



RESEARCH PROGRAM ON  
**Climate Change,  
Agriculture and  
Food Security**



**CGIAR Research Program on  
Climate Change, Agriculture and Food Security (CCAFS)**

## **Baseline Household Survey Results: Chicualacuala District, Mozambique**

**July 2013**

**Richard Dixon**



## Acknowledgments

Many thanks to Fernanda Gomes, Research Coordinator, National Agricultural Research Institute (IIAM), for leadership and guidance throughout the baseline survey implementation.

Thanks to the Professor Dr. Pedro Hortêncio Comissal, Senior Polytechnic Institute of Gaza Province (ISPG) for allowing lecturers and agricultural students to be part of the data collection process. We are very grateful for the commitment of the data collection teams from ISPG often working under difficult conditions. The Chicualacuala team: Team Leader Arão Raimundo Finiasse and team members Camilo Rafael Madime, Eucádia Olga Munguambe and Renato da Silva Malate. Many thanks go to Joash Mango for training the teams in the CCAFS methodology.

Data entry was supervised by Gilberto Muai, and entered on CPro by Neusa Andre and Rogerio Zunguze with technical support from Sam Dumble, Reading University, UK. Many thanks go to Steve McSween for invaluable advice on the data analysis and presentation.

Thanks to the IUCN Mozambican staff: Regina Cruz, Head of Office Maputo, for management support during the survey; Helga Marques, Administrator, for administration and logistical support; and, Americo Come, Driver, for driving under difficult conditions in the field without complaint.

## TABLE OF CONTENTS

<b>Map.....</b>	<b>iii</b>
<b>Executive Summary.....</b>	<b>1</b>
<b>1.0 Background and Description of Survey Area .....</b>	<b>3</b>
<b>2.0 The Survey.....</b>	<b>4</b>
2.1. Objective of the Survey	
2.2. Scope of the Survey	
2.3. Sampling Procedure	
2.4. Survey Instrument and Survey Topics	
Selection and Training of Survey Interviewers	
Survey Logistics	
Data Entry, Analysis, and Report Compilation	
Limitations of the Survey	
<b>3.0 Household Description.....</b>	<b>7</b>
Gender of Survey Respondents, and Gender and Civil Status of Heads of Household	
Household Size and Proportion of Residents of Working and Non-working Age	
Education Levels	
House Construction Materials and Household Utilities	
Household Assets	
Membership in Associations or other Community Based Organization	
<b>4.0 Household Livelihood Resources: Access to, Consumption, and Sale of On-Farm and Off-Farm Products.....</b>	<b>11</b>
On-Farm Livelihood Resources	
Off-Farm Livelihood Resources	
On-Farm and Off-Farm Production Responsibilities Falling Mainly to Women and Children	
Livelihood Diversification Indices	
Off-Farm Sources of Cash Income	
<b>5.0 Food Security .....</b>	<b>15</b>
Reported Periods of Food Insecurity During the Last 12 Months	
<b>6.0 Agricultural Practices .....</b>	<b>17</b>
Land Use	
Agricultural Inputs Purchased During the Past Year and Use of Credit	
Use of Fertilizer	
Tree Planting	
Access to Hired Farm Machinery and Labour	
Water for Agriculture	
Information Received About Pest or Disease Outbreak and Use of the Information in Making Farm Decisions	
<b>7.0 Changes Made to the Farming System Over the Past 10 Years and Reasons Given for Change.....</b>	<b>19</b>
Changes Made to Crops Over the Past 10 Years	
Changes Made to Livestock Over the Past 10 Years	
Agricultural System Adaptability Index, Reported Input Intensification and Increased Productivity	
<b>8.0 Climate and Weather Forecast Information .....</b>	<b>26</b>

Access to Weather Forecast Information  
Farm-Related Advice Received in Weather Forecasts and Use of the Advice  
to Make Farm Changes

## 9.0 Climate Related Crisis.....30

### TABLES

Table 1.	Site selection criteria
Table 3.1.	Types of households included in the survey, by percentage of households
Table 3.2.	Proportion of working age and non-working age household residents, by percentage of households per category
Table 3.3	Highest level of level of education attained by a household member, by percentage of households
Table 3.4.	Improved housing and access to utilities, by percentage of households
Table 3.5.	Types of assets owned by households, by percentage of households
Table 3.6	Asset index by percentage of households per index category
Table 3.7	Association or community-based organization membership, by percentage of households
Table 4.1	Number and percentage of households producing, consuming and selling various products produced on their own farms (on-farm)
Table 4.2	Number and percentage of households producing, consuming and selling various products produced outside their own farms (off-farm)
Table 4.3.	Percentage of women and children that were reported to be primarily responsible for the production of various on-farm and off-farm products
Table 4.4	Production and commercialization diversification indices
Table 4.5.	Off-farm cash income sources by percentage of households
Table 6.1	Areas of potentially land available and areas currently used for cropping, by percentage of households
Table 6.2	Agricultural Inputs Purchased, by percentage of households
Table 6.3.	Percentage of households reporting to hire farm equipment or labour
Table 6.4	Water sources for agriculture on-farm
Table 7.1	Crops reported to be the most important to households livelihood today and 10 years ago, by percentage of households
Table 7.2	Crop changes reported to have been made during last 10 years, by percentage of households
Table 7.3.	Land management changes made during the past 10 years, by percentage of households
Table 7.4.	Reason given for having made land management and crop change during the past 10 years, by percentage of households
Table 7.5	Animals reported to be the most important to households livelihood today and 10 years ago, but percentage of households
Table 7.6.	Number of different types of animals owned by households, by percentage of households
Table 7.7.	Types of livestock management changes made during the past 10 years, by percentage of households
Table 7.8	Percentage of households reporting to have made changes to the types of livestock they own during the past 10 years

---

Table 7.9.	Reasons for having made livestock changes during the past 10 years, by percentage of households
Table 7.10	Adaptability/Innovation Index
Table 8.1	Types of weather information received by percentage of households
Table 8.2	Sources of weather related information by type of forecast and percentage <sup>*</sup> of households
Table 8.3	Percentages of households receiving weather related information
Table 8.4.	Percentage of households reporting that weather forecast information included advice on how to use the information and the percentage of households that reported having used the advice
Table 8.5.	Types of farm changes made after receiving weather forecast, by number and percentage of households

## FIGURES

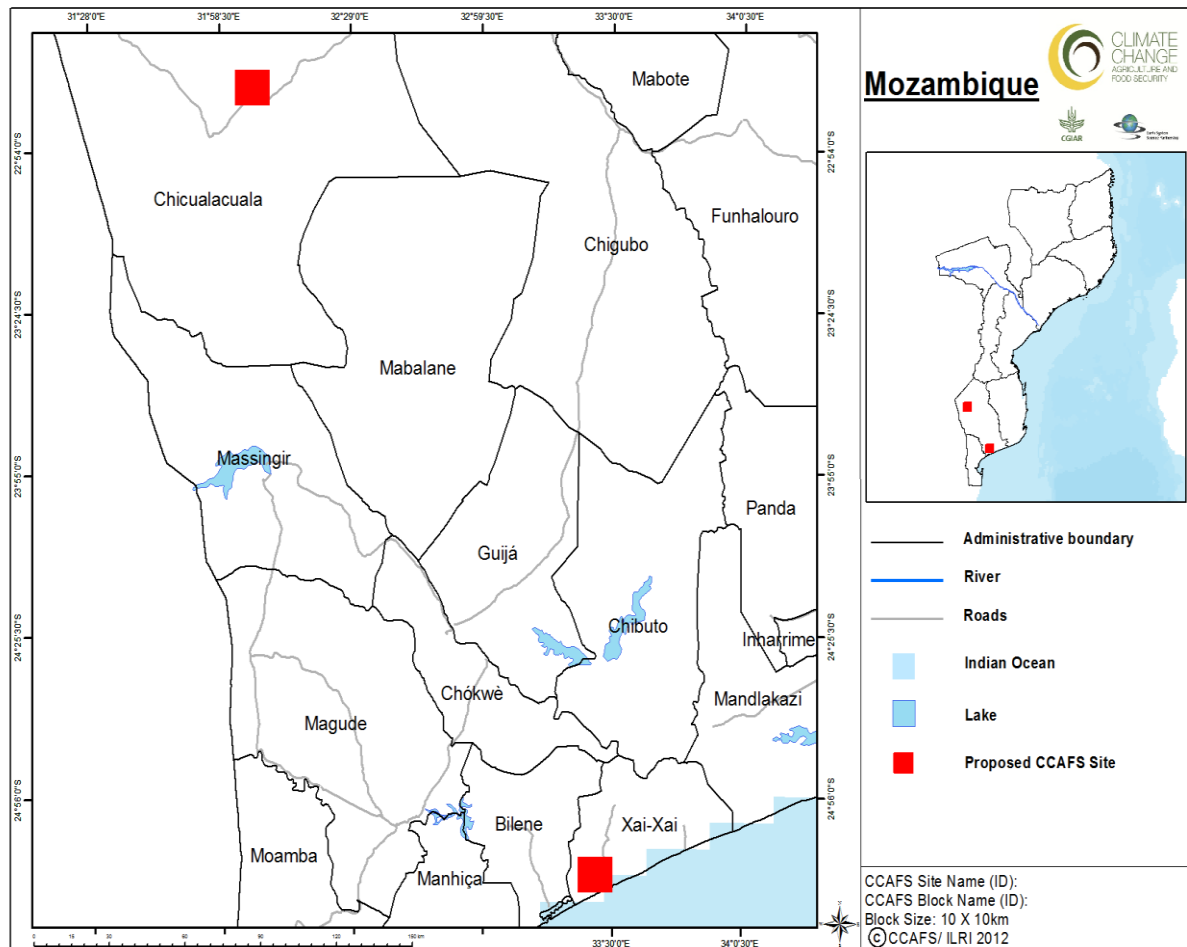
Figure 1	Study area
Figure 5.1	Percentage of households reporting a food shortage during the previous year, by month
Figure 5.2	Percentages of households reporting food shortage and reporting to procure most of the their food from off-farm sources, by month

