98	0.86	0.84
Individual applied training	0.99	1.00	0.86
Individual thinks training was useful	0.94	0.77	0.80
Crop production			
Individuals over 17 receiving training	0.70	0.64	0.74
For those that received training:			
MiDA provided training	0.96	0.90	0.83
Individual applied training	0.98	0.98	0.89
Individual thinks training was useful	0.88	0.81	0.79
C. Agricultural Organizations			
FBO member	1.00	1.00	0.92
Belong to FBO because:			
Access to inputs	0.67	0.34	0.15
Information about prices	0.14	0.25	0.10
Access to training	0.70	0.59	0.47
Sharing of farming techniques	0.27	0.39	0.29
Sharing of equipment	0.07	0.09	0.04
Any member has mgmt position	0.18	0.15	0.28
HH interacts with anchor farmer	0.13	0.41	0.04
N	**200**	**99**	**354**

Notes: Three outliers with agricultural income greater than USD 1M are dropped.

Panel B shows descriptive statistics for agricultural training. The share of households that received training on "farming as business" is 45 percent for Botanga, 35 percent for Golinga and 14 percent for Kpong. With respect to training in crop production, 70 percent in Botanga, 64 percent in Golinga and 74 percent in Kpong received this training. In general, both types of training were provided by MiDA, and farmers found that training was useful.

Panel C presents summary statistics for agricultural organizations. All households in Botanga and Golinga are members of an FBO, while the fraction in Kpong is 92 percent. The reasons that households report for interacting with their FBOs vary slightly by irrigation scheme, but access to training is the most common reason across the three irrigation schemes. Finally, the percentage of households that report having interacted with an anchor farmer is 13 percent for Botanga, 41 percent for Golinga and 4 percent for Kpong. Not surprisingly very few households overall have interacted with an anchor farmer. Although the fraction for Golinga is relatively high, it is important to remember that Golinga is a very small scheme and only 99 households were surveyed.

It is apparent that households in Kpong are less disadvantaged than households in Botanga and Golinga. Households in Kpong are more educated, more likely to live in a formal dwelling and have higher income. They also hold more area and produce crops at a higher yield. These differences between the irrigation schemes are important to keep in mind when estimating the treatment effects.

Section 4: Modeling Participation

To analyze how different household characteristics are correlated with treatment status, Table 7 shows marginal effects for logit regressions, where the dependent variable is the participation dummy. Given the documented heterogeneity between the three irrigation schemes (especially between Botanga and Golinga in one side, and Kpong in the other), we show results without controlling for irrigation scheme fixed effects in the first column and controlling for it in the second column. Most of the variables described in the summary statistics are included in the regressions[3].

We can see that, overall, the specification is not very sensitive to the use of irrigation scheme fixed effects, as most of the coefficients do not change that much between the two models. Although households are quite different depending on their irrigation scheme, it is possible that the correlations of household characteristics and participation are not that different overall, which could explain the low sensitivity to the use of fixed effects. In what follows, we will only refer to the second, most saturated specification.

With respect to household head characteristics, while gender and age do not seem to be correlated with participation, education level is. Household heads with junior high school education are 33.3 percentage points more likely to be in the treatment group and those with

[3] We do not include variables that are observed only for certain groups (like yields from specific crops), or variables that are too correlated, like the number of plots and the total area held (in this case, only the latter is included). We did not include variables related to income in order to rely in more invariant measurements of wealth, like household assets and land held.

senior high school education are 20.1 percentage points more likely to be in the treatment group. The coefficient on tertiary education is also positive but not significant. These results suggest that there might be a non-linear relationship between education and participation. Household heads with no education are less likely to be in the treatment group, but after education beyond junior high school does not seem to increases the likelihood of being in treatment.

Regarding household characteristics, household size is strongly negatively correlated with the probability of being in the treatment group. At the same time, living in a formal dwelling, as opposed to a shack or a hut, is negatively correlated with the likelihood of being in the treatment group, while a positive correlation is observed for number of household assets.

With respect to crop production, households growing maize are less likely to be in the treatment group, while the opposite is observed for households growing rice. Finally, households with members that have received training (in farming as a business, crop production, post-harvest activities and/or irrigation), are less likely to be in the treatment group.

Table 7. Marginal Effects for a Logit Model on being in the Treatment Group

	(1)	(2)
A. Household head characteristics		
Female	0.0730	0.0423
	(0.0968)	(0.0875)
Age	0.00291	0.00246
	(0.00189)	(0.00185)
Education level (No Ed. Is the left out category)		
Primary	0.127	0.0730
	(0.0980)	(0.0972)
Junior High School	0.397***	0.333***
	(0.107)	(0.102)
Senior High School	0.257***	0.201*
	(0.0993)	(0.105)
Tertiary Education	0.172*	0.119
	(0.0902)	(0.0913)
B. Household characteristics		
Number of household members (Less than 5 is the left out category)		
Between 5 and 8	-0.0829	-0.0932
	(0.0778)	(0.0735)
Between 9 and 11	-0.237***	-0.238***
	(0.0828)	(0.0833)
More than 11	-0.305***	-0.296***
	(0.0947)	(0.0964)
Hungry season	0.0308	0.0409
	(0.0636)	(0.0600)
Always lived in the same village	-0.00700	-0.00151
	(0.145)	(0.136)
Formal dwelling	-0.407***	-0.423***
	(0.0993)	(0.0960)
Number of household assets	0.0148***	0.0163***
	(0.00570)	(0.00505)
C. Agricultural Production		
Fraction of area irrigated	0.112	0.130
	(0.138)	(0.141)
Total area (GPS)	-0.00889	-0.00960
	(0.00904)	(0.00905)
Crop production		
Grows kernel maize	-0.257***	-0.245***
	(0.0740)	(0.0753)
Grows fresh maize	-0.199*	-0.204**
	(0.102)	(0.102)
Grows Rice	0.303***	0.348***
	(0.0966)	(0.0841)
Received agricultural training	-0.309***	-0.304***
	(0.0977)	(0.101)
D. Agricultural Organizations		
Any member has mgmt position	-0.0257	-0.0281
	(0.0574)	(0.0555)
Irrigation scheme fixed effects	No	Yes
Dep. Var. mean	**0.524**	**0.524**
N	**652**	**652**

Standard errors clustered at the FOB level in parentheses.
Notes: All specifications include dummies for item response missing data. One observation is dropped due to perfect predictability.
* p<.1 ** p<.05 *** p<.01

Section 5: Summary

The analysis of the baseline data uncovered important characteristics of the treatment and comparison groups. First, sociodemographic characteristics do not seem very different between the two groups and, although there are some important differences regarding income, these are not significant.

With respect to the characteristics of their agricultural activities, we see more differences. Plots in the treatment group are smaller than in the comparison group, which could mean that the latter may not be a good counterfactual for the former. A possible strategy to overcome this problem, in the context of the impact evaluation, could be restricting the sample of plots in the comparison group to those that are not too large and, therefore, more comparable to the plots in then treatment group[4].

With respect to heterogeneity across irrigation schemes, we see that Kpong is clearly less disadvantaged than Botanga and Golinga. Households in Kpong are more educated, with fewer members, higher incomes, larger plots and higher yields. To properly account for heterogeneity in the context of studying the treatment effect, it might be recommendable to run separate analysis for Botanga and Golinga on one side, and Kpong on the other.

Finally, the regression analysis we present in this report indicates that households in the treatment group have more education and fewer members. This pattern was not clear when looking at the summary statistics, which underscores the importance of conducting a more systematic analysis of participation. That being said, education and household size may be relatively stable over time, so they do not constitute a threat to identification in the context of the empirical strategy proposed for this project, i.e. the double difference estimator. It is important, nonetheless, to keep in mind that positive selection might be an important factor to consider for the purpose of estimating the causal effect of providing irrigation.

[4] To accomplish this, we could exclude the extreme values from the analysis, or we can also do matching.

Annex 1: Survey instrument

GHANA Irrigation Impact Evaluation

(Baseline Questionnaire)

INTERVIEW **Interviewer No.** |__|__|__| **Supervisor No.** |__|__|__|

PROVINCE: _____

DISTRICT/COMMUNE: _____

VILLAGE/CLUSTER: _____

FBO NAME: _____ **FBO NUMBER:** |__|__|__|

HOUSEHOLD NUMBER: **Code** |__|__|

IRRIGATION BASELINE SURVEY **QUESTIONNAIRE No. |__|__|__|__|__|**

GIS LOCATION OF HOUSEHOLD	**Latitude**	**N –** |__|__|__| **Degrees** |__|__|__| . |__|__|__| **Minutes**
	Longitude	**W –** |__|__|__| **Degrees** |__|__|__| . |__|__|__| **Minutes**

TIME OF BEGINNING OF INTERVIEW: |____| |____| (AUTO-CAPTURE)

IRRIGATION BASELINE SURVEY **QUESTIONNAIRE No. |__|__|__|__|__|**

SECTION A: INTRODUCTION AND CONSENT

Hello and thank you for talking to us. We are from Panafields, a Ghanaian social science research organization. We are working on a Millennium Development Authority farming activities that is intended to increase the income of households working plots in the intervention area.

To help us understand if the MiDA program is achieving this goal, we would like to ask you some questions about your household and your farming activities in order to understand the impacts of the irrigation scheme on farming households. This information is important to know as it will tell us how to improve the success of projects meant to support farmers such as yourself.

The interview will take about 90 minutes and we will ask questions to you or from other adults in the household who may be the most knowledgeable about particular topics. We also ask that you allow us to measure the size of your farm plots. This survey will be repeated in the future and you may be asked to participate again so that we can measure the changes among farmers.

All the information you and others in your household give us will remain confidential and you will not be identified, so please feel free to speak openly. The information that you provide will be kept until at least 2015 for the purposes of understanding MiDA program impacts and preparing reports to the project sponsor on the changes among farmers. Your participation is completely voluntary. You are free to not answer any question with which you are not comfortable, and you may stop the interview at any time.

If you have any questions about the survey, you may contact Seth Kande at Panafields at 233 302-250-965.

Do you wish to participate in this survey? May we start now?

Response to consent (*2 NO, 1 YES*) |__| IF NO, GO TO LIST OF DISPOSITION CODES

IRRIGATION BASELINE SURVEY **QUESTIONNAIRE No. |__|__|__|__|__|**

IF YOU ADMINISTER PART OF THE QUESTIONNAIRE TO OTHER MEMBERS OF THE HOUSEHOLD (AS IS LIKELY), YOU MUST READ THIS GREETING/CONSENT TO EACH PERSON WHO PARTICIPATES IN THE SURVEY AND RECORD THEIR ID NUMBER (FROM SECTION B, PAGE 3) AND RESPONSE TO THE RIGHT.

May I please talk to the person who knows most about your household's farming practices and other agricultural activities? Later on we will have more questions for your wife/husband about employment.

A4.	a. What is your name?	b. What is your family name?
	[_____]	[_____]
	c. What is your cell phone number? _____	d. What's your alternative phone number?