## Annexes

1. Implementation plan
2. Code sheet used
3. Adopted manual for field Supervision
4. Sampling frame for villages (village list with 7 highlighted)
5. Questionnaire in English and Portuguese

Separate Book Data files with data entry and analysis

## Map



## Executive Summary

IUCN carried out household baseline survey in two sites in Mozambique in 2012/2013. This report presents the main results of the analysis of the survey carried out in November 2012 in seven villages, with 140 households, in Chicualacuala District, a National Agricultural Research Institute (IIAM) priority site, located in Gaza Province, in the Limpopo river basin, Mozambique. The survey was carried out using the standardised CCAFS household baseline tool. Within the Chicualacuala district the site a 10 x 10 km block was selected. A complete and up-to-date list of villages within the block was made. A random sample of seven villages was taken from all those villages in each block. A complete list of households within each selected village was generated. 20 households were selected at random from the list within each village. The CCAFS questionnaire was then used on a total sample of 140 respondents.

The results show that the vast majority of surveyed households in Chicualacuala produce food crops and rely on livestock production for their livelihoods. A description of a typical household was that 67% are male headed, 33% female headed and 67% have 1 or more children <5 years. The prominent ethnic group is Changani (87%) and the average household size is 6.8. the education level is low with 27% not having received any formal education and for 48% Primary school is the highest level of Education. Households are poor with 59% having improved roofing material and only 2% having access to stored water and electricity. The majority of households have access to between 1-5 hectares of land with only 6% having access to more than 5 hectares. An unexpected finding was that 96% stated that they did not belong to a Community group or Association.

Household livelihood resources from on-farm sources, nearly every family (92%) produced staple food crops but only 6% sell the staple food crop. 88% produced other food crops but again only 4% sell them. Fruit is also produced on farm (73% owning fruit trees) but only 9% sell fruit. Unsurprisingly for this zone small livestock is very important with 64% producing and 21% selling small livestock, the most important marketing commodity. 14% produce large livestock and 5% sell them. In terms of off-Farm resources fuel wood is the most important with 96% of households produce it but again only 3% selling fuels wood. Charcoal is the most important marketable commodity 24% produce with 16% selling charcoal. Most of the crop production is consumed by the family members themselves, as few households sell their agricultural produce. Households that do sell produce usually sell fruit, small livestock and charcoal. On-farm consumption is supplemented with off-farm produce as well.

Women carry out most of the work both on and off farm, some work is equally shared between men and women and 15% is carried out by family as a whole. 39% of households receive remittances, 37% have paid non-farm employment and 37% other business. A quarter of households have a family member working for the government. Nearly all households experience a food shortage between September and January.

Generally, cowpea, millet and sorghum were cited as the three most important crops in this area. However inputs are scarce and fertilizer not commonly used. Only one per cent of households are food secure throughout the year and 81% experience difficulties in feeding their families from any source for one to two months each year. The main inputs available,

affordable and used are veterinary medicines, but only 8% use them, and improved seeds are only used by 6% of households. However, 47% of households planted trees in past 12 months. A quarter of households hire animal traction, 14% hire farm labour, but almost no one uses irrigation.

Households have been adapting and making changes in their farming practices over the last ten years, with the majority of households stating they had made changes to at least three of their crops, however, cropping patterns remain similar to those of 10 years ago. The changes have been varietal changes, for example, 51% planted draught tolerant sorghum, 29% a longer cycle variety of cowpea and millet, and 16% a higher yielding variety of cowpea. 61 % expanded the land for cowpea cultivation, 59% introduced intercropping with millet, and 47% reduced the area allocated to maize production. The reasons given for these changes were mainly climatical, i.e. 80% because of more erratic rainfall, 36% because of more frequent draughts, and 31% because the rainy season was beginning much later. Oxen, Chicken and pigs are the most cited livestock, but few have made livestock-related management changes except for the increase in oxen reared. Climate- and market-related reasons are behind these changes, as well as factors relating to land and labour issues. Looking at the adaptability index, the majority (80%) make between 2 and 10 changes and are classed as intermediate adapters.

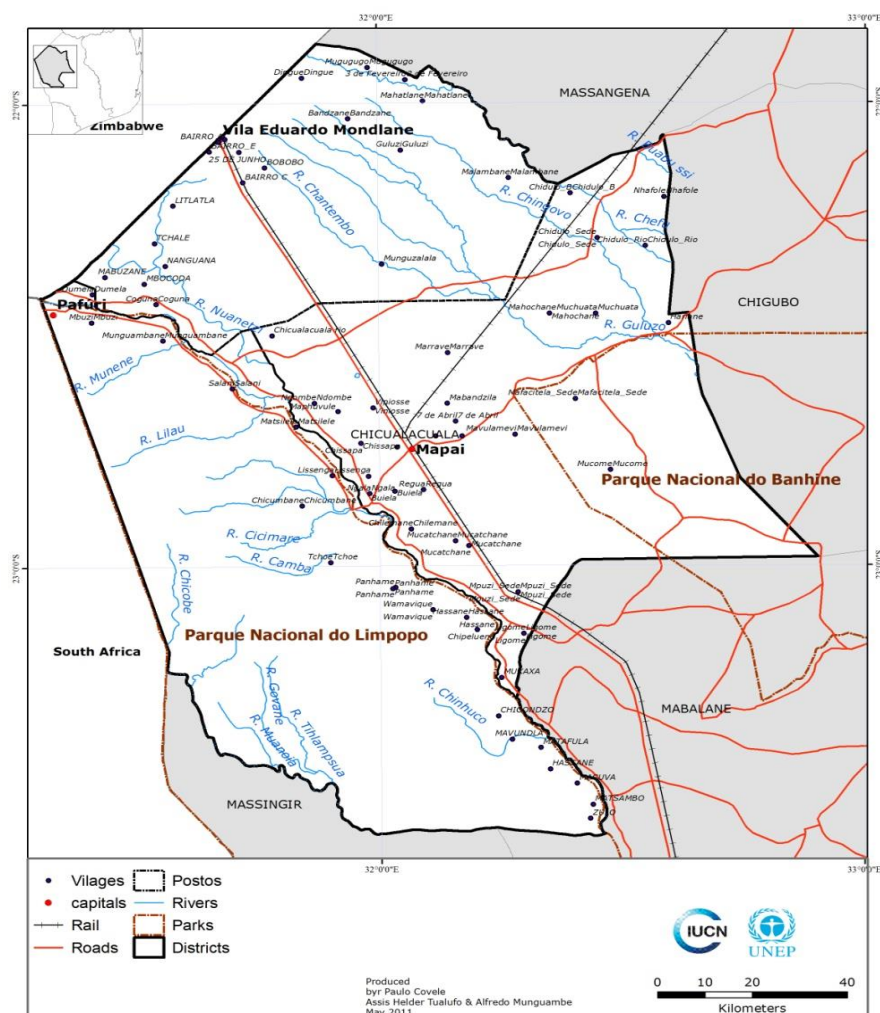
Friends, relatives and neighbors, and radio are the most common sources of weather and climate-related information. Twice as many males as females receive weather-related information. Less than half of households that received weather information included some advice on how to use the information for making farm decisions. The aspects of farming that were most commonly changed, upon receiving information about the start of rainy season, were land management decisions.

67% of respondents reported that their household had been impacted by a climate related crisis within the last five years. Among them, 50% said that they had received some type of assistance, with the majority reporting that that assistance came from NGOs (60%), followed by family/friends (36%), government agencies (13%).



## 1.0 Background and Description of Survey Area.

The Chicualacuala District covers an area of 18.065 km<sup>2</sup> and is situated just north of Gaza province, bordered to the south by the districts of Mabalane and Massingir, in the East by the District of Chigubo Mabalane and to the north, the Massangena District, and the Republics of Zimbabwe and South Africa to the west (Figure 1). The population recorded in 2007 was 38,917 inhabitants (INE - III Census of Population and Housing 2007, 2008).



**Figure 2 Study area**

The climate is dry with an average annual rainfall less than 500mm and mean annual temperatures above 24°C. These conditions are aggravated by great irregularity of rainfall during the rainy season and therefore the occurrence of frequent dry periods (PMA, 2009).

The topography is characterized by a slope decreasing in a Northeast-Southeast direction. The high regions (between 400-520m) are found near the border with Zimbabwe and South Africa and the low-lying regions (60-100m) covers part of the administrative post of Mapai, in the Banhine Reserve (MAE, 2005)

The main water resources included the following rivers: Limpopo, Nuanetzi, Chefu, Munene and Singuedzi. All of these belong to the Limpopo basin (PMA, 2009).

## 2.0 The Survey

### 2.1 Objective of the Survey

**Goal:** Enhanced livelihood resilience and adaptive capacity to climate change risks in food insecure areas in Southern Mozambique

**Purpose:** Enhanced role of agricultural and ecosystems services and goods in managing climate related risks to improve livelihood resilience and adaptive capacity in Southern Mozambique.

The International Union for the Conservation of Nature (IUCN) was subcontracted by the National Institute for Agricultural Research (IIAM) to implement a Baseline survey for the Climate Change for Agriculture and Food Security Project (CCAFS) funded project entitled *Managing climate related risks to improve livelihood resilience and adaptive capacity in agricultural ecosystems in Southern Mozambique*.

**Output 1.** To investigate local knowledge regarding climate change, its effects on the community livelihoods, the changes they introduce in the system to manage these climate changes.

### 2.2. Scope of the Survey

This was done by replicating the CCAFS Baseline Survey (<http://ccafs.cgiar.org/resources/baseline-surveys>). The Baseline Survey sought to identify the risks and opportunities posed by climate change to the agricultural system and the effective strategies farmers are already using to enhance their adaptive capacity. This part of the survey was conducted at the household level. Village and organizational level surveys will be conducted during the next phase of the research. The survey is an important tool to understand the starting point over which the project research outputs will be better defined, monitored and evaluated.

### 2.3. Sampling Procedure

#### **Sampling scheme for selecting blocks, villages and households for the baseline survey**

The sampling requires 3 layers in a hierarchy: 10 x 10 km block (one per site/district), villages within a block (7) and households within each village (20). This scheme does not refer explicitly to administrative hierarchies.

#### **Steps:**

1. The sites are equivalent to a district, in this survey there are two sites (i) Xai Xai district and (ii) Chicualacuala district, both in Gaza Province. This report will only cover results from Chicualacuala
2. Within that larger site a 10 x 10 km block is selected for the baseline survey.

3. Locations of sites/blocks are based on the criteria described in the site criteria Table 1. below.

**Table 1. Site selection criteria**

Criterion
Locations representing key biophysical and agro-ecological gradients of the respective regions
Research locations that represent the key socio-economic and (where relevant) demographic gradients for the region, including extent of urbanization and gendered participation in different agricultural production systems
Research sites that lie along gradients of anticipated temperature and precipitation change
Research sites that lie along gradients of current and anticipated land use pressure
Research sites that represent different institutional (e.g. land tenure) arrangements. Similarly, gradients of significant difference in political and governance history
Sites that have significant but contrasting climate-related problems and opportunities for intervention
High potential sites, i.e. where impact is likely to be achieved: sites that build on ongoing CGIAR and national research infrastructure and research sites, and thus have good existing data on historical weather records; characterization of the natural resource base; detailed, longitudinal data on agricultural production; detailed, longitudinal socio-economic and demographic data at the household and village settlement/district level; data on the food system; and data on historical events and shocks experienced in relation to food security in the site
Governance and institutional capacity that favor the likelihood of scaling up and generating transferable results
A network of regional partners that will facilitate scaling up
Sites that have mitigation/carbon sequestration potential
Sites that are safe to work in, i.e. have good security for research teams
Research sites that are physically accessible and have the minimum logistical comforts for conducting research
Marginal sites with high vulnerability where impact will be difficult to achieve but where the need for innovative solutions to poverty and climate change vulnerability may be greatest

4. One block per site was selected.
5. In this survey the criteria for selection of a site were met by an area of 10 x 10 km block, however, larger blocks can be used e.g. 30 x 30 km block if criteria cannot be met within 10x10km, i.e. low population density or dispersed populations.

**Block coordinates for the Chicualacuala Site are:**

Point 1. E 402461 and S 7494361

Point 2. E 412461 and S 7494361

Point 3. E 412461 and S 7484361

Point 4. E 402461 and S 7484361

### Villages

1. The definition of a 'village' was that of an entity that has some level of local administration organization. The key criteria are that: (i) People within a village are a 'community' in the sense that there is a level of interaction and dependence among them; (ii) It is possible to define who is/is not part of the village; (iii) It is possible to communicate with the village (e.g. through a headman or similar to call a village meeting).
2. A complete and up-to-date list of villages within each selected block was then made.
3. A random sample of seven villages was taken from all those villages in each block.

### Households

1. This survey was based on interviews of one or more individuals (ideally the household head and spouse) within the household who were able to answer questions about their household. Enumerators were instructed to try to confirm responses with appropriate household members if and when possible. All of the questions refer to people who are regularly resident in the household. A household was defined as follows:  
*'A household is composed of a group of people living in the same dwelling space who eat meals together and have at least one common plot together or one food/income-generating activity together (e.g. herding, business, fishing) and acknowledge the authority of a man or woman who is the head of household' (Beaman and Dillon, IFPRI, 2010).*
2. A complete list of households within each selected village was generated.
3. 20 households were selected at random from the list within each village.

Drawing a list of households in the village: A traditional survey team approach was used to develop the household list visiting and numbering every household in the village. A random number table was then used to select the 20 households as per the manual.

During the survey village guides were used to identify households, i.e. someone from the community who knows it well and can accompany the team during the household listing and numbering.

## **2.3. Survey Instrument and Survey Topics**

To implement the Baseline Research Survey at each of two selected site (using the already tested CCAFS methodology) to better understand farmers' perceptions on climate change vulnerability, if and how farmers are changing agricultural practices in response to climate change. This baseline research will provide quantitative and qualitative information to guide the identification of alternative technological packages deemed suitable for the prevailing farming systems.

In this report the baseline survey has been conducted to gather baseline information at the household-level about some **basic indicators** of welfare, information sources, livelihood/agriculture/natural resource management strategies, needs and uses of climate and agricultural-related information and current risk management, mitigation and adaptation practices. The objective was to capture some of the diversity in the landscape, across communities and households. The data collected aims for sufficient precision in

these indicators to capture changes that have occurred over time. The survey also included information on household size, type and education levels; household assets; sources of livelihood; natural resources access and management; adaptation strategies relating to crops, livestock, aquaculture, agro-forestry, and land management; food security and risk; information and knowledge; and social networks. Please see attached questionnaire Annex 1 – English and Portuguese.

#### **2.4. Survey Implementation**

The survey took place 4/11/2012 – 25/11/2012. Three enumerators and a supervisor at each site. Each enumerator completed three surveys in one day (sometimes four). Therefore taking two to three days per village & 15-16 days in total for each site. In first two weeks the enumerators collected data for six days and then had a break on Sunday.

#### **2.5. Selection and Training of Survey Interviewers**

Team Selection: The supervisors were preselected from lecturers in the polytechnic – Tuzine to lead the Xai Xai team and Arao to lead the Chicualacuala team. Six of the best enumerators from twelve agriculture students who participated in the training were selected and were contacted for the survey.

#### **2.6. Data Entry, Analysis, and Report Compilation:**

CSPRO training took place for the data entry team in Maputo on 20/10/2012, two data processors and one supervisor. Data entry to take place consecutively with survey on one week lag and data was entered in a double data entry process (i.e. both processors will enter every questionnaire). All data was entered and internally verified within two weeks of the final data collection.

Data Analysis: Upon completion and verification of data the data was sent to the Statistical Services Centre, University of Reading for further checks on the data and production of generic statistical analysis.

### **3.0 Household Description**

#### ***Gender of Survey Respondents, and Gender and Civil Status of Heads of Households***

A total of 140 respondents were interviewed during the survey. Among them, eighty (80) respondents (57% of the sample) were female and sixty (60) respondents (43% of the sample) were a male.<sup>1</sup>

Two-thirds (67%) of respondents reported that their household is headed by a male. Male heads of household were typically reported to reside with their wife (95%) and only a small percentage (5%) were reported to be divorced, single, or widowed (Table 3.1).

A third of respondents (33%) reported that their household is headed by female. In contrast to male heads of household, female heads of households were most commonly reported to be divorced, single, or widowed (70%). Among the remaining 30% of female headed

<sup>1</sup> Unless otherwise noted, all percentages are based on a sample size of 140 households.

households, the male was reported to be part of the family, but normally absent from the home.