IRRIGATION BASELINE SURVEY **QUESTIONNAIRE No. |__|__|__|__|__|**

SECTION B: HOUSEHOLD COMPOSITION AND DEMOGRAPHICS

Now I would like to ask you some questions about the makeup of your household. . By household, we mean those of you that sleep under the same roof and take meals together at least four days a week.

B1.1	Has your household always lived in this village? *1 YES → B1.4 ; 2 NO; 99 REFUSED; 88 DON'T KNOW*	|__|	LANGUAGE CODES *11 Twi* *12 Fanti* *13 Akuapem* *14 Sefwi* *15 Brong* *16 Nzema* *17 Ga* *18 Dangme* *19 Ewe* *20 Guan* *21 Buli* *22 Mamprusi* *23 Frafra/Gruni* *24 Kassene* *25 Dagbani* *26 Wali/Dagari* *27 Sissala* *28 English*
B1.2	How many years ago did your household arrive in this village? ENTER 0 IF LESS THAN ONE YEAR AGO *-1 REFUSED; -2 DON'T KNOW*	|__|__|	
B1.3	When your household arrived in this village, from where did it come? *1 THIS REGION (NEARBY); 2 ELSEWHERE IN GHANA* *3 ANOTHER COUNTRY; 7 REFUSED; 8 DON'T KNOW*	|__|	
B1.4	What is the main language you speak at home?	|__|__|	

			29 Other (specify) *88 DON'T KNOW* *99 REFUSED*

Now I would like to ask you some questions about the makeup of your HH. By household, we mean those of you that sleep under the same roof and take meals together at least four days a week." First, I would like to ask you the name of each person's in this household. IF THEY DO NOT WANT TO GIVE NAMES: or please give me initials or some other way for us to refer to them. COLLECT ALL NAMES FIRST IN B2.2 AND THEN ASK B2.3 – B2.7 FOR EACH PERSON BEFORE MOVING ON TO THE NEXT HH MEMBER.

	B2. HOUSEHOLD ROSTER *TO BE COMPLETED FOR ALL PERSONS IN THE HOUSEHOLD, **INCLUDING** FOR HOUSEHOLD MEMBERS **NOT PRESENT** AT THE TIME OF THE INTERVIEW.*						**CODES FOR B2.4** *1 HEAD* *2 SPOUSE* *3 CO-SPOUSE* *4 SON/DAUGHTER* *5 SON/DAUGTHER IN LAW* *6 PARENT* *7 PARENT IN LAW* *8 SIBLINGS/SIBLINGS IN LAW* *9 OTHER RELATIVES* *10 NON-RELATIVES* *77 REFUSED* *88 DON'T KNOW* *99 OTHER*
B2.1	**B2.2**	**B2.3**	**B2.4**	**B2.5**	**B2.6**	**B2.7**	
Member ID	**Can you tell me the name of all the members of this household?** *Record the household members beginning with the HH head, followed by the spouse nd then the children starting with youngest first and concluding with the oldest.* *ROSTER TO BE COMPLETED FOR ALL PERSONS IN THE HOUSEHOLD, INCLUDING FORHOUSEHOLD MEMBERS NOT PRESENT AT THE TIME OF THE INTERVIEW.*	What is [NAME]'s gender? *1 FEMALE* *2 MALE* *8 DON'T KNIW* *9 REFUSED*	How is [NAME] related to the head of the household? *SEE CODES*	How many years old is [NAME]? *IF UNDER AGE 1, ENTER "0"; IF OVER 99, ENTER 99* *-1 REFUSED* *-2 DON'T KNOW* Years	What was the highest grade / level [NAME] completed? IF B2.5 < 5 SKIP TO NEXT HOUSEHOLD MEMBER *SEE CODES*	Is [NAME] attending school this year? 2 NO 1 YES 88 DON'T KNOW 99 REFUSED IF B2.5 < 5 or B2.5 > 25 SKIP TO NEXT HOUSEHOLD MEMBER	
01	[ ]	| |	| |	| | |	| | |	|	

02	[ ]	| |	| |	| | |	| | |	| |	
03	[ ]	| |	| |	| | |	| | |	| |	**CODES FOR B2.6**
04	[ ]	| |	| |	| | |	| | |	| |	*999 None*
05	[ ]	| |	| |	| | |	| | |	| |	*01 Pre-school*
06	[_____]	|__|	|__|	|__|__|	|__|__|	|__|	*02 Primary 1*
07	[_____]	|__|	|__|	|__|__|	|__|__|	|__|	*03 Primary 2*
08	[_____]	|__|	|__|	|__|__|	|__|__|	|__|	*04 Primary 3*
09	[_____]	|__|	|__|	|__|__|	|__|__|	|__|	*05 Primary 4*
10	[_____]	|__|	|__|	|__|__|	|__|__|	|__|	*06 Primary 5*
11	[_____]	|__|	|__|	|__|__|	|__|__|	|__|	*07 Primary 6*
12	[_____]	|__|	|__|	|__|__|	|__|__|	|__|	*08 JSS1*
							09 JSS2
							10 JSS3
							11 M1
							12 M2
							13 M3
							14 M4

IRRIGATION BASELINE SURVEY **QUESTIONNAIRE No. |__|__|__|__|__|__|**

C: AGRICULTURAL ORGANIZATIONS

C1	Are any members of the household a current member of any formal, registered cooperative or farmer association? *1 YES 2 NO → C4 99 REFUSED 88 DON'T KNOW*		|__|
C2	**(a-c)** Who in your household is a member of any formal, registered cooperative or farmer association?	**(d-f)** What special function, if any, do they have in the organization?	
C2.a/d	*FIRST HOUSEHOLD MEMBER* (a) |__|	(d) |__| [_____]	
C2.b/e	*SECOND HOUSEHOLD MEMBER* (b) |__|	(e) |__| [_____]	
C2.c/f	*THIRD HOUSEHOLD MEMBER* (c) |__|	(f) |__| [_____]	
C3	For what reasons (UP TO THREE) do members of your household belong to any formal, registered cooperative or farmer association? *IF THE FARMER MENTIONS A REASON, RECORD "1" IN THE RESPONSE BOX; IF NOT MENTIONED, RECORD "0"; THEN → D1*		
(a)	Better access to inputs		|__|
(b)	Better information about prices		|__|
(c)	Better access to training		|__|
(d)	Sharing of farming techniques		|__|
(e)	Better access to/Sharing of equipment		|__|
(f)	Sharing of labor		|__|
(g)	Access to new farming plots		|__|
(h)	Do not know		
(i)	Other 1 [SPECIFY]: [_____]		|__|
(j)	Other 2 [SPECIFY]: [_____]		|__|
(k)	Other 3 [SPECIFY]: [_____]		|__|
C4	For what reasons (UP TO THREE) do members of your household **NOT** belong to any formal, registered cooperative or farmer association?		
(a)	Costs too much (fees/membership costs)		|__|

CODES FOR C2d/e/f

1 MEMBER, NO FUNCTION
2 MANAGEMENT/ ... ADMINISTRATION
... (NON-FINANCIAL)
3 ACCOUNTANT/ FINANCIAL ... ADMINISTRATION
4 SERVICE PROVIDER
5 TRAINER LEAD FARMER
99 REFUSED
88 DON'T KNOW
5 OTHER [SPECIFY]:

(b)	Takes too much time		
(c)	Does not provide sufficient benefits (in terms of price information or price of crops)		
(d)	Does not provide sufficient benefits (in terms of training/sharing of farming techniques, access to inputs)		
(e)	Does not provide sufficient benefits (in terms of sharing of equipment)		
(f)	Conflict/disagreement with members of cooperative/association		
(g)	Do not know		
(h)	Other 1 [SPECIFY]: [ ]		
(i)	Other 2 [SPECIFY]: [ ]		
(j)	Other 3 [SPECIFY]: [ ]		

D. ANCHOR FARMER INTERACTION and TRAINING

D1. Does your household work with Solar Harvest/VegPro in **ANY** capacity? |__| *1 YES* *2 NO* → *D2 [TRAINING: The enumerator has a script with the name of the Anchor farmer]* 88 DON'T KNOW 99 REFUSED

IRRIGATION BASELINE SURVEY **QUESTIONNAIRE No. |__|__|__|__|__|**

	D1.1	D1.2	D1.3	D1.5	D1.6	
I will now read a list of the types of assistance the anchor farmer could potentially provide. To your knowledge, which of the following types of assistance are offered by the anchor farmer center? MAKE MULTI-CHOICE AND ASK FOLLOW-UP QUESTIONS ONLY FOR THOSE THAT ARE CHOSEN		Does the anchor farmer offer [ASSISTANCE TYPE] for free? *2 NO* *1 YES* 88 DON'T KNOW 99 REFUSED	Does your household choose to accept this service from the Anchor farm*er?* *2 NO* *1 YES → D1.6* *88 DON'T KNOW* *99 REFUSED*	Why did your household NOT accept/use this assistance from the anchor farmer? *SEE CODES- ALLOW ONLY ONE RESPONSE* GO TO NEXT SERVICE	How useful or valuable is/ are the [ASSISTANCE TYPE]? ENUMERATOR SHOULD READ "NOT AT ALL", "SOMEWHAT", "VERY MUCH" TO RESPONDENT *999 NOT AT ALL* *1 SOMEWHAT* *2 VERY MUCH* *99 REFUSED* *88 DON'T KNOW*	***CODES FOR D1.5*** *1 TOO MUCH WORK* *2 CANNOT AFFORD PRICE OR FEES* *3 CANNOT AFFORD TO HIRE WORKERS TO DO IT* *4 DON'T THINK IT WILL INCREASE YIELDS/NOT USEFUL* *5 DON'T NEED IT* *6 FORGOT HOW TO DO METHOD* *7 WOULD THEN HAVE TO DO MORE WEEDING* *8 MORE EXPENSIVE THAN FROM OTHER SOURCES* *99 REFUSED* *88 DON'T KNOW* *9 OTHER [SPECIFY]*
(a) Access to additional seed varieties	|__|	|__|	|__|	|__| |_____|	|__|	
(b) Irrigation training	|__|	|__|	|__|	|__| |_____|	|__|	
(c) Farm-business training	|__|	|__|	|__|	|__| |_____|	|__|	
(d) External market opportunities	|__|	|__|	|__|	|__| |_____|	|__|	
e) Contract farming	|__|	|__|	|__|	|__| |_____|	|__|	

(f) Provide fertilizer	|__|	|__|	|__|	|__| |_____|	|__|	
(g) Provide farm chemicals						|__| |_____|			
(h) Land preparation services						|__| |_____|			
(i) Equipment services						|__| |_____|			
(j) Transport services						|__| |_____|			
(k) Water and irrigation services						|__| |_____|			

IRRIGATION BASELINE SURVEY **QUESTIONNAIRE No. |__|__|__|__|__|**

D2. TRAINING

D2. Has anyone in your household received any training on best farming practices in the last 5 years? |__| *1 YES* *0 NO* → ***Section E***