**Table 3.1. Types of households included in the survey, by percentage of households**

Characteristic of head of household	Male headed	Female headed
Type of household	67	33
Civil status of head of household		
Husband living with wife	95 <sup>*</sup>	
Married but husband living outside the household		30 <sup>**</sup>
Divorced, separated, or widowed	5 <sup>*</sup>	70 <sup>**</sup>

<sup>\*</sup> n=percentage based on a sample of 67 male headed households

<sup>\*\*</sup> n=percentage based on a sample of 33 female headed households

The majority of households were reported to be affiliated with the Changana tribe/language grouping (87%), with only small percentages of the sample reporting to be Chope (2%), Bitonga (1%), Matswa (3%), Ndaou (1%), Zulo (1%), Macua (1%), Chuabo (3%), or Manhungue (1%).

#### ***Household Size and Proportion of Residents of Working and Non-working Age***

Among all households, the mean size was 6.8 individuals (range 1 to 23). There is 95% statistical confidence that the mean number of household members lies between 6.2 and 7.4, and the median household size is 7 individuals, meaning that half of households have more than 7 residents and half of households have fewer than 7.

Two-thirds of respondents (67%) reported that their household contained one or more children under the age of five years, and half of households (50%) were reported to contain one or more residents over 60 years of age.

Most survey households could be characterized as having a productive ratio of working age to non-working age individuals, with the majority of households (70%) reporting that sixty percent or more of the residents were of working age. Only in a relatively few households (8%) were most of the residents (60% or more) reported to be of non-working age (Table 3.2).

**Table 3.2. Proportion of working age and non-working age household residents, by percentage of households per category**

Proportion of household residents of working or non-working age	Percentage of households
Working age residents	
More than 60% of residents are of working age	70
Fewer than 60% of residents are of working age	30
Non-working age residents	
More than 60% of residents are of non-working age	8
Fewer than 60% of residents are of non-working age	92

### Education Levels

Slightly over one-fourth of households (27%) reported that no resident has any formal education, about half (48%) reported that primary school was the highest level of education attained by any resident member of their household, and a fourth (25%) reported that a member had attained secondary level or above (Table 3.3).

**Table 3.3 Highest level of level of education attained by a household member, by percentage of households**

Highest level of education of any resident household member	Number of households	Percentage of households
No formal education	38	27
Primary	67	48
Secondary	32	23
Post-secondary	3	2
Total	140	100

### House Construction Materials and Households Utilities

Over half of the respondents reported that their houses were constructed with improved roofing material (59%), concrete block walls (55%), and that they had improved food crop storage facilities (51%) (Table 3.4). Forty six percent (46%) reported that they had separate housing for their farm animals. Almost no households (2% or less) reported having access to stored water, electricity, indoor running water, or a well/borehole. Eleven percent (11%) of respondents reported that their household uses an improved stove.

**Table 3.4. Improved housing and access to utilities, by percentage of households**

Types of housing components and utilities	Number of households	Percentage of households
<b>Improved housing</b>		
Improved roofing (e.g. tin, tile)	82	59
Improved housing (e.g. concrete, brick)	77	55
Improved storage facility for crops	72	51
Separate housing for farm animals	64	46
<b>Utilities</b>		
Improved stove	16	11
Household water storage tank (>500 liters)	2	2
Electricity from grid	2	1
Running water in dwelling	2	1
Well/borehole	0	0

### Household Assets

Seventy two percent (72%) of respondents reported that their household have information assets, forty one (41%) percent reported to have transport assets, nineteen percent (19%) reported energy assets, fourteen percent (14%) reported production assets, and five (5%) percent reported luxury assets. The most commonly reported assets were cell phone (64%), bicycle (38%) radio (35%), solar panel (16%) and animal traction plough (14%) (Table 3.5).



**Table 3.5. Types of assets owned by households, by percentage of households**

Type of asset	Number of households	Percentage of households
<b>Information Assets</b>	<b>101</b>	<b>72</b>
Radio	49	35
Television	11	8
Cell phone	90	64
Internet access	3	2
<b>Transportation Assets</b>	<b>57</b>	<b>41</b>
Bicycle	53	38
Motorcycle	2	1
Car or truck	7	5
<b>Energy Assets</b>	<b>26</b>	<b>19</b>
Solar panel	23	16
Motor (electric or diesel)	1	1
Battery (car battery)	11	8
<b>Production Assets</b>	<b>19</b>	<b>14</b>
Tractor	1	1
Animal traction plough	19	14
<b>Luxury Assets</b>	<b>8</b>	<b>5</b>
Refrigerator	3	2
Bank account	5	4

An asset index was developed to categorize households according to their ownership of various types of assets. Among all households, nineteen percent (19%) were found to have none of the queried assets, sixty percent (60%) of households reported having 1-3 of the assets, and twenty one percent (21%) reporting having four or more of the different types of assets (Table 3.6).

**Table 3.6 Asset index by percentage of households per index category**

Number of queried assets	Number of households	Percentage of households
None (basic level)	27	19
1-3 (intermediate level)	83	60
4 or more	29	21
System missing	1	1
<b>Total</b>	<b>140</b>	<b>101*</b>

\* Not equal to 100 due to rounding error.

### **Membership in Associations or other Community Based Organizations**

Ninety-six percent of respondents reported that no member of their household belonged to any type of Association or Community Based Organization (Table 3.7). Two percent (2%) of households reported belonging to a tree nursery/tree planting group and two percent (2%) reported belonging to a forest product collection group.



**Table 3.7 Association or community-based organization membership, by percentage of households**

Types of Associations of Community-Based Organizations	Number of households	Percentage of households
Tree nursery/tree planting	2	2
Forest product collection group	3	2
Water catchment/management	0	0
Soil improvement related	0	0
Crop improvement related	0	0
Irrigation	0	0
Savings/credit related	0	0
Agricultural product marketing	0	0
Agricultural productivity enhancement related	0	0
Seed production	0	0
Vegetable production	0	0
Other group not mentioned above?	0	0
No group membership	135	96

**Discussion**

The vast majority of surveyed households in Chicualacuala produce food crops and rely on livestock production for their livelihoods. A description of a typical household was that 67% are male headed, 33% female headed and 67% have 1 or more children <5 years. The prominent ethnic group is Changanis (87%) and the average household size is 6.8. The education level is low with 27% not having received any formal education and for 48% Primary school is the highest level of Education. Households are poor with 59% having improved roofing material and only 2% having access to stored water and electricity. The majority of households have access to between 1-5 hectares of land with only 6% having access to more than 5 hectares. An unexpected finding was that 96% stated that they did not belong to a Community group or Association.

#### 4.0 Household Livelihood Resources: Access to, Consumption, and Sale of On-Farm and Off-Farm products

**On-Farm Livelihood Resources**

The majority of households were reported to produce and consume on-farm staple food crops, processed food crops, fruits, vegetables, and small livestock (Table 4.1). Relatively few households reported sale of on-farm produce, although about 1-in-5 households (21%) reported to have sold small livestock.

**Table 4.1 Number and percentage of households producing, consuming and selling various products produced on their own farms (on-farm)**

Types of on-farm products	Producing		Consuming		Selling	
	Number	Percent	Number	Percent	Number	Percent
Staple food crops	129	92	128	91	8	6
Food crops (processed)	123	88	121	86	6	4

Fruits	102	73	101	72	13	9
Vegetables	96	69	96	69	1	1
Small livestock	90	64	84	60	30	21
Fuel wood	52	37	51	36	2	1
Large livestock	20	14	18	13	7	5
Charcoal	11	8	8	8	9	6
Fodder	7	5	7	5	1	1
Livestock products	5	4	5	4	0	0
Timber	5	4	5	4	0	0
Cash crops	3	2	3	2	1	1
Manure/compost	1	1	1	1	0	0
Fish	0	0	0	0	0	0
Honey	0	0	0	0	0	0

### ***Off-Farm Livelihood Sources***

The majority of households reported to have produced and consumed fuel wood, food crops, and fruits obtained from off-farm sources; and almost half of households also reported producing (45%) and consuming (42%) fish from off-farm sources. In general, off-farm products were not sold, although sixteen percent (16%) of households reported to have sold charcoal.

**Table 4.2 Number and percentage of households producing, consuming and selling various products produced outside their own farms (off-farm)**

Types of off-farm products	Producing		Consuming		Selling	
	Number	Percent	Number	Percent	Number	Percent
Fuel wood	135	96	122	87	4	3
Food crops	128	91	128	91	1	1
Fruits	112	80	111	79	1	1
Fish	63	45	59	42	0	0
Charcoal	34	24	32	23	22	16
Fodder	27	19	26	19	2	1
Timber	17	12	17	12	0	0

### ***On-farm and Off-Farm Production Responsibilities Falling Mainly to Women and Children***

During their discussions of on-farm products, more than half of respondents reported that women were primarily responsible for the production of raw food crops (63%), processed food crops (61%), vegetables (58%), and fruit (51%) (Table 4.3). Among off-farm products, more than half of respondents reported that women were the primary producers/collectors of fuel wood (70%), raw food crops (63%), and fruit (54%). Fourteen percent (14%) of respondents reported that women were not responsible for the production/collection of any on-farm or off-farm products.