	D2.1	D2.2	D23	D2.4	D2.5	D2.6	
Which of the following types of farming best practices training has someone in your household received in the last 5 years? ALLOW MULTIPLE SELECTIONS – ONLY ASK FOLLOW-UP QUESTIONS ON THOSE WHICH ARE SELECTED HERE	Household member who received training? *List all people (up to 3) that receive training first, then move to D2.2*	For each person trained, how many years ago was the most recent training received? *ENTER 0 FOR WITHIN PAST 12 MONTHS* *5 WITHIN PAST 12 MONTHS* *1 1-2YEAR* *2 2-3 YEARS* *3 3-4 YEARS* *4 MORE THAN 4 YEARS AGO* *88 DON'T KNOW* *99 REFUSED*	Who provided the training? *PROVIDE UP TO 2 ANSWERS SEE CODES*	Did that person apply what was taught in the training to the last crop cycle (2012)? *2 NO* *1 YES→D2.6* *88 DON'T KNOW* *99 REFUSED*	Why did that persom NOT practice the methods in which they were trained? *SEE CODES* ALLOW ONLY ONE RESPONSE	How useful or valuable was the training? ENUMERATOR SHOULD READ "NOT AT ALL", "SOMEWHAT", "VERY MUCH" TO RESPONDENT *1 NOT AT ALL* *2 SOMEWHAT* *3 VERY MUCH* *99 REFUSED* *88 DON'T KNOW*	**CODES FOR D2.3** *1 MIDA* *2 AGRIBUSINESS CENTER* *3 MINISTRY OF FOOD & AGRICULTURE* *4 OTHER GOVT AGENCY* *5 NGO* *6 OTHER FARMER* *7 REFUSED* *8 DON'T KNOW* *9 OTHER* ***CODES FOR D2.5*** *1 TOO MUCH WORK* *2 CANNOT AFFORD PRICE OR FEES* *3 CANNOT AFFORD TO HIRE WORKERS TO DO IT* *4 DON'T THINK IT WILL INCREASE YIELDS/NOT USEFUL* *5 DON'T NEED IT* *6 FORGOT HOW TO DO*
(a) Farming as a Business	| |	| | |	| |	| |	| |	| | | ⌈ ⌉	| |	
	| |	| | |	| |	| |	| |	| | | ⌈ ⌉	| |	
	| |	| | |	| |	| |	| |	| | | ⌈ ⌉	| |	
(b) Crop Production	| |	| | |	| |	| |	| |	| | | ⌈ ⌉	| |	
	| |	| | |	| |	| |	| |	| | | ⌈ ⌉	| |	
	| |	| | |	| |	| |	| |	| | | ⌈ ⌉	| |	
	| |	| | |	| |	| |	| |	| | | ⌈ ⌉	| |	

(c) Post Harvest Training	| |	| | |	| |	| |	| |	| | | ⌈ ⌉	| |	*METHOD*
	| |	| | |	| |	| |	| |	| | | ⌈ ⌉	| |	*7 WOULD THEN HAVE TO DO MORE WEEDING*
	| |	| | |	| |	| |	| |	| | | ⌈ ⌉	| |	
(d) Irrigation Operations	| |	| | |	| |	| |	| |	| | | ⌈ ⌉	| |	*8 MORE EXPENSIVE THAN FROM OTHER SOURCES*
	| |	| | |	| |	| |	| |	| | | ⌈ ⌉	| |	
	| |	| | |	| |	| |	| |	| | | ⌈ ⌉	| |	*77 REFUSED*

IRRIGATION BASELINE SURVEY **QUESTIONNAIRE No. |__|__|__|__|__|**

SECTION E. AGRICULTURAL PRODUCTION

E1 Land Holdings

The following section will ask about your farmland holdings.

The following section will ask about your farmland holdings.

Please tell me about each piece of farm land belonging to your household and any other pieces of land that you are responsible for, whether or not they were cultivated by your household during the LAST 12 MONTHS, from August 2011 to August 2012.

How many pieces of land was this household responsible for during the last 12 months, regardless of whether there was crop growing on them or not? [_|_]

Now, please give me the name or location of each piece of land. I will use these names or locations to refer to the pieces of land for the rest of this interview. Please start with your largest piece of land, then follow with your second largest piece of land and so on.

	E1.1. What is the total size of this piece of land in acres? ENTER THE NUMERIC VALUE HERE -1 REFUSED -2 DON'T KNOW	**E1.2.** Does the piece of land belong to your household or has it been rented or borrowed? 1 = belongs to HH ➔ **E1.6** 2 = rented 3 = borrowed	**E1.3.** Does your household have a share cropping arrangement or do you pay a fixed price? 1 = share cropping 2 = fixed price ➔ **E1.5** 88 DON'T KNOW	**E1.4.**What is the percentage of harvest your HH pays the landlord? ➔ **E1.8** ENTER A PERCENTAGE BETWEEN 0 and 100	**E1.5.** How much is your HH paying the owner of the land for you to use it during the last 12 months? Please include payments in the form of money as well as goods or services. -1 REFUSED	**E1.6.** Does your household lend or rent out [PLOT NAME] to another individual or household? 2= no ➔ **E1.8** 1 = yes	**E1.7.** If "yes", how much did or will your HH receive (in kind or money) for conceding the use of this land during the last 12 months? -1 REFUSED -2 DON'T KNOW

				→ E1.8 88 DON'T KNOW 99 REFUSED	99 REFUSED	-1 REFUSED -2 DON'T KNOW	-2 DON'T KNOW	88 DON'T KNOW 99 REFUSED	
Plot ID	Plot name /location to identify it (if applicable))	Amt							
01									
02									
03									
04									
05									
06									
07									
08									
09									
10									

IRRIGATION BASELINE SURVEY **QUESTIONNAIRE No. |__|__|__|__|__|**

		E1.8. Was this piece of land cultivated during any period within the past 12 months? 1 YES 2 NO →Next Plot 88 DON'T KNOW 99 REFUSED	E1.9. Is this piece of land more wet; less wet, or about the same as the other lands in your community? 1 MORE 2 LESS 3 ABOUT THE SAME 88 DON'T KNOW 99 REFUSED	E1.10. How many days does it take for this land to drain after a heavy rainfall? (# of Days) -1 REFUSED -2 DON'T KNOW	E1.11 Is this land watered from a source other than rain water? 1YES 2NO → E1.14 88 DON'T KNOW 99 REFUSED	E1.12 Is this piece of land part of the Solar Harvest/VegPro irrigation scheme? 2 NO 1 YES→ E1.15 88 DON'T KNOW 99 REFUSED	E1.13. What is the main source of the water for this land besides rain? MAIN SOURCE 1 Weir/ Dam 2 Well 3 Borehole 4 River / Stream 5 Pipe-borne 6 Other (specify) 88 DON'T KNOW 99 REFUSED	E1.14. What is the main method you use to apply the water on this piece of land? MAIN METHOD 1 Irrigation by gravity 2 Irrigation by pump/sprinkler 3 Manual irrigation 5 OTHER (SPECIFY) 88 DON'T KNOW 99 REFUSED	E1.15. In what year was this piece of land last fallow? -1 REFUSED -2 DON'T KNOW
Plot ID	Plot name (if applicable)								
01		|__|	|__|	|__|	|__|	|__|	|__| |_____|	|__| |_____|	|_|_|_|_|
02		|__|	|__|	|__|	|__|	|__|	|__| |_____|	|__| |_____|	|_|_|_|_|
03		|__|	|__|	|__|	|__|	|__|	|__| |_____|	|__| |_____|	|_|_|_|_|

04		|__| |__| |__| |__| |__| |__| |_____| |__| |_____| |_|_|_|_|
05		|__| |__| |__| |__| |__| |__| |_____| |__| |_____| |_|_|_|_|
06		|__| |__| |__| |__| |__| |__| |_____| |__| |_____| |_|_|_|_|
07		|__| |__| |__| |__| |__| |__| |_____| |__| |_____| |_|_|_|_|
08		|__| |__| |__| |__| |__| |__| |_____| |__| |_____| |_|_|_|_|
09		|__| |__| |__| |__| |__| |__| |_____| |__| |_____| |_|_|_|_|
10		|__| |__| |__| |__| |__| |__| |_____| |__| |_____| |_|_|_|_|

F: Agricultural Production

F1: Wet Season Production

Now I'd like to ask about each of the MAJOR CROPS grown and harvested by your household during the most recent wet season. Please exclude any vegetables or other crops grown in a kitchen garden, as I will ask you about those later. Please tell me about each crop by piece of land that were grown during the most recent WET season that you completed.

	F1.1	F1.2	F1.3	F1.4	F1.5	CODES FOR F1.1	
Plot ID	What crops were grown on this piece of land during the last wet season? *(Make sure to ask if any part of the plot is in fallow to let us know this as well)* *Use codes*	What percentage of the piece of land used to grow this crop (show percentage diagram) *(If 100% is in fallow, skip to next plot)* *TOTAL MUST ADD TO 100%* -1 REFUSED -2 DON'T KNOW	Which household member did most of the work cultivating this piece of land? *SEE HOUSEHOLD MEMBER CODES FROM SECTION B* 13 HIRED LABOR 999 NONE 88 DON'T KNOW 99 REFUSED	Which other household member assisted the most with cultivating this piece of land? *SEE HOUSEHOLD MEMBER CODES FROM SECTION B* 13 HIRED LABOR 999 NONE 88 DON'T KNOW 99 REFUSED	What type of equipment did your household use for cultivating this piece of land? CHOOSE ALL THAT APPLY *999 NONE* *1 MANUAL POWER* *2 ANIMAL POWER* *3 MACHINE POWER* *99 REFUSED* *88 DON'T KNOW*	*01 FALLOW* *10 COTTON* *11 MAIZE (DRIED KERNELS)* *12 CASSAVA (GARI)* *13 MAIZE (FRESH ON HUSK)* *14 WHEAT* *15 MILLET* *16 SORGHUM* *17 RICE* *18 CASSAVA (TUBERS)*	*35 SPINACH* *36 LETTUCE* *37 PEPPERS* *38 SQUASH* *39 CUCUMBERS* *40 OKRA* *41 ONIONS* *42 BANANAS* *43 MANGO* *44 PINEAPPLE* *45 PAPAYA*

IRRIGATION BASELINE SURVEY **QUESTIONNAIRE No. |__|__|__|__|__|**

01	Crop 1 |__|__|__| Crop 2 |__|__|__|	Crop 1 |__|__|__| Crop 2 |__|__|__|	|__|__|	|__|__|	|__|	19 *POTATOES* 20 *SWEET POTATO* 21 *YAMS* 22 *PLANTAIN* 24 *CASHEW NUT* 25 *COCONUT* 26 *BEANS* 27 *LENTILS* 28 *PEAS* 29 *PIGEON PEA* 30 *COWPEA* 31 *CHICKPEA* 32 *CARROTS* 33 *TOMATOES* 34 *CABBAGES* 46 *WATERMELON* 47 *ORANGES* 48 *LEMON* 49 *CASSAVA (CHIPS)* 50 *SOYA BEANS* 51 *SUNFLOWER* 52 *JATROPHA* 53 *TOBACCO* 54 *SHELLED GROUNDNUTS* 55 *UNSHELLED GROUNDNUTS* 56 *SUNHEMP* 57 *OTHER* 88 *DON'T KNOW* 99 *REFUSED*
02	Crop 1 |__|__|__| Crop 2 |__|__|__|	Crop 1 |__|__|__| Crop 2 |__|__|__|	|__|__|	|__|__|	|__|	
03	Crop 1 |__|__|__| Crop 2 |__|__|__|	Crop 1 |__|__|__| Crop 2 |__|__|__|	|__|__|	|__|__|	|__|	
04	Crop 1 |__|__|__| Crop 2 |__|__|__|	Crop 1 |__|__|__| Crop 2 |__|__|__|	|__|__|	|__|__|	|__|	
05	Crop 1 |__|__|__| Crop 2 |__|__|__|	Crop 1 |__|__|__| Crop 2 |__|__|__|	|__|__|	|__|__|	|__|	
06	Crop 1 |__|__|__| Crop 2 |__|__|__|	Crop 1 |__|__|__| Crop 2 |__|__|__|	|__|__|	|__|__|	|__|	
07	Crop 1 |__|__|__| Crop 2 |__|__|__|	Crop 1 |__|__|__| Crop 2 |__|__|__|	|__|__|	|__|__|	|__|	

08	Crop 1 |__|__|__| Crop 2 |__|__|__|	Crop 1 |__|__|__| Crop 2 |__|__|__|	|__|__|	|__|__|	|__|	
09	Crop 1 |__|__|__| Crop 2 |__|__|__|	Crop 1 |__|__|__| Crop 2 |__|__|__|	|__|__|	|__|__|	|__|	
10	Crop 1 |__|__|__| Crop 2 |__|__|__|	Crop 1 |__|__|__| Crop 2 |__|__|__|	|__|__|	|__|__|	|__|	

For each crop grown in the last WET season from April 2012 to August 2012 I will now ask you about how much was harvested and what happened to the crop.

	F2.1	F2.2	F2.3	F2.4	F2.5	F2.6	F2.7	F2.8	F2.9	F2.10	F2.11	F2.12	CODE FOR F2.3
	Crop ID *POPULATE WITH CROP CODES FROM PREVIOUS PAGE*	How much [CROP] did your household have in stock (in storage) before the harvest? -1 REFUSED -2 DON'T KNOW	Unit of Measure for F2.2 – F2.12 See codes	During the last wet season, how much of [CROP] did your household harvest in total across all pieces of land? USE UNITS FROM 2.4 -1 REFUSED -2 DON'T KNOW	After it was harvested, how much [CROP] was lost to insect, rodents, rotting or some other problem? USE UNITS FROM 2.4 -1 REFUSED -2 DON'T KNOW	How much of the [CROP] harvested during the last wet season was used for animal feed? USE UNITS FROM 2.4 -1 REFUSED -2 DON'T KNOW	What quantity of the [CROP] harvested during the last wet season was sold to the Solar Harvest/VegPro? (IF 0 SKIP TO F2.9) USE UNITS FROM 2.4 -1 REFUSED -2 DON'T KNOW	How much did you receive for each [UNIT] of [CROP] sold to the Solar Harvest/VegPro? [CURRENCY] -1 REFUSED -2 DON'T KNOW	What quantity of the [CROP] harvested during the last wet season was sold to someone other than the Solar Harvest/VegPro? (IF 0 SKIP TO F2.11 USE UNITS FROM 2.4 -1 REFUSED -2 DON'T KNOW	How much did you receive for each [UNIT] of [CROP] sold to someone else? [CURRENCY] -1 REFUSED -2 DON'T KNOW	How much of the [CROP] harvested the last wet season has been consumed by members of your household? USE UNITS FROM 2.4 -1 REFUSED -2 DON'T KNOW	How much of the [CROP] harvested during the last wet season is still being stored by your household? USE UNITS FROM 2.4 -1 REFUSED -2 DON'T KNOW	*11 KG* *12 LITRES* *13 BUSHELS* *14 BAGS (25 KG)* *15 BAGS (50 KG)* *16 TINS (5 LITRES)* *17 BUCKETS* *18 BUNCH* *19 CUP* *20 OXCARTS* *21 CRATES* *22 PIECES*
(a)	|__|__|	|__|__|	|__|__|	|__|__|__|	|__|__|	|__|__|	|__|__|__|	|__|__|__|	|__|__|	|__|__|__|	|__|__|__|	|__|__|__|	
(b)	|__|__|	|__|__|	|__|__|	|__|__|__|	|__|__|	|__|__|	|__|__|__|	|__|__|__|	|__|__|	|__|__|__|	|__|__|__|	|__|__|__|	

(c)	|__|__|	|__|__|	|__|__|	|__|__|__|	|__|__|	|__|__|	|__|__|__|	|__|__|__|	|__|__|	|__|__|__|	|__|__|__|	|__|__|__|	
(d)	|__|__|	|__|__|	|__|__|	|__|__|__|	|__|__|	|__|__|	|__|__|__|	|__|__|__|	|__|__|	|__|__|__|	|__|__|__|	|__|__|__|	
(e)	|__|__|	|__|__|	|__|__|	|__|__|__|	|__|__|	|__|__|	|__|__|__|	|__|__|__|	|__|__|	|__|__|__|	|__|__|__|	|__|__|__|	
(f)	|__|__|	|__|__|	|__|__|	|__|__|__|	|__|__|	|__|__|	|__|__|__|	|__|__|__|	|__|__|	|__|__|__|	|__|__|__|	|__|__|__|	
(g)	|__|__|	|__|__|	|__|__|	|__|__|__|	|__|__|	|__|__|	|__|__|__|	|__|__|__|	|__|__|	|__|__|__|	|__|__|__|	|__|__|__|	
(h)	|__|__|	|__|__|	|__|__|	|__|__|__|	|__|__|	|__|__|	|__|__|__|	|__|__|__|	|__|__|	|__|__|__|	|__|__|__|	|__|__|__|	
(i)	|__|__|	|__|__|	|__|__|	|__|__|__|	|__|__|	|__|__|	|__|__|__|	|__|__|__|	|__|__|	|__|__|__|	|__|__|__|	|__|__|__|	
(j)	|__|__|	|__|__|	|__|__|	|__|__|__|	|__|__|	|__|__|	|__|__|__|	|__|__|__|	|__|__|	|__|__|__|	|__|__|__|	|__|__|__|	
(k)	|__|__|	|__|__|	|__|__|	|__|__|__|	|__|__|	|__|__|	|__|__|__|	|__|__|__|	|__|__|	|__|__|__|	|__|__|__|	|__|__|__|	

	F3.1	F3.2	F3.3	F3.4	F3.5	F3.6	F3.7
	Crop *FROM PREVIOUS PAGE*	What amount of [CROP] seeds did you buy from the Solar Harvest/Veg Pro for the previous WET season? GO TO 3.5 if F3.2 = 0		In total, how much did you pay for the [CROP] seeds that you bought at the Solar Harvest/VegPro?	What amount of [CROP] seeds did you buy at any other source/s other than the Solar Harvest/VegPro for the previous WET season? GO TO NEXT SEED TYPE if F3.5 = 0		In total, how much did you pay for those [CROP] seeds?

		Quantity -1 REFUSED -2 DON'T KNOW	Unit *11 KG* *12 LITRES* *13 BUSHELS* *14 BAGS (25 KG)* *15 BAGS (50 KG)* *16 TINS (5 LITRES)* *17 BUCKETS* *18 BUNCH* *19 CUP* *20 OXCARTS* *21 CRATES* *22 PIECES* 23 SACHET (1/2 KG)	Total Price -1 REFUSED -2 DON'T KNOW	Quantity -1 REFUSED -2 DON'T KNOW	Unit *11 KG* *12 LITRES* *13 BUSHELS* *14 BAGS (25 KG)* *15 BAGS (50 KG)* *16 TINS (5 LITRES)* *17 BUCKETS* *18 BUNCH* *19 CUP* *20 OXCARTS* *21 CRATES* *22 PIECES* 23 SACHET (1/2 KG)	Total Price -1 REFUSED -2 DON'T KNOW
(a)	|__|__|	|__|__|		|__|__|__|__|__|__|	|__|__|		|__|__|__|__|__|__|
(b)	|__|__|	|__|__|		|__|__|__|__|__|__|	|__|__|		|__|__|__|__|__|__|
(c)	|__|__|	|__|__|		|__|__|__|__|__|__|	|__|__|		|__|__|__|__|__|__|
(d)	|__|__|	|__|__|		|__|__|__|__|__|__|	|__|__|		|__|__|__|__|__|__|
(e)	|__|__|	|__|__|		|__|__|__|__|__|__|	|__|__|		|__|__|__|__|__|__|

(f)	|__|__|	|__|__|		|__|__|__|__|__|__|	|__|__|		|__|__|__|__|__|__|
(g)	|__|__|	|__|__|		|__|__|__|__|__|__|	|__|__|		|__|__|__|__|__|__|
(h)	|__|__|	|__|__|		|__|__|__|__|__|__|	|__|__|		|__|__|__|__|__|__|
(i)	|__|__|	|__|__|		|__|__|__|__|__|__|	|__|__|		|__|__|__|__|__|__|
(j)	|__|__|	|__|__|		|__|__|__|__|__|__|	|__|__|		|__|__|__|__|__|__|
(k)	|__|__|	|__|__|		|__|__|__|__|__|__|	|__|__|		|__|__|__|__|__|__|

	F3.8	F3.9	F3.10	F3.11	F3.12	F3.13	F3.14
		What amount of [ITEM] did you buy from the Solar Harvest/VegPro for the previous WET season? GO TO F3.12 if F3.9 = 0		In total, how much did you pay for the [INPUT] you bought at the Solar Harvest/VegPro?	What amount of [ITEM] did you buy from any other source/s other than the Solar Harvest/VegPro for the previous wet season? GO TO NEXT INPUT TYPE if F3.12=0		In total, how much did you pay for the [INPUT] you bought at that source/s?

		Quantity -1 REFUSED -2 DON'T KNOW	Unit *11 KG* *12 LITRES* *13 BUSHELS* *14 BAGS (25 KG)* *15 BAGS (50 KG)* *16 TINS (5 LITRES)* *17 BUCKETS* *18 BUNCH* *19 CUP* *20 OXCARTS* *21 CRATES* *22 PIECES* **23 SACHET (1/2 KG)**	Total Price -1 REFUSED -2 DON'T KNOW	Quantity -1 REFUSED -2 DON'T KNOW	Unit *11 KG* *12 LITRES* *13 BUSHELS* *14 BAGS (25 KG)* *15 BAGS (50 KG)* *16 TINS (5 LITRES)* *17 BUCKETS* *18 BUNCH* *19 CUP* *20 OXCARTS* *21 CRATES* *22 PIECES* **23 SACHET (1/2 KG)**	Total Price -1 REFUSED -2 DON'T KNOW
(a)	Manure or compost	|__|__|		|__|__|__|__|__|__|	|__|__|		|__|__|__|__|__|__|
(b)	Fertilizer	|__|__|		|__|__|__|__|__|__|	|__|__|		|__|__|__|__|__|__|
(c)	Pesticide	|__|__|		|__|__|__|__|__|__|	|__|__|		|__|__|__|__|__|__|
(d)	Herbicide	|__|__|		|__|__|__|__|__|__|	|__|__|		|__|__|__|__|__|__|

IRRIGATION BASELINE SURVEY **QUESTIONNAIRE No. |__|__|__|__|__|**

SECTION F. AGRICULTURAL PRODUCTION

F4: Dry Season Production

Now I'd like to ask about each of the MAJOR CROPS grown and harvested by your household during the past 12 months. Please exclude any vegetables or other crops grown in a kitchen garden, as I will ask you about those later. Please tell me about each crop by plot that were grown during the most recent DRY season that you completed.