Few households reported children to be primarily responsible for any type of on-farm or off-farm production/collection activity. Livestock was the most frequently reported type of child production activity with nine percent (9%) of households reporting that children were primarily responsible for the production of small livestock and eight percent (8%) reporting

that children were primarily responsible for the production of large livestock. Eighty one percent (81%) of households reported that children were not primarily responsible for the production of any type of on-farm product, and eighty eight percent (88%) reported that children were not primarily responsible for the production/collection any type of off-farm product.

**Table 4.3. Percentage of women and children that were reported to be primarily responsible for the production of various on-farm and off-farm products**

Types of Products	On-farm		Off-farm	
	Women (%)	Children (%)	Women (%)	Children (%)
Food crop (raw)	63	3	63	2
Food crop (processed)	61	1	Not applicable	
Vegetable	58	1		
Fruit	51	5	54	5
Fuel wood	31	2	70	4
Small livestock	19	9	Not applicable	
Not responsible for any product	14	81	14	88
Fodder	4	0	3	5
Charcoal	4	0	7	0
Other cash crop	1	0	Not applicable	
Livestock products	1	2		
Manure/compost	1	0		
Large livestock	0	8		
Timber	Not applicable		1	0
Fish			36	1

#### ***Livelihood Diversification Indices***

A production diversification index was created to categorize households as having a low, medium, or high production diversification based on the number of products they reported to produce on-farm. Using this index, about fifty nine percent (59%) of households are classified as having an intermediate level of production diversification (5 to 8 products produced), and forty one percent (41%) are classified as having a low level of production diversification (1 to 4 products produced). No households would be classified as having a high level of production diversification (9 or more products) (Table 4.4).

A similar index was developed to categorize household levels of commercialization diversification. Among all households surveyed, fifty nine percent (59%) reported no commercialization of on-farm products, thirty seven percent (37%) are classified as having a low commercialization diversification (1 to 2 products sold), and four percent (4%) are classified as having an intermediate level of commercialization diversification (3 to 5 products sold). No households would be classified as having a high level of commercialization diversification (6 or more products sold) (Table 4.4).

**Table 4.4 Production and commercialization diversification indices**

Production and Commercialization Indices	Number of households	Percentage of households
<b>Production Diversification</b>		
1-4 products (low production diversification)	55	41
5-8 products (intermediate production diversification)	80	59
9 or more products (high production diversification)	0	0
System missing	5	
Total	140	100
<b>Selling/Commercialization Diversification</b>		
No products sold (no commercialization)	83	59
1-2 products sold (low commercialization)	52	37
3-5 products sold (intermediate commercialization)	5	4
6 or more products sold (high commercialization)	0	0
Total	140	100

**Off-farm sources of cash income**

Ninety one percent (91%) of households reported to have a non-farm source of cash income and, on average, reported receiving cash from 1.7 sources (range 0-6). There is 95% statistical confidence that the true mean number of income sources lies between 1.5 and 1.8 and the median number of income sources is 2, meaning that half of households receive incomes from more than 2 sources and half of households receive income from less than 2 sources.

Seventy one percent (71%) of respondents reported that during the last 12 months their household began receiving a cash income from at least one new source. Fourteen percent (14%) of households reported that they were no longer receiving cash from at least one source that had received from a year ago. Twenty five percent (25%) of respondents reported that there was no change in the income sources from one year ago.

The most frequently reported non-farm cash income source was remittances/gifts (39%), followed by non-farm employment (37%), business (37%), and payments from government or other projects/programs (29%). Other types of non-farm income sources were reported by less than ten percent of households. Nine percent (9%) reported that they have no off-farm income source (Table 4.5).

**Table 4.5. Off-farm cash income sources by percentage of households**

Source of Cash Income	Number of households	Percentage of households
Remittances/gifts	55	39
Other paid non-farm employment	52	37
Business	52	37

Payments from government or other projects/programs	41	29
Employment on someone else's farm	12	9
No off-farm cash sources	12	9
Renting out farm machinery	7	5
Loan or credit from a formal institution	5	4
Informal loan or credit	5	4
Renting out your own land	3	2
Payments for environmental services	1	1

### **Discussion**

Household livelihood resources from on-farm sources, nearly every family (92%) produced staple food crops but only 6% sell the staple food crop. 88% produced other food crops but again only 4% sell them. Fruit is also produced on farm (73% owning fruit trees) but only 9% sell fruit. Unsurprisingly for this zone small livestock is very important with 64% producing and 21% selling small livestock, the most important marketing commodity. 14% produce large livestock and 5% sell them. In terms of off-farm resources fuel wood is the most important with 96% of households produce it but again only 3% selling fuels wood. Charcoal is the most important marketable commodity 24% produce with 16% selling charcoal. Most of the crop production is consumed by the family members themselves, as few households sell their agricultural produce. Households that do sell produce usually sell fruit, small livestock and charcoal. On-farm consumption is supplemented with off-farm produce as well.

Women carry out most of the work both on and off farm, some work is equally shared between men and women and 15% is carried out by family as a whole. 39% of households receive remittances, 37% have paid non-farm employment and 37% other business. A quarter of households have a family member working for the government. Nearly all households experience a food shortage between September and January.

## **5.0 Food Security**

### ***Reported Periods of Food Insecurity During the Last 12 months***

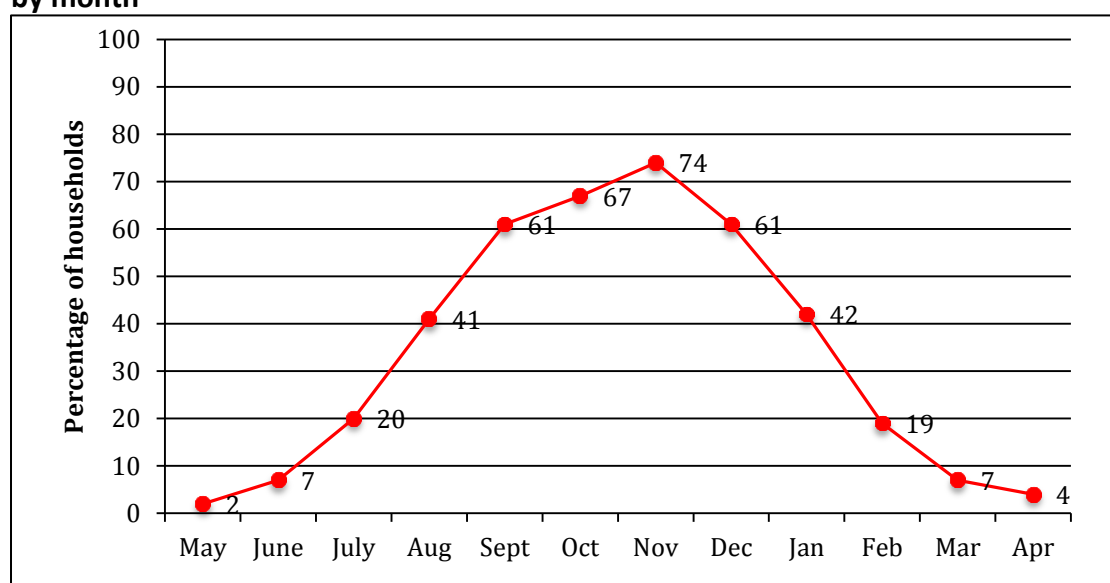
During the interviews, respondents were asked to recall the months when their household had experienced a period of food shortages during the past year. They were also asked to recall the primary source of household food (either on-farm "own production" or off-farm) during each month of the previous year.

On average, households reported to have experienced food shortages during four (4) months of the previous year (range 1 to 9 months). There is 95% statistical confidence that the mean number of months of food insecurity lies between 3.8 and 4.3 months, and the median number of hungry months is 4, meaning that half of households reported to have experienced food shortages for more than 4 months and half of households reported to have experienced food shortages for less than 4 months.