	F4.1	F4.2	F4.3	F4.4	F4.5	CODES FOR F4.1	
Plot ID	What crops were grown on this piece of land during the last dry season? *(Make sure to ask if any part of the plot is in fallow to let us know this as well)* *Use codes*	What percentage of the piece of land is used to grow this crop? (show percentage diagram) *(If 100% is in fallow, skip to next plot)* *TOTAL MUST ADD TO 100%* -1 REFUSED -2 DON'T KNOW	Which household member did most of the work cultivating this piece of land? *SEE HOUSEHOLD MEMBER CODES FROM SECTION B* 13 HIRED LABOR 999 NONE 88 DON'T KNOW 99 REFUSED	Which other household member assisted the most with cultivating this piece of land? *SEE HOUSEHOLD MEMBER CODES FROM SECTION B* 13 HIRED LABOR 999 NONE 88 DON'T KNOW 99 REFUSED	What type of equipment did your household use for cultivating this piece of land? CHOOSE ALL THAT APPLY *999 NONE* *1 MANUAL POWER* *2 ANIMAL POWER* *3 MACHINE POWER* *99 REFUSED* *88 DON'T KNOW*	*01 FALLOW* *10 COTTON* *11 MAIZE (DRIED KERNELS)* *12 CASSAVA (GARI)* *13 MAIZE (FRESH ON HUSK)* *14 WHEAT* *15 MILLET* *16 SORGHUM* *17 RICE* *18 CASSAVA (TUBERS)*	*35 SPINACH* *36 LETTUCE* *37 PEPPERS* *38 SQUASH* *39 CUCUMBERS* *40 OKRA* *41 ONIONS* *42 BANANAS* *43 MANGO* *44 PINEAPPLE* *45 PAPAYA* *46 WATERMELON*

IRRIGATION BASELINE SURVEY **QUESTIONNAIRE No. |__|__|__|__|__|**

01	Crop 1 |__|__|__| Crop 2 |__|__|__|	Crop 1 |__|__|__| Crop 2 |__|__|__|	|__|__|	|__|__|	|__|	
02	Crop 1 |__|__|__| Crop 2 | | | |	Crop 1 |__|__|__| Crop 2 | | | |	|__|__|	|__|__|	|__|	
03	Crop 1 |__|__|__| Crop 2 | | | |	Crop 1 |__|__|__| Crop 2 | | | |	|__|__|	|__|__|	|__|	
04	Crop 1 |__|__|__| Crop 2 | | | |	Crop 1 |__|__|__| Crop 2 | | | |	|__|__|	|__|__|	|__|	
05	Crop 1 |__|__|__| Crop 2 |__|__|__|	Crop 1 |__|__|__| Crop 2 |__|__|__|	|__|__|	|__|__|	|__|	
06	Crop 1 |__|__|__| Crop 2 |__|__|__|	Crop 1 |__|__|__| Crop 2 |__|__|__|	|__|__|	|__|__|	|__|	
07	Crop 1 |__|__|__| Crop 2 |__|__|__|	Crop 1 |__|__|__| Crop 2 |__|__|__|	|__|__|	|__|__|	|__|	

19 POTATOES
20 SWEET POTATO
21 YAMS
22 PLANTAIN
24 CASHEW NUT
25 COCONUT
26 BEANS
27 LENTILS
28 PEAS
29 PIGEON PEA
30 COWPEA
31 CHICKPEA
32 CARROTS
33 TOMATOES
34 CABBAGES
47 ORANGES
48 LEMON
49 CASSAVA (CHIPS)
50 SOYA BEANS
51 SUNFLOWER
52 *JATROPHA*
53 TOBACCO
54 SHELLED GROUNDNUTS
55 UNSHELLED GROUNDNUTS
56 SUNHEMP
57 OTHER
88 DON'T KNOW
99 REFUSED

08	Crop 1 |__|__|__| Crop 2 |__|__|__|	Crop 1 |__|__|__| Crop 2 |__|__|__|	|__|__|	|__|__|	|__|	
09	Crop 1 |__|__|__| Crop 2 |__|__|__|	Crop 1 |__|__|__| Crop 2 |__|__|__|	|__|__|	|__|__|	|__|	
10	Crop 1 |__|__|__| Crop 2 |__|__|__|	Crop 1 |__|__|__| Crop 2 |__|__|__|	|__|__|	|__|__|	|__|	

IRRIGATION BASELINE SURVEY **QUESTIONNAIRE No. |__|__|__|__|__|**

For each crop grown in the last DRY season from September 2011 to Mach 2012 I will now ask you about how much was harvested and what happened to the crop.

	F5.1	F5.2	F5.3	F5.4	F5.5	F5.6	F5.7	F5.8	F5.9	F5.10	F5.11	F5.12	CODE FOR F5.3
	Crop ID *POPULATE WITH CROP CODES FROM PREVIOUS PAGE*	How much [CROP] did your household have in stock (in storage) before the harvest? -1 REFUSED -2 DON'T KNOW	Unit of Measure for F2.2 – F2.12 See codes	During the last dry season, how much of [CROP] did your household harvest in total across all pieces of lands? USE UNITS FROM 5.4 -1 REFUSED -2 DON'T KNOW	After it was harvested, how much [CROP] was lost to insect, rodents, rotting or some other problem? USE UNITS FROM 5.4 -1 REFUSED -2 DON'T KNOW	How much of the [CROP] harvested during the last dry season was used for animal feed? USE UNITS FROM 5.4 -1 REFUSED -2 DON'T KNOW	What quantity of the [CROP] harvested during the last dry season was sold to the Solar Harvest/VegPro? (IF 0 SKIP TO F2.9) USE UNITS FROM 5.4 -1 REFUSED -2 DON'T KNOW	How much did you receive for each [UNIT] of [CROP] sold to the Solar Harvest/VegPro? [CURRENCY] -1 REFUSED -2 DON'T KNOW	What quantity of the [CROP] harvested during the last dry season was sold to someone other than the Solar Harvest/VegPro? (IF 0 SKIP TO F2.11 USE UNITS FROM 5.4 -1 REFUSED -2 DON'T KNOW	How much did you receive for each [UNIT] of [CROP] sold to someone else? [CURRENCY] -1 REFUSED -2 DON'T KNOW	What quantity of the [CROP] harvested the last dry season has been consumed by members of your household? USE UNITS FROM 5.4 -1 REFUSED -2 DON'T KNOW	How much of the [CROP] harvested during the last dry season is still being stored by your household? USE UNITS FROM 5.4 -1 REFUSED -2 DON'T KNOW	*11 KG* *12 LITRES* *13 BUSHELS* *14 BAGS (25 KG)* *15 BAGS (50 KG)* *16 TINS (5 LITRES)* *17 BUCKETS* *18 BUNCH* *19 CUP* *20 OXCARTS* *21 CRATES* *22 PIECES*
(a)	|__|__|	|__|__|	|__|__|	|__|__|__|	|__|__|	|__|__|	|__|__|__|	|__|__|__|	|__|__|	|__|__|__|	|__|__|__|	|__|__|__|	

(b)	|__|__|	|__|__|	|__|__|	|__|__|__|	|__|__|	|__|__|	|__|__|__|	|__|__|__|	|__|__|	|__|__|__|	|__|__|__|	|__|__|__|	
(c)	|__|__|	|__|__|	|__|__|	|__|__|__|	|__|__|	|__|__|	|__|__|__|	|__|__|__|	|__|__|	|__|__|__|	|__|__|__|	|__|__|__|	
(d)	|__|__|	|__|__|	|__|__|	|__|__|__|	|__|__|	|__|__|	|__|__|__|	|__|__|__|	|__|__|	|__|__|__|	|__|__|__|	|__|__|__|	
(e)	|__|__|	|__|__|	|__|__|	|__|__|__|	|__|__|	|__|__|	|__|__|__|	|__|__|__|	|__|__|	|__|__|__|	|__|__|__|	|__|__|__|	
(f)	|__|__|	|__|__|	|__|__|	|__|__|__|	|__|__|	|__|__|	|__|__|__|	|__|__|__|	|__|__|	|__|__|__|	|__|__|__|	|__|__|__|	
(g)	|__|__|	|__|__|	|__|__|	|__|__|__|	|__|__|	|__|__|	|__|__|__|	|__|__|__|	|__|__|	|__|__|__|	|__|__|__|	|__|__|__|	
(h)	|__|__|	|__|__|	|__|__|	|__|__|__|	|__|__|	|__|__|	|__|__|__|	|__|__|__|	|__|__|	|__|__|__|	|__|__|__|	|__|__|__|	
(i)	|__|__|	|__|__|	|__|__|	|__|__|__|	|__|__|	|__|__|	|__|__|__|	|__|__|__|	|__|__|	|__|__|__|	|__|__|__|	|__|__|__|	
(j)	|__|__|	|__|__|	|__|__|	|__|__|__|	|__|__|	|__|__|	|__|__|__|	|__|__|__|	|__|__|	|__|__|__|	|__|__|__|	|__|__|__|	

(k)	|__|__|	|__|__|	|__|__|	|__|__|__|	|__|__|	|__|__|	|__|__|__|	|__|__|__|	|__|__|	|__|__|__|	|__|__|__|	|__|__|__|	

	F6.1	F6.2	F6.3	F6.4	F6.5	F6.6	F6.7
	Crop *FROM PREVIOUS PAGE*	What amount of [CROP] seeds did you buy from the Solar Harvest/VegPro for the previous Dry season? GO TO 3.5 if F6.2 = 0		In total, how much did you pay for the [CROP] seeds you bought from the Solar Harvest/VegPro?	What amount of [CROP] seeds did you buy at any other source/s other than the Solar Harvest/VegPro for the previous Dry season? GO TO NEXT SEED TYPE if F6.5 = 0		In total, how much did you pay for those [CROP] seeds?