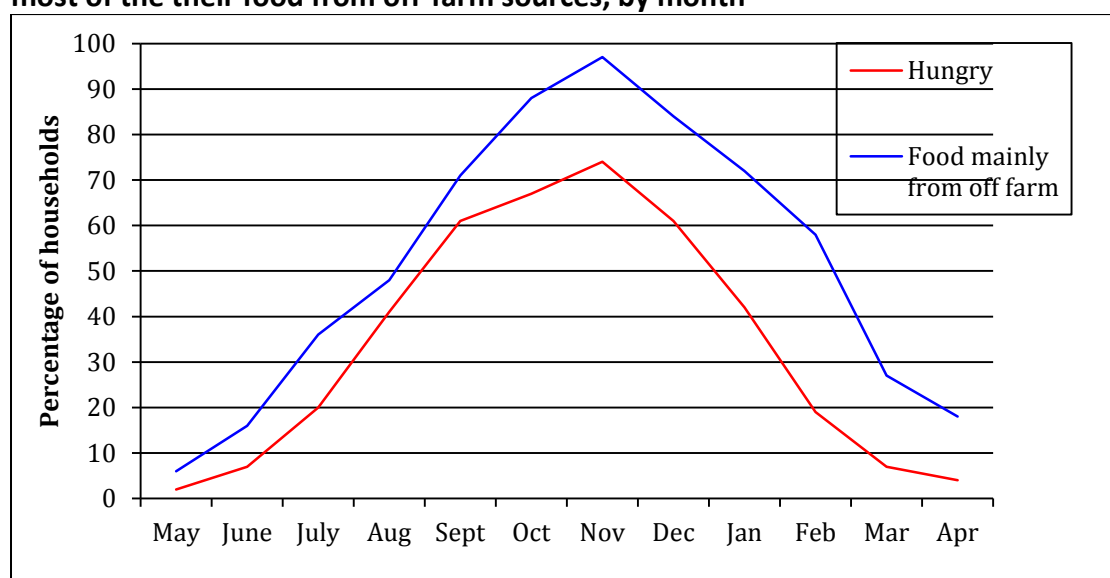
No households reported to have been hungry during all 12 months, and no households reported to have been food secure during all 12 months. Over forty percent of households reported to have experienced six months of food insecurity during the period of August through January (Figure 5.1). Based on responses provided by respondents, during the 12 months immediately prior to the survey, the hunger season had peaked in November, when three-fourths (74%) of households were reportedly food insecure.

The months with the highest percentages of food insecure households coincide with the months when the highest percentage of households were also relying primarily on off-farm food sources (Figure 5.2), indicating an inability to provide adequate household food supplies when relying primarily on off-farm food resources.

**Figure 5.1. Percentage of households reporting a food shortage during the previous year, by month**



**Figure 5.2. Percentages of households reporting food shortage and reporting to procure most of their food from off-farm sources, by month**



### Discussion

Generally, cowpea, millet and sorghum were cited as the three most important crops in this area. However inputs are scarce and fertilizer not commonly used. Only one per cent of households are food secure throughout the year and 81% experience difficulties in feeding their families from any source for one to two months each year. The main inputs available, affordable and used are veterinary medicines, but only 8% use them, and improved seeds are only used by 6% of households. However, 47% of households planted trees in past 12 months. A quarter of households hire animal traction, 14% hire farm labour, but almost no one uses irrigation.

## 6.0 Agricultural Practices

### Land Use

Respondents reported that their households currently cultivate 2.2 hectares of land, on average, with 95% statistical confidence that the true mean is between 1.9 and 2.5 hectares. The range was 0 to 8.0 hectares, and the median was 2.0, meaning that half of the households reported cultivating more than 2 hectares and half of the households reported cultivating less than 2 hectares.<sup>2</sup> In corollary to that, when respondents were asked how much land their household owns for cropping purposes, the mean area of land owned was reported to be 2.7 hectares (95% CI [2.5,3.0]). The range was 0.5 to 9.0 hectares, and the median was, again, 2.0 hectares.

This would indicate that on average, households are cultivating eighty two percent (82%) of the farmland land they control. When asked to estimate the area of their land that was currently degraded, the mean estimate was 0.1 hectare.

The majority of households (61%) reported to currently use 1-5 hectares of land for crop production (Table 6.1). About one third (32%) of households reported that they farm areas of less than one hectare, and six percent (6%) of households reported that they currently farm more than five hectares.

**Table 6.1 Areas of potentially land available and areas currently used for cropping, by percentage of households**

Farmland status	Areas of land controlled by household		
	<1 hectare	1-5 hectares	>5 hectares
Land area available for cropping	31	63	6
Land area currently used for cropping	32	61	7

### Agricultural Inputs Purchased During the Last Year and Use of Agricultural Credit

Few respondents reported that their households purchased agricultural inputs during the last year. Eight percent (8%) reported the use of purchased veterinary medicine and six percent (6%) reported to have purchase seed (Table 6.2). No households reported to have received any loans/credit for agricultural activities.

<sup>2</sup> Thirteen percent (13%) of respondents reported that their households used communal land for an agricultural enterprise, but only 2 respondents (1%) reported that communal land was used for crop production. The remainder reported that their households accessed communal land for grazing livestock.

**Table 6.2 Agricultural Inputs Purchased, by percentage of households**

Type of Input Purchased	Number of households	Percentage of households
Veterinary medicine	11	8
Seeds	8	6
Fertilizers	0	0
Pesticides	0	0
Received credit for agricultural activities	0	0
None of the above	123	87

***Use of Fertilizer***

No household reported to have used any type of chemical fertilizer during the last 12 months.<sup>3</sup>

***Tree Planting***

Forty seven percent (47%) of households reported to have planted trees during the last 12 months, and among them sixty six percent (66%) planted 1-10 trees, thirty two percent (32%) planted 11-50 trees, and two percent (2%) planted 51-100 trees.

Two-thirds (68%) of households reported to have deliberately protected trees during the last 12 months, with half of them (51%) reporting to have protected 1-10 trees, and half (49%) reporting to have protected 11-50 trees.

***Access to Hired Farm Equipment and Labour***

The most frequently hired farm equipment was an animal drawn plough (26%) (Table 6.3). Fourteen percent (14%) of households report to hire farm labour on occasion. Two-thirds (67%) of households did not hire any farm equipment or labour.

**Table 6.3. Percentage of households reporting to hire farm equipment or labour**

Type of farm input hired	Number of households	Percentage of households
Animal drawn plough	36	26
Farm labour	20	14
Tractor	2	1
Do not hire farm equipment or labour	93	67

***Water for Agriculture***

Households report almost universal reliance upon rainfall for the water requirements of their various agricultural enterprises. One percent (1%) of respondents reported to use irrigation and one percent (1%) reported using tanks for water harvesting (Table 6.4).

<sup>3</sup> The response to this direct question conflicts with Table 7.3 (page \_\_) where one respondent reported that s/he "started using or using more mineral/chemical fertilizer" with maize.



**Table 6.4 Water sources for agriculture on-farm**

On-farm agriculture water sources	Number of households	Percentage of households
Irrigation	1	1
Tanks for water harvesting	2	1
Dams or water holes	0	0
Boreholes	0	0
Water pumps	0	0
None of the above	137	98

### ***Information Received About Pest or Disease Outbreak and Use of the Information in Making Farm Decisions***

Only three respondents reported that their household had received information about pest or disease outbreak during the previous 12 months. They reported that the information was received from radio, government extension or veterinary offices, and NGO project officers. All reported that the information was received by male household members. Two households reported that the information included advice on how to use it and one reported that they were able to use the advice.

### ***Discussion***

Households have been adapting and making changes in their farming practices over the last ten years, with the majority of households stating they had made changes to at least three of their crops, however, cropping patterns remain similar to those of 10 years ago. The changes have been varietal changes, for example, 51% planted draught tolerant sorghum, 29% a longer cycle variety of cowpea and millet, and 16% a higher yielding variety of cowpea. 61 % expanded the land for cowpea cultivation, 59% introduced intercropping with millet, and 47% reduced the area allocated to maize production. The reasons given for these changes were mainly climatical, i.e. 80% because of more erratic rainfall, 36% because of more frequent draughts, and 31% because the rainy season was beginning much later. Oxen, Chicken and pigs are the most cited livestock, but few have made livestock-related management changes except for the increase in oxen reared. Climate- and market-related reasons are behind these changes, as well as factors relating to land and labour issues. Looking at the adaptability index, the majority (80%) make between 2 and 10 changes and are classed as intermediate adapters.

## **7.0 Changes Made to the Agricultural System Over the Past 10 Years and Reasons Given for Change<sup>4</sup>**

### ***Changes Made to Crops Over the Past 10 Years***

When asked to name the crop that is most important for their household livelihood, thirty four percent (34%) reported cowpea, followed by millet (25%), maize (19%), and sorghum (16%) (Table 7.1). With the exception of slightly more importance given to maize, and

<sup>4</sup> During the survey respondents could discuss changes made for up to five different types of crops and five different animals. For simplicity, this analysis considers only the types of changes reported to have been made to the first crop or animal they mentioned. This allows the report to capture the changes of main importance without becoming mired in repetitive details included about crops or animals of lesser importance to the household. The same strategy is employed when reporting the reasons given for having made those changes.

slightly less importance given to sorghum, the list of most important crops today differs little from the crops that were reported to have been the most important to households 10 years ago.

**Table 7.1 Crops reported to be the most important to households livelihood today and 10 years ago, by percentage of households**

Type of crop	Currently most important		Most important 10 Years Ago	
	Number	Percent	Number	Percent
Cowpea	48	34	46	33
Millet	35	25	34	24
Maize	27	19	21	15
Sorghum	23	16	28	20
Other crops	7	4	11	9
Total	140	98 <sup>*</sup>	140	101 <sup>*</sup>

<sup>\*</sup>Not equal to 100 because of rounding error.

Ninety eight percent (98%) of households reported that they produce 2-3 main types of crops and ninety five percent (95%) reported that they have made changes in one or more of their most important crops during the past 10 years. The most frequently cited reason for this change was climate (85% of households).