		Quantity -1 REFUSED -2 DON'T KNOW	Unit *11 KG* *12 LITRES* *13 BUSHELS* *14 BAGS* *(25 KG)* *15 BAGS* *(50 KG)* *16 TINS* *(5 LITRES)* *17 BUCKETS* *18 BUNCH* *19 CUP* *20 OXCARTS* *21 CRATES* *22 PIECES*	Total Price -1 REFUSED -2 DON'T KNOW	Quantity -1 REFUSED -2 DON'T KNOW	Unit *11 KG* *12 LITRES* *13 BUSHELS* *14 BAGS* *(25 KG)* *15 BAGS* *(50 KG)* *16 TINS* *(5 LITRES)* *17 BUCKETS* *18 BUNCH* *19 CUP* *20 OXCARTS* *21 CRATES* *22 PIECES* **23 SACHET (1/2 KG)**	Total Price -1 REFUSED -2 DON'T KNOW
(a)	|__|__|	|__|__|		|__|__|__|__|__|__|	|__|__|		|__|__|__|__|__|__|
(b)	|__|__|	|__|__|		|__|__|__|__|__|__|	|__|__|		|__|__|__|__|__|__|
(c)	|__|__|	|__|__|		|__|__|__|__|__|__|	|__|__|		|__|__|__|__|__|__|
(d)	|__|__|	|__|__|		|__|__|__|__|__|__|	|__|__|		|__|__|__|__|__|__|
(e)	|__|__|	|__|__|		|__|__|__|__|__|__|	|__|__|		|__|__|__|__|__|__|

(f)	|__|__|	|__|__|		|__|__|__|__|__|__|	|__|__|		|__|__|__|__|__|__|
(g)	|__|__|	|__|__|		|__|__|__|__|__|__|	|__|__|		|__|__|__|__|__|__|
(h)	|__|__|	|__|__|		|__|__|__|__|__|__|	|__|__|		|__|__|__|__|__|__|
(i)	|__|__|	|__|__|		|__|__|__|__|__|__|	|__|__|		|__|__|__|__|__|__|
(j)	|__|__|	|__|__|		|__|__|__|__|__|__|	|__|__|		|__|__|__|__|__|__|
(k)	|__|__|	|__|__|		|__|__|__|__|__|__|	|__|__|		|__|__|__|__|__|__|

	F6.8	F6.9	F6.10	F6.11	F6.12	F6.13	F6.14
		What amount of [ITEM] did you buy from the Solar Harvest/VegPro for the previous Dry season? GO TO F6.12 if F6.9 = 0		In total, how much did you pay for the [INPUT] you bought at the Solar Harvest/VegPro?	What amount of [ITEM] did you buy from any source/s besides the Solar Harvest/VegPro for the previous Dry season? GO TO NEXT INPUT TYPE if F6.12=0		In total, how much did you pay for the [INPUT] you bought from that source/s?

		Quantity -1 REFUSED -2 DON'T KNOW	Unit *11 KG* *12 LITRES* *13 BUSHELS* *14 BAGS (25 KG)* *15 BAGS (50 KG)* *16 TINS (5 LITRES)* *17 BUCKETS* *18 BUNCH* *19 CUP* *20 OXCARTS* *21 CRATES* *22 PIECES*	Total Price -1 REFUSED -2 DON'T KNOW	Quantity -1 REFUSED -2 DON'T KNOW	Unit *11 KG* *12 LITRES* *13 BUSHELS* *14 BAGS (25 KG)* *15 BAGS (50 KG)* *16 TINS (5 LITRES)* *17 BUCKETS* *18 BUNCH* *19 CUP* *20 OXCARTS* *21 CRATES* *22 PIECES*	Total Price -1 REFUSED -2 DON'T KNOW
(a)	Manure or compost	|__|__|		|__|__|__|	|__|__|		|__|__|__|
(b)	Fertilizer	|__|__|		|__|__|__|	|__|__|		|__|__|__|
(c)	Pesticide	|__|__|		|__|__|__|	|__|__|		|__|__|__|
(d)	Herbicide	|__|__|		|__|__|__|	|__|__|		|__|__|__|

IRRIGATION BASELINE SURVEY **QUESTIONNAIRE No. |__|__|__|__|__|**

G. AGRICULTURAL LAND

Now, I would like to ask you few questions about any kitchen gardens your household might have. First I will ask you about any kitchen garden you grew during the WET SEASON and then about the DRY SEASON.

<table>
<tr><td>G1.</td><td colspan="9">Does your household have a kitchen garden to grow vegetables in the WET season?
1 YES 2 NO → G2 88 DON'T KNOW 99REFUSED</td><td>|__|</td><td rowspan="5">CODES FOR G1.2 & G2.1

01 FALLOW
10 COTTON
11 MAIZE (DRIED KERNELS)
12 CASSAVA (GARI)
13 MAIZE (FRESH ON HUSK)
35 SPINACH
36 LETTUCE
37 PEPPERS
38 SQUASH
39 CUCUMBERS
40 OKRA
41 ONIONS</td></tr>
<tr><td>G1.1</td><td colspan="9">Which household member is mainly responsible for caring for the kitchen garden in the WET season? |__|__| (member ID)</td><td></td></tr>
<tr><td rowspan="3">G1.2</td><td colspan="9">What vegetables or other crops do you grow in this kitchen garden in the WET season? Please list them in order of importance to your household in terms of amount consumed or sold. SEE CODES AT RIGHT</td></tr>
<tr><td>(a)</td><td>(b)</td><td>(c)</td><td>(d)</td><td>(e)</td><td>(f)</td><td>(g)</td><td>(h)</td><td>(i)</td><td></td></tr>
<tr><td>|__|__|</td><td>|__|__|</td><td>|__|__|</td><td>|__|__|</td><td>|__|__|</td><td>|__|__|</td><td>|__|__|</td><td>|__|__|</td><td>|__|__|</td><td></td></tr>
<tr><td>G1.3</td><td colspan="9">In the last 12 months how much income [CURRENCY] did your household earn from vegetables and other crops grown in this kitchen garden in the WET season? -1 REFUSED -2 DON'T KNOW</td><td>|__|__|__|__|__|</td></tr>
</table>

G1.4	How much land is used for this kitchen garden in the WET season? *-1 REFUSED -2 DON'T KNOW*	(a) Amount |_|_|_|	(b)Units 1 Acres 2 Poles 3 Ropes 4 Plots 5 Sq.meters 88 DON'T KNOW 99 REFUSED |_|
G2.	Does your household have a kitchen garden to grow vegetables in the **DRY** season? *1 YES 2 NO* → SECTION H 88 DON'T KNOW 99 REFUSED	|__|	
G2a	Which household member is mainly responsible for caring for the kitchen garden in the DRY season? |__|__| (member ID)		

G2.1 What vegetables or other crops do you grow in this kitchen garden in the DRY season? Please list them in order to your household in terms of amount consumed or sold. *SEE CODES AT RIGHT*

(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)
|__|__|	|__|__|	|__|__|	|__|__|	|__|__|	|__|__|	|__|__|	|__|__|	|__|__|

14 WHEAT
15 MILLET
16 SORGHUM
17 RICE
18 CASSAVA (TUBERS)
19 POTATOES
20 SWEET POTATO
21 YAMS
22 PLANTAIN
24 CASHEW NUT
25 COCONUT
26 BEANS
27 LENTILS
28 PEAS
29 PIGEON PEA
30 COWPEA
31 CHICKPEA
32 CARROTS
33 TOMATOES
34 CABBAGES

42 BANANAS
43 MANGO
44 PINEAPPLE
45 PAPAYA
46 WATERMELON
47 ORANGES
48 LEMON
49 CASSAVA (CHIPS)
50 SOYA BEANS
51 SUNFLOWER
52 JATROPHA
53 TOBACCO
54 SHELLED GROUNDNUTS
55 UNSHELLED GROUNDNUTS
56 SUNHEMP
57OTHER
88 DON'T KNOW
99 REFUSED

G2.2	In the last 12 months how much income [CURRENCY] did your household earn from vegetables and other crops grown in this kitchen garden in the DRY season? *-1 REFUSED -2 DON'T KNOW*	|__|__|__|__|__|	
G2.3	How much land is used for this kitchen garden in the DRY season? *-1 REFUSED -2 DON'T KNOW*	(a) Amount |_|_|_|	(b)Units 1 Acres 2 Poles 3 Ropes 4 Plots 5 Sq.meters 88 DON'T KNOW 99 REFUSED |_|

IRRIGATION BASELINE SURVEY **QUESTIONNAIRE No. |__|__|__|__|__|**

H. AGRICULTURAL ASSETS

Please tell me about any farm equipment that your household owns

H1. Farm equipment	**H1.1**	**H1.2**	**H1.3**	**H1.4**
	How many of this type of [EQUIPMENT] are owned by your household? -1 REFUSED -2 DON'T KNOW *IF NONE , ENTER 0* *SKIP TO NEXT EQUIPMENT*	Did you split the cost of [EQUIPMENT] with any other person outside of your household? 1 YES 2NO → H1.4 88 DON'T KNOW 99 REFUSED	How many people outside of your household contributed to the purchase of [EQUIPMENT]? -1 REFUSED -2 DON'T KNOW	What is the estimated value of one of these [EQUIPMENT] if sold today? [CURRENCY] *(unit value)* *-1 REFUSED* *-2 DON'T KNOW*
(a) Tractor	|__|__|	|_|	|_|_|	|__|__|__|__|__|__|
(b) Machine pulled plow or harrow	|__|__|	|_|	|_|_|	|__|__|__|__|__|__|
(c) Animal pulled plow	|__|__|	|_|	|_|_|	|__|__|__|__|__|__|
(d) Animal Cart	|__|__|	|_|	|_|_|	|__|__|__|__|__|__|

(e) Seeder	|__|__|	|_|	|_|_|	|__|__|__|__|__|__|
(f) Harvester	|__|__|	|_|	|_|_|	|__|__|__|__|__|__|
(g) Spreader or sprayer	|__|__|	|_|	|_|_|	|__|__|__|__|__|__|
(h) Wheelbarrow or hand cart	|__|__|	|_|	|_|_|	|__|__|__|__|__|__|
(i) Irrigation water pumps	|__|__|	|_|	|_|_|	|__|__|__|__|__|__|
(j) Generator	|__|__|	|_|	|_|_|	|__|__|__|__|__|__|

Please tell me about any farm livestock that your household owns

H2. Farm livestock	**H2.1**	**H2.2**
	How many [ANIMALS] does the household own? -1 REFUSED -2 DON'T KNOW IF RESPONDENT DOES NOT OWN [ANIMAL], ENTER "0" SKIP TO NEXT ANIMAL IF 0 SKIP TO NEXT ANIMAL TYPE	What is the estimated value of one of these [ANIMAL] if sold today? [CURRENCY] *(unit value)* 1 REFUSED -2 DON'T KNOW
(a) Cattle	|__|__|__|	|__|__|__|__|__|__|
(b) Draft animal such as donkey, horse, or bullock	|__|__|__|	|__|__|__|__|__|__|
(c) Goats	|__|__|__|	|__|__|__|__|__|__|
(d) Sheep	|__|__|__|	|__|__|__|__|__|__|
(e) Pigs	|__|__|__|	|__|__|__|__|__|__|
(f) Chickens	|__|__|__|	|__|__|__|__|__|__|
(g) Other fowl	|__|__|__|	|__|__|__|__|__|__|
(h) Rabbit	|__|__|__|	|__|__|__|__|__|__|
(i) Other 1 [SPECIFY]: [_____]	|__|__|__|	|__|__|__|__|__|__|

(jb) Other 2 [SPECIFY]: [_____]	|__|__|__|	|__|__|__|__|__|__|
(ic) Other 3 [SPECIFY]: [_____]	|__|__|__|	|__|__|__|__|__|__|

IRRIGATION BASELINE SURVEY **QUESTIONNAIRE No. |__|__|__|__|__|**

SECTION J. HOUSEHOLD INCOME, SAVINGS AND NON-AGRICULTURAL ASSETS

I would like to ask you now about non farming assets that you household may own any farm livestock that your household owns

J1. Non-agricultural Assets of the Household

	J1.1	**J1.2**
	How many [ITEM] does your household have that are in working condition? *0 NONE ➔ NEXT ITEM* -1 REFUSED -2 DON'T KNOW	What is the estimated value of one of these [ITEM] if sold today? [CURRENCY] *(unit value)* *-1 REFUSED* *-2 DON'T KNOW*
(a) Radio	|__|__|	|__|__|__|__|__|__|__|__|__|
(b) TV	|__|__|	|__|__|__|__|__|__|__|__|__|
(c) DVD Player	|__|__|	|__|__|__|__|__|__|__|__|__|
(d) Mobile Telephone	|__|__|	|__|__|__|__|__|__|__|__|__|
(e) Refrigerator	|__|__|	|__|__|__|__|__|__|__|__|__|
(f) Kerosene stove	|__|__|	|__|__|__|__|__|__|__|__|__|
(g) Electric Stove	|__|__|	|__|__|__|__|__|__|__|__|__|
(g) Bicycle	|__|__|	|__|__|__|__|__|__|__|__|__|

(h) Motorbike	|__|__|	|__|__|__|__|__|__|__|__|__|__|
(i) Automobiles, including Pick-up trucks or Minibuses	|__|__|	|__|__|__|__|__|__|__|__|__|__|
(k) Boats or boat motors	|__|__|	|__|__|__|__|__|__|__|__|__|__|
(m) Computer	|__|__|	|__|__|__|__|__|__|__|__|__|__|
J1. 3 Is you household connected to the electric grid? 2 NO 1 YES	|_|	
J1. 4 Does anyone in your household have a bank account? 2 NO 1 YES	|_|	

IRRIGATION BASELINE SURVEY **QUESTIONNAIRE No. |__|__|__|__|__|**

J2 Employment and Off-Farm Income **(everyone 7 and older) Populate from household member codes FROM SECTION B**

We have already talked about cultivating the household plots. Now, I would like to ask you a few questions about any OTHER work that members of your household may have done during the last 12 months, from August 2011 – August 2012.

	J2.1	J2.2	J2.3
Member ID	Other than working on the household plots, did [NAME] do anything else to earn money including work for pay, work in business for his/herself, work in a family business, making things to sell, casual labor, odd jobs, or any other activity to earn money? 2 No ➔*NEXT MEMBER* 1 Yes 88 DON'T KNOW 99 REFUSED	In the main activity other than working on the household plots to earn money during the last year was [NAME]... 1 ... a paid employee? 2 ... self employed? 3 ... working for a family business? 88 don't know 99 REFUSED ➔*IF J2.2>1,* ***GO TO J2.4***	For whom did [NAME] work in this main activity? ENUMERATOR SHOULD READ RESPONSE OPTIONS TO RESPONDENT 01 Anchor Farmer 02 Other private sector employer (other farm, business, or private services) 03 Government Sector 04 NGO, Inter. Org, or Cooperative 05 Other 88 DON'T KNOW

			99 REFUSED
01	|_|	|_|	|_|_|
02	|_|	|_|	|_|_|
03	|_|	|_|	|_|_|
04	|_|	|_|	|_|_|
05	|_|	|_|	|_|_|
06	|_|	|_|	|_|_|
07	|_|	|_|	|_|_|
08	|_|	|_|	|_|_|
09	|_|	|_|	|_|_|
10	|_|	|_|	|_|_|
11	|_|	|_|	|_|_|
12	|_|	|_|	|_|_|
13	|_|	|_|	|_|_|
14	|_|	|_|	|_|_|

15	|_|	|_|	|_|_|
16	|_|	|_|	|_|_|
17	|_|	|_|	|_|_|
18	|_|	|_|	|_|_|

Member ID	J2.4	J2.5	J2.6	J2.7	J2.8
	How much did [NAME] make doing this work (incl. any bonuses, commissions allowances, or tips) ? TIME UNIT CODES 1 Daily 2 Weekly 3 Fortnightly (every two weeks) 4 Monthly 5 Quarterly (every 3 months) 6 Yearly		Does [NAME] receive any payment for this work in the form of goods and services? 2 No ➔ *J2.9* 1 Yes 88 DON'T KNOW 99 REFUSED	Approximately what is the value of goods or services provided? TIME UNIT CODES 1 Daily 2 Weekly 3 Fortnightly (every two weeks) 4 Monthly 5 Quarterly (every 3 months) 6 Yearly 88 DON'T KNOW	

	88 DON'T KNOW 99 REFUSED			99 REFUSED	
	GH¢ 88 DON'T KNOW 99 REFUSED	TIME UNIT		GH¢ 88 DON'T KNOW 99 REFUSED	TIME UNIT
01	|_|_|_|_|	|_|	|_|	|_|_|_|_|	|_|
02	|_|_|_|_|	|_|	|_|	|_|_|_|_|	|_|
03	|_|_|_|_|	|_|	|_|	|_|_|_|_|	|_|
04	|_|_|_|_|	|_|	|_|	|_|_|_|_|	|_|
05	|_|_|_|_|	|_|	|_|	|_|_|_|_|	|_|
06	|_|_|_|_|	|_|	|_|	|_|_|_|_|	|_|
07	|_|_|_|_|	|_|	|_|	|_|_|_|_|	|_|
08	|_|_|_|_|	|_|	|_|	|_|_|_|_|	|_|

09	|_|_|_|_|	|_|	|_|	|_|_|_|_|	|_|
10	|_|_|_|_|	|_|	|_|	|_|_|_|_|	|_|
11	|_|_|_|_|	|_|	|_|	|_|_|_|_|	|_|
12	|_|_|_|_|	|_|	|_|	|_|_|_|_|	|_|
13	|_|_|_|_|	|_|	|_|	|_|_|_|_|	|_|
14	|_|_|_|_|	|_|	|_|	|_|_|_|_|	|_|
15	|_|_|_|_|	|_|	|_|	|_|_|_|_|	|_|
16	|_|_|_|_|	|_|	|_|	|_|_|_|_|	|_|
17	|_|_|_|_|	|_|	|_|	|_|_|_|_|	|_|
18	|_|_|_|_|	|_|	|_|	|_|_|_|_|	|_|

	J2.9	J2.10	J2.11	J2.12	J2.13

IRRIGATION BASELINE SURVEY **QUESTIONNAIRE No.** |__|__|__|__|__|

Member ID	During the past 12 months, for how many weeks did [NAME] do work in this activity?	During these weeks, how many hours per week did [NAME] usually work in this activity?	Is [Name] still working on this activity? 2 No 1 Yes 88 DON'T KNOW 99 REFUSED (if activity is seasonal but will work next season indicate 1 Yes)	During the past 12 months, did [NAME] do any secondary work beside the activity was just discussed or working on household plots? 2 No ➔*NEXT MEMBER* 1 Yes 88 DON'T KNOW 99 REFUSED	How much did this member earn in the secondary job in the past 12 months? -1 REFUSED -2 DON'T KNOW GH¢
	WEEKS -1 REFUSED -2 DON'T KNOW	HOURS/WEEK -1 REFUSED -2 DON'T KNOW			
01	|_|_|	|_|_|_|	|_|	|_|	|_|_|_|_|
02	|_|_|	|_|_|_|	|_|	|_|	|_|_|_|_|
03	|_|_|	|_|_|_|	|_|	|_|	|_|_|_|_|
04	|_|_|	|_|_|_|	|_|	|_|	|_|_|_|_|
05	|_|_|	|_|_|_|	|_|	|_|	|_|_|_|_|
06	|_|_|	|_|_|_|	|_|	|_|	|_|_|_|_|

07	|_|_|	|_|_|_|	|_|	|_|	|_|_|_|_|
08	|_|_|	|_|_|_|	|_|	|_|	|_|_|_|_|
09	|_|_|	|_|_|_|	|_|	|_|	|_|_|_|_|
10	|_|_|	|_|_|_|	|_|	|_|	|_|_|_|_|
11	|_|_|	|_|_|_|	|_|	|_|	|_|_|_|_|
12	|_|_|	|_|_|_|	|_|	|_|	|_|_|_|_|
13	|_|_|	|_|_|_|	|_|	|_|	|_|_|_|_|
14	|_|_|	|_|_|_|	|_|	|_|	|_|_|_|_|
15	|_|_|	|_|_|_|	|_|	|_|	|_|_|_|_|
16	|_|_|	|_|_|_|	|_|	|_|	|_|_|_|_|
17	|_|_|	|_|_|_|	|_|	|_|	|_|_|_|_|
18	|_|_|	|_|_|_|	|_|	|_|	|_|_|_|_|

Member ID	J2.15 In this secondary activity to earn money during the last year was [NAME]... 1 ... a paid employee? 2 ... self employed? 3 ... working for a family business? 88 don't know 99 REFUSED ➔*IF J2.15>1,* ➔*NEXT MEMBER*	J2.16 *(IF J2.15=1)* For whom did [NAME] work in this main activity? 01 Anchor Farmer __(Solar Harvest/VegPro)__ 02 Other private sector employer (other farm, business, or private services) 03 Government Sector 04 NGO, Inter. Org, or Cooperative 05 Other 88 DON'T KNOW 99 REFUSED
01	|_|	|_|_|
02	|_|	|_|_|
03	|_|	|_|_|
04	|_|	|_|_|
05	|_|	|_|_|
06	|_|	|_|_|

07	|_|	|_|_|
08	|_|	|_|_|
09	|_|	|_|_|
10	|_|	|_|_|
11	|_|	|_|_|
12	|_|	|_|_|
13	|_|	|_|_|
14	|_|	|_|_|
15	|_|	|_|_|
16	|_|	|_|_|
17	|_|	|_|_|
18	|_|	|_|_|

J3. Other, non-labor, income		**J3.1**	**J3.2**
		How much did your household receive during the last 12 months from [INCOME TYPE] including the value of any payment in the form of goods? -1 REFUSED -2 DON'T KNOW [CURRENCY] IF NONE, ENTER "0" ➔ *NEXT INCOME TYPE*	Who in your household received this payment? (Specific member, or whole household) *Use Member codes from Section B – List up to three* CAPI INSTRUCTIONS – POPULATE WITH HOUSEHOLD MEMBER CODES FROM SECTION B
(a)	Rental of land / property	|__|__|__|__|__|__|	|__|__| |__|__| |__|__|
(b)	Rental of farm equipment / animals	|__|__|__|__|__|__|	|__|__| |__|__| |__|__|
(c)	Sale of household assets	|__|__|__|__|__|__|	|__|__| |__|__| |__|__|
(d)	Remittances from family outside the household, friends or others	|__|__|__|__|__|__|	|__|__| |__|__| |__|__|
(e)	SSNIT (Social Security National Insurance Trust)	|__|__|__|__|__|__|	|__|__| |__|__| |__|__|
(f)	Private pensions or other retirement payments	|__|__|__|__|__|__|	|__|__| |__|__| |__|__|

(i)	social assistance payments from the government (i.e., scholarships, disability payments, etc.)	|__|__|__|__|__|__|	|__|__| |__|__| |__|__|
(j)	Social assistance from aid programs, church, or others	|__|__|__|__|__|__|	|__|__| |__|__| |__|__|
(k)	OTHER [SPECIFY]:_____	|__|__|__|__|__|__|	|__|__| |__|__| |__|__|

IRRIGATION BASELINE SURVEY **QUESTIONNAIRE No. |__|__|__|__|__|**

SECTION K. FOOD SECURITY

ASK THE MEMBER OF THE HOUSEHOLD MAINLY RESPONSIBLE FOR FOOD PREPARATION.