The most frequently cited crop change made during the past 10 years was the adoption of drought tolerant crop varieties (51%, sorghum most often mentioned), followed by the adoption of long cycle varieties (29%, cowpeas and millet most often mentioned), higher yielding varieties (16%, cowpeas), disease resistant varieties (16%, cowpeas), pest resistant varieties (16%, cowpeas), and the use of improved seed (16%, maize) (Table 7.2). Among households that reported having made changes to their crops during the past 10 years, sorghum, cowpea, and millet were most frequently the first crops mentioned when discussing those changes.

**Table 7.2 Crop changes reported to have been made during last 10 years, by percentage of households**

Changes made	Number of Responses	Percentage of households	Crops most often mentioned first
Planting drought tolerant variety	72	51	sorghum
Planting longer cycle variety	41	29	cowpea, millet
Planting higher yielding variety	23	16	cowpeas
Planting disease resistant variety	22	16	cowpeas
Planting pest resistant variety	22	16	cowpeas
Planting pre-treated/improved seed	16	11	Maize
Planting better quality variety	12	9	cowpeas
Introduced new variety of crop	7	5	millet
Planting shorter cycle variety	5	4	cowpeas
Stopped using a variety	3	2	millet, sorghum,

			sweet potato
Testing a new variety	1	1	Sweet potato
Planting flood tolerant variety	0		
Planting salinity tolerant variety	0		
Planting toxicity tolerant variety	0		
Other	0		

The most frequently reported land management changes made during the past 10 years were expanded crop production area (61%, cowpeas most frequently mentioned), the introduction of intercropping (59%, millet most frequently mentioned), and a reduction in crop production area (47%, maize most frequently mentioned) (Table 7.3). Among households that reported having made changes to their land management practices during the past 10 years, cowpea, millet, and maize were most frequently the first crop mentioned when discussing those changes.

**Table 7.3. Land management changes made during the past 10 years, by percentage of households**

Changes made	Number of responses	Percentage of households	Crops most often mentioned first
Expanded area	86	61	cowpeas
Introduced intercropping	83	59	millet
Reduced area	66	47	maize
Stopped burning	3	2	maize
Started using manure/compost	3	2	cowpea, LeafyVeg, maize
Introduced rotations	3	2	maize
Introduced micro-catchments	2	1	groudnut, LeafyVeg
Introduced mulching	2	1	cowpea, millet
Earlier land preparation	2	1	cowpea, maize
Started irrigating	1	1	maize
Earlier planting	1	1	beans
Later planting	1	1	maize
Started using or using more mineral/chemical fertilizer	1	1	maize
Introduced crop cover	1	1	maize
Introduced/built ridges of bunds	1	1	maize
Stopped irrigating	0		
Introduced terraces	0		
Introduced stone lines	0		
Introduced hedges	0		
Introduced contour ploughing	0		
Introduced improved irrigation	0		
Introduced improved drainage	0		
Introduced tidal water control	0		
Introduced mechanized farming	0		
Started using or using more pesticides or herbicides	0		

Started using integrated pest management	0		
Started using integrated crop management	0		
Other	0		

The most frequently cited reasons for making crop and land management changes during the past 10 years were more erratic rainfall (80%, changes to maize most often mentioned), better yield (38%, millet), more frequent drought (36%, cowpeas), later start of rain (31%, maize), strong wind (27%, cowpeas), earlier start of rain (26%, maize) and better price (20%, cowpeas) (Table 7.4). When discussing why they had made changes to their cropping and land management practices during the past 10 years, respondents most frequently first mentioned maize, millet, and cowpea as the crops targeted by those changes.

**Table 7.4. Reason given for having made land management and crop change during the past 10 years, by percentage of households**

Reason for change	Number of responses	Percentage of households	Crops most often mentioned first
<b>Markets</b>			
Better Yield	53	38	millet
Better Price	28	20	cowpeas
New opportunity to sell	7	5	cowpeas
<b>Climate</b>			
More erratic rainfall	112	80	maize
More frequent droughts	50	36	cowpeas
Later start of rainy season	43	31	maize
Strong winds	38	27	cowpeas
Earlier start of rainy season	37	26	maize
Less overall rainfall	11	8	maize
Higher temperatures	3	2	maize
More overall rainfall	1	1	millet
Lower groundwater table	1	1	leafy vegetables
More frequent floods	1	1	cowpeas
More cold spells or foggy days	0		
More frequent cyclones	0		
Higher salinity	0		
Higher tides (sea level has risen)	0		
<b>Land</b>			
More land	42	30	cowpeas
Less land	41	29	watermelon
Land is less productive	6	4	millet, maize
Land is more productive	5	4	cowpeas, maize
<b>Labour</b>			
Able to hire labour	12	9	millet
Unable to hire labour (too expensive)	3	2	maize

Insufficient labour when needed	0		
Sufficient labour	0		
Unable to hire labour (not available)	0		
<b>Pests &amp; Diseases</b>			
More resistant to pests/diseases	68	49	cowpeas
New pests/diseases have come	56	40	cowpeas
<b>Projects, etc.</b>			
Government/project told us to	4	3	maize
Government/project showed us how	1	1	cashew
Policy change	0		
Other kinds of changes not listed	0		

### **Changes Made to Livestock Over the Past 10 Years**

Respondents report that traditional oxen (27%), chickens (14%), and pigs (14%) are the animals that are most important to their household livelihoods. With the exception of slightly more households reporting oxen (traditional) to be the currently most important livestock animal, the animals reported as being most important to households are about the same as 10 years ago.

**Table 7.5 Animals reported to be the most important to households livelihood today and 10 years ago, but percentage of households**

Type of animal	Currently most important		Most important 10 years ago	
	Number	Percent	Number	Percent
Oxen (traditional)	38	27	28	20
Chickens	20	14	17	12
Pigs	20	14	22	16
Beef cattle	8	6	5	4
Ducks	8	6	6	4
Goats	7	5	10	7
Guinea fowl	2	1	5	4
Oxen (traction)	1	1	2	1
Do not raise animals	35	25	44	32
System missing	1	1	1	1
<b>Total</b>	<b>140</b>	<b>100</b>	<b>140</b>	<b>101</b>

Among all households, twenty six percent (26%) reported that they do not produce any type of livestock, twelve percent (12%) reported to produce one type, twenty four percent (24%) report two types, and thirty nine percent (39%) reported to produce three types of animals (Table 7.6).

**Table 7.6. Number of different types of animals owned by households, by percentage of households**

Number of different types of animals owned	Number of households	Percentage of households
No animals owned	36	26
1 type of animal owned	17	12
2 different types of animals owned	33	24
3 different types of animals owned	54	39
Total	140	101

The most frequently reported livestock management changes made during the last 10 years were to reduce the herd size (26%, pigs most frequently mentioned), followed by the introduction of stall keeping (19%, oxen and pigs), increase in herd size (18%, oxen), stop keeping one or more types of animals (17% pigs), and the introduction of a new type of animal (15%, beef cattle) (Table 7.7). Pigs, traditional oxen, and beef cattle were the most frequent types of animals that were mentioned first when discussing these changes.

**Table 7.7. Types of livestock management changes made during the past 10 years, by percentage of households**

Changes made	Number of responses	Percentage of households	Animals most often mentioned first
Reduction in herd size	36	26	pigs
Stall keeping introduced	27	19	oxen (traditional), pigs
Increase in herd size	25	18	oxen (traditional)
Stopped keeping one or more types of farm animal	24	17	pigs
New farm animal introduced	21	15	beef cattle
New breed introduction	13	9	pigs
New farm animal being tested	7	7	pigs, sheep
Growing fodder crops	4	3	oxen (traditional), pigs
Improved pasture	3	2	goats, pigs, oxen (traditional)
Cut and carry introduced	2	1	pigs
Fodder storage (e.g. hay, silage)	1	1	pigs
Change in herd composition	0		
Fencing introduced	0		
Other kinds of changes not listed	0		

Half of households (50%) report that they currently have one type of animal that is different than 10 years ago (Table 7.8). Among households raising 2-3 different types of animals, fourteen percent (14%) reports that 2-3 types of their animals are different than 10 years ago. Twenty six percent of households reported that they do not raise any animal now, nor did they 10 years ago, and eleven percent (11%) report raising one type of animal with the type of animal being unchanged from 10 years ago.

**Table 7.8 Percentage of households reporting to have made changes to the types of livestock they own during the past 10 years**

Number of different types of livestock owned	Number of households	Percentage of households
No animals listed currently or 10 years ago	36	26
Only one animal listed and is the same as 10 years ago	16	11
Only one animal is listed and it is different that 10 years ago	1	1
2-3 animals listed and at most 1 is different to 10 years ago	68	49
2-3 animals listed and 2-3 are different than 10 years ago	19	14
Total	140	101*

\* Not equal to 100 because of rounding error.

Ninety one percent (91%) of households reported that they have made changes to one or more of their important farm animals during the last 10 years. On average these households report having made a change in 1.2 types of animals.