Now, I would like to ask you few questions related to your household's access to sufficient food for everyone in the household to eat during the year.

K1	During the last 12 months did your household experience a period of time when there was not enough food for everyone to eat ("Hungry Season")? *2 NO → GO TO SECTION L 1 YES 88 DON'T KNOW 99 REFUSED*	|__|	**CODES FOR K2.1 – K2.2** *01 JANUARY* *02 FEBRUARY* *03 MARCH* *04 APRIL* *05 MAY* *06 JUNE* *07 JULY* *08 AUGUST* *09 SEPTEMBER* *10 OCTOBER* *11 NOVEMBER* *12 DECEMBER* *88 DON'T KNOW* *99 REFUSED*
K2.1	What was the starting month of the Hungry Season?	|__|__|	
K2.2	What was the ending month of the Hungry Season?	|__|__|	

For the rest of these questions that I will ask about your household's food security, I want you to think about the last four weeks of the last Hungry Season, the [ENDING MONTH = LAST MONTH OF THE CRITICAL PERIOD]

K3	Last [ENDING MONTH] were you or any household member not able to eat the kinds of food that you usually eat because of a lack of money or other resources? *1 YES 2 NO → GO TO K4 88 DON'T KNOW 99 REFUSED*	|__|	**CODES FOR K3.1, K4.1, K5.1, K6.1** *1 RARELY (ONCE OR TWICE)* *2 SOMETIMES (3-10 TIMES)* *3 OFTEN (MORE THAN 10 TIMES)* *99 REFUSED* *88 DON'T KNOW*
K3.1	How often did this happen during [ENDING MONTH]? *SEE CODES*	|__|	
K4	Last [ENDING MONTH], did you or any other household member have to eat a smaller meal because of a lack of money or other resources? *1 YES 2 NO → GO TO K5 88 DON'T KNOW 99 REFUSED*	|__|	
K4.1	How often did this happen during [ENDING MONTH]? *SEE CODES*	|__|	
K5	Last [ENDING MONTH] did you or any other household member have to eat fewer meals because of a lack of money or other resources? *1 YES 2 NO → GO TO K6 88 DON'T KNOW 99 REFUSED*	|__|	
K5.1	How often did this happen during [ENDING MONTH]? *SEE CODES*	|__|	

K6	Last (ENDING MONTH) did you or any other household member have to sell any household assets that you did not want to in order to buy food? *1 YES 2 NO → GO TO SECTION L 88 DON'T KNOW 99 REFUSED*	|__|	
K6.1	How often did this happen during [ENDING MONTH]? *SEE CODES*	|__|	

Section L

L.1	INTERVIEWER PLEASE CHOOSE THE HOUSING TYPE FROM THIS LIST:	1 Formal dwelling / house on a separate site 2 Traditional dwelling / hut 3 Informal dwelling / shack 4 Other (SPECIFY) 88 DON'T KNOW 99 REFUSED	**L1.1** |_|	**L1.2**
L.2	How many rooms in total does this household occupy? COUNT BEDROOMS, LIVING ROOMS, DINING ROOMS, KITCHEN BUT NOT BATHROOMS IF NONE ENTER 0 -1 REFUSED -2 DON'T KNOW		|_|_|	
L.3		9 No facilities	**L3.1**	**L3.2**

	What type of sanitation toilet do you use daily?	1 Flush toilet to sewage network 2 Flush toilet to septic tank 3 Chemical Toilet 4 Ventilated Improved Pit Latrine 5 Pit Latrine 6 Tub or bucket latrine (where feces are manually removed) 7 Other (Specify) 88 DON'T KNOW 99 REFUSED		|_|	Specify: _____
ML.4	What is your main source of drinking water?	1 Piped water into dwelling 2 Piped water to yard/plot 3 Piped into someone else's yard/plot 4 Public tap/standpipe 5 Tube-well/borehole 6 Protected dug well 7 Unprotected dug well	8 Protected spring 9 Unprotected spring 10 Rainwater collection 11 Bottled/Sachet water 12 Cart with small tank/drum 13 Tanker-truck 14 Surface water (river, dam, lake, pond) 88 DON'T KNOW	|_|_|	

			99 REFUSED			
L.5	What is the main fuel used by the household for cooking?	1 Wood 2 Charcoal 3 Gas 4 Electricity		5 Kerosene 6 Crop residue/ sawdust 7 Animal waste 8 Other (Specify) 88 DON'T KNOW 99 REFUSED	**L5.1** |_|	**L5.2** Specify: _____

IRRIGATION BASELINE SURVEY **QUESTIONNAIRE No.** |__|__|__|__|__|

M. FARM AREA(S) SIZE(S) AND NUMBER(S) OF PLOTS

NOTE THAT THE FOLLOWING MEASUREMENTS MUST BE MADE AT THE FARMER'S PLOTS AREA(S) AND THAT SOME OF THESE MEASUREMENTS REQUIRE USE OF THE MAP60 GPS UNIT.

LOCATION OF (CENTER OF) PLOT AREAS AND SIZE OF AREAS (HA) BY WALKING AROUND AREAS WITH THE GPS:

M1.1 PLOT AREA 1 – Was this plot measured? 1 YES 2 NO 88 DON'T KNOW 99 REFUSED			**COMMENTS/ OBSERVATIONS**
M1.1a	Area 1 Center Latitude	N– |__|__|__|º |__|__|.|__|__|__|'	
M1.1b	Longitude	E – |__|__|__|º |__|__|.|__|__|__|'	
M1.1c	Area 1 size (ha) -1 REFUSED -2 DON'T KNOW	|__|__|__|.|__|__|	
M2.1 PLOT AREA 2 – Was this plot measured? 1 YES 2 NO 88 DON'T KNOW 99 REFUSED			**COMMENTS/ OBSERVATIONS**
M2.1a	Area 2 Center Latitude	N– |__|__|__|º |__|__|.|__|__|__|'	
M2.1b	Longitude	E – |__|__|__|º |__|__|.|__|__|__|'	
M2.1c	Area 2 size (ha)		

	-1 REFUSED -2 DON'T KNOW	|__|__|__|.|__|__|	
M3.1 PLOT AREA 3 – Was this plot measured? 1 YES 2 NO 88 DON'T KNOW 99 REFUSED			**COMMENTS/ OBSERVATIONS**
	Area 3 Center		
M3.1a	Latitude	N– |__|__|__|º |__|__|.|__|__|__|'	
M3.1b	Longitude	E – |__|__|__|º |__|__|.|__|__|__|'	
M3.1c	Area 3 size (ha) -1 REFUSED -2 DON'T KNOW	|__|__|__|.|__|__|	
M4.1 PLOT AREA 4 – Was this plot measured? 1 YES 2 NO 88 DON'T KNOW 99 REFUSED			**COMMENTS/ OBSERVATIONS**
	Area 4 Center		
M4.1a	Latitude	N– |__|__|__|º |__|__|.|__|__|__|'	
M4.1b	Longitude	E – |__|__|__|º |__|__|.|__|__|__|'	
M4.1c	Area 4 size (ha) -1 REFUSED -2 DON'T KNOW	|__|__|__|.|__|__|	

M5.1 PLOT AREA 5 – Was this plot measured? 1 YES 2 NO 88 DON'T KNOW 99 REFUSED			**COMMENTS/ OBSERVATIONS**
	Area 5 Center		
M5.1a	Latitude	N– |__|__|__|º |__|__|.|__|__|__|'	
M5.1b	Longitude	E – |__|__|__|º |__|__|.|__|__|__|'	
M5.1c	Area 5 size (ha) -1 REFUSED -2 DON'T KNOW	|__|__|__|.|__|__|	
M6.1 PLOT AREA 6 – Was this plot measured? 1 YES 2 NO 88 DON'T KNOW 99 REFUSED			**COMMENTS/ OBSERVATIONS**
	Area 6 Center		
M6.1a	Latitude	N– |__|__|__|º |__|__|.|__|__|__|'	
M6.1b	Longitude	E – |__|__|__|º |__|__|.|__|__|__|'	
M6.1c	Area 6 size (ha) -1 REFUSED -2 DON'T KNOW	|__|__|__|.|__|__|	

M7.1 PLOT AREA 7 – Was this plot measured? 1 YES 2 NO 88 DON'T KNOW 99 REFUSED			**COMMENTS/ OBSERVATIONS**
	Area 7 Center		
M7.1a	Latitude	N– |__|__|__|º |__|__|.|__|__|__|'	
M7.1b	Longitude	E – |__|__|__|º |__|__|.|__|__|__|'	
M7.1c	Area 7 size (ha) -1 REFUSED -2 DON'T KNOW	|__|__|__|.|__|__|	
M8.1 PLOT AREA 8 – Was this plot measured? 1 YES 2 NO 88 DON'T KNOW 99 REFUSED			**COMMENTS/ OBSERVATIONS**
	Area 8 Center		
M8.1a	Latitude	N– |__|__|__|º |__|__|.|__|__|__|'	
M8.1b	Longitude	E – |__|__|__|º |__|__|.|__|__|__|'	
M8.1c	Area 8 size (ha) -1 REFUSED -2 DON'T KNOW	|__|__|__|.|__|__|	

M9.1 PLOT AREA 9 – Was this plot measured? 1 YES 2 NO 88 DON'T KNOW 99 REFUSED			**COMMENTS/ OBSERVATIONS**
	Area 9 Center		
M9.1a	Latitude	N– |__|__|__|º |__|__|.|__|__|__|'	
M9.1b	Longitude	E – |__|__|__|º |__|__|.|__|__|__|'	
M9.1c	Area 9 size (ha) -1 REFUSED -2 DON'T KNOW	|__|__|__|.|__|__|	
M10.1 PLOT AREA 10 – Was this plot measured? 1 YES 2 NO 88 DON'T KNOW 99 REFUSED			**COMMENTS/ OBSERVATIONS**
	Area 10 Center		
M10.1a	Latitude	N– |__|__|__|º |__|__|.|__|__|__|'	
M10.1b	Longitude	E – |__|__|__|º |__|__|.|__|__|__|'	
M10.1c	Area 10 size (ha) -1 REFUSED -2 DON'T KNOW	|__|__|__|.|__|__|	