The most frequently cited reasons for making livestock changes were new opportunity to sell (19%, goats and oxen), more productive (19%, pigs), better price (18%, pigs), and new disease occurring (15%, chickens) (Table 7.9). Goats, oxen, pigs and chicken were the most frequent types of animals that were mentioned first when discussing why livestock management changes had been made.

**Table 7.9. Reasons for having made livestock changes during the past 10 years, by percentage of households**

Reason for making change	Number of responses	Percentage of households	Animals most often mentioned first
New opportunity to sell	26	19	goats, oxen (traditional)
More productive	26	19	pigs
Better price	25	18	pigs
New diseases occurring	21	15	chickens
More frequent droughts	10	7	pigs
More resistant to diseases	7	5	chickens
More frequent floods	0		
Higher tides	0		
Frequent cyclones	0		
More salinization	0		
Insufficient labour	0		
Able to hire labour	0		
Government/project told us to	0		
Government/project showed us how	0		
Policy change	0		
Other	0		

### ***Agricultural System Adaptability Index, Reported Input Intensification and Increased Productivity***

An adaptability index was created to categorize households according to the number of changes they have made to their agricultural systems during the past ten years. Among all households, thirteen percent (13%) are categorized as exhibiting low adaptability because they reported only one or no changes to their agricultural system over the past 10 years (Table 7.10). Eighty six percent (86%) of households are characterized as intermediate adapters because they made 2-10 changes to their agricultural system during the past 10 years, and one percent (1%) of households would be characterized as high adapters, because they report having made 11 or more changes to their agricultural systems during the past 10 years.

**Table 7.10 Adaptability/Innovation Index**

Number of changes made in farming practices in last 10 years	Number of households	Percentage of households
0-1 change (low adapters)	18	13
2-10 changes (intermediate adapters)	121	86
11 or more changes (high adapters)	1	1
Total	140	100

Overall, twenty percent (20%) of respondents reported that their household had intensified the use of agricultural inputs over the past 10 years, with forty percent (40%) reporting an increase in agricultural productivity.

### ***Discussion***

Households have been adapting and making changes in their farming practices over the last ten years, with the majority of households stating they had made changes to at least three of their crops, however, cropping patterns remain similar to those of 10 years ago. The changes have been varietal changes, for example, 51% planted draught tolerant sorghum, 29% a longer cycle variety of cowpea and millet, and 16% a higher yielding variety of cowpea. 61 % expanded the land for cowpea cultivation, 59% introduced intercropping with millet, and 47% reduced the area allocated to maize production. The reasons given for these changes were mainly climatical, i.e. 80% because of more erratic rainfall, 36% because of more frequent draughts, and 31% because the rainy season was beginning much later. Oxen, Chicken and pigs are the most cited livestock, but few have made livestock-related management changes except for the increase in oxen reared. Climate- and market-related reasons are behind these changes, as well as factors relating to land and labour issues. Looking at the adaptability index, the majority (80%) make between 2 and 10 changes and are classed as intermediate adapters.

## **8.0 Climate and Weather Forecast Information**

### ***Access to Weather Forecast Information***

Ninety one percent (91%) of respondents report that their households had received some type of weather or climate related forecast information during the past year. Thirty six percent (36%) reported that they had received information about an upcoming extreme



weather event, eighty nine percent (89%) reported having received information about the start of the rainy season, twenty seven (27%) reported that they had received short term weather information covering the next 2-3 days, and thirty one (31%) reported that they had received longer term weather predictions covering the next 2-3 months (Table 8.1).

**Table 8.1. Types of weather information received by percentage of households**

Type of weather or climate information received	Number of households	Percentage of households
Received some type of weather information	127	91
Information about the start of the rainy season	124	89
Forecast of extreme weather event	51	36
Weather forecast for next 2-3 days	38	27
Weather forecast for next 2-3 months	44	31

The most commonly reported sources of weather related information were friends, relatives, or neighbors, local groups/gatherings/meetings, and radio (Table 8.2).

**Table 8.2. Sources of weather related information by type of forecast and percentage\* of households**

Sources of weather information	Types of weather information received							
	Extreme weather		Start of rainy season		2-3 day forecast		2-3 month forecast	
	No.	%	No.	%	No.	%	No.	%
Friends, relatives or neighbors	29	57	95	77	27	71	41	93
Radio	20	39	41	33	19	50	11	25
Local group/ gatherings/meetings	10	20	71	57	10	26	19	43
Television	1	2	0	0	2	5	0	0
Traditional forecaster/indigenous knowledge	5	10	5	4	1	3	0	0
Teachers in local school	0	0	0	0	1	3	0	0
Government agricultural or veterinary officer	4	8	3	2	0	0	0	0
NGO project officers	0	0			0	0	0	0
Meteorological offices	0	0	1	1	0	0	0	0
Newspaper	0	0	0	0	0	0	0	0
Own observation	1	2	2	2	0	0	0	0
Religious faith	2	4	3	2	0	0	0	0
Other	6	12	13	11	5	8	0	0

\* Percentages are based on the number of people that reported to have received each type of information. See Table 8.1.

Among the thirty six percent (36%) of households that reported to have received forecast information about extreme weather events, forty one percent (41%) reported that the information was received by both males and females, thirty five percent (35%) reported

that the information was received only by males, and twenty two percent (22%) reported that it was received only by females (Table 8.3).

Eighty nine percent (89%) of households reported to have received information about the start of the rainy season, and among them almost twice as many males (46%) as females (24%) were reported to have received the information. Nineteen percent (19%) of households reported that the information was received by both males and females.

Similar percentages of households reported having received 2-3 day weather forecasts (27%) and 2-3 month forecasts (31%). Roughly twice as many men as women were reported to have received these types of information.

**Table 8.3 Percentages of households receiving weather related information**

Types of weather forecast information received	Households receiving information		Who received the information <sup>*</sup>					
			Male		Female		Both	
	No.	%	No.	%	No.	%	No.	%
Extreme weather events	51	36	18	35	11	22	21	41
Start of the rain	124	89	57	46	30	24	23	19
2-3 day weather forecast	38	27	22	58	8	21	8	21
2-3 month weather forecast	44	31	29	66	15	34	0	0

<sup>\*</sup>These percentages are the percentage of households that received the particular type of information.

### ***Farm-Related Advice Received in Weather Forecasts and Use of the Advice to Make Farm Changes***

Less than half of households reported that the weather information received included any type of advice about how to use the information for making farm decisions, but among households reporting that the information did include advice, a relatively high percentage also reported that they were able to use the advice.

Among the forty one percent (41%) of households reporting that advice was included in information received about extreme weather events, two thirds (67%) reported they were able to use the advice for making farm decisions (Table 8.4). Ninety one percent (91%) of those receiving farming advice related to the start of the rainy season said they were able to use the advice provided. Although only small percentages of respondents reported that the 2-3 day or 2-3 month forecasts included advice about how to use the information, almost half (43%) of households that received it said that they were able to use the 2-3 day forecast advice, and all (100%) of the households that received advice along with the 2-3 month forecast said they were able to use it.

**Table 8.4. Percentage of households reporting that weather forecast information included advice on how to use the information and the percentage of households that reported having used the advice**

Types of weather forecast information received	Number of households receiving	Forecast included advice about how to use information in farming*		Household were able to use this advice**	
		No.	%	No.	%
Extreme weather forecast	51	21	41	14	67
Start of the rain	124	53	43	48	91
2-3 day forecast	38	7	18	3	43
2-3 month forecast	44	3	7	3	100

\*These percentages are the percentage of households that received the particular type of information.

\*\*These percentages are the percentage of households that said the information also included advice.

Twenty eight percent (28%) of respondents reported that they made useful land management decisions based on information and farming advice they received related to the start of the rainy season (Table 8.5). Less than five percent of respondents named other specific types of changes they made to their farming systems after receiving weather information/forecast and related farm management advice.

**Table 8.5. Types of farm changes made after receiving weather forecast, by number and percentage of households**

Type of forecast received	Types of changes made following weather forecast and advice							
	Land Management		Crop type		Water management		Other	
	No.	%	No.	%	No.	%	No.	%
Extreme weather	1	1	3	2	2	1	3	1
Start of the rain	39	28	5	4	1	1	3	2
2-3 day forecast	1	1	0	0	0	0	1	1
2-3 month forecast	0	0	0	0	1	1	1	1

### Discussion

Friends, relatives and neighbours, and radio are the most common sources of weather and climate-related information. Twice as many males as females receive weather-related information. Less than half of households that received weather information included some advice on how to use the information for making farm decisions. The aspects of farming that were most commonly changed, upon receiving information about the start of rainy season, were land management decisions.

## 9.0 Climate Related Crisis

### ***Climate Related Crises***

Two-thirds (67%) of respondents reported that their household had been impacted by a climate related crisis within the last five years. Among them, fifty percent (50%) said that they had received some type of assistance, with the majority reporting that that assistance came from NGOs (60%), followed by family/friends (36%), government agencies (13%), and church organizations (4%).