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

Summary of Baseline Household Survey Results:
Makueni, Kenya

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Abstract

This report presents a summary of the main results of a survey carried out between April 2012 and June 2012 in seven (7) villages with 140 households (HHs) in Wote, a benchmark site of the CGIAR Research Program on Climate Change, Agriculture, and Food Security (CCAFS)[1]. Wote is located in Makueni County in South Eastern Kenya. The survey was carried out using the standardised CCAFS household baseline tool.

The results show that the majority of the surveyed households in the area are male-headed and less than 2% are child-headed, with an average of 6 persons per household. Education is highly valued in the area as a majority have received formal education. A majority of surveyed households produce food crops, fruits (mango and citrus) and keep livestock and hence the major livelihood is mixed farming. However, the farming is subsistence as most of the crops produced are consumed at the household level. More than 50% of fruits, livestock products and small livestock are usually sold. Also sold are the cash crops.

Off-farm produce and products are not common in the area as land is privately owned and there is no communal land. The most important crops for consumption in the area are maize, cowpeas and pigeon peas and most important livestock currently is chicken. Fertilizer use in the area is very low. For our surveyed households only 2% are 'food secure' all year long. Only 1% have enough food for their families for at least 10 months of the year, and 97% of the households struggle to get enough food to feed their family for more than 2 months out of a year. All the households have made changes to their crops and livestock as a result of climate and market-related reasons.

The radio is the major source of weather and climate related information in the area. This information in most cases is received by women. Most of the information received had some advice on what to do in weather aspects. The most changed aspects of farming upon receipt of all the information were crop type, crop variety, land management and change in timing of farming activities. The least changed aspects of farming upon receipt of relevant information were land area, field allocation, water management, livestock type and livestock breeds

Keywords

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[1] For more information about CCAFS, see: http://www.ccafs.cgiar.org. A complementary community-level survey was also conducted in Wote and those survey guidelines and reports will also be available on the website.

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Table of contents

1.0 Introduction

This is a report of a baseline household level survey which was carried out from April to June 2012 in 7 (out of 53) villages with 140 households in Wote, Kenya. The CCAFS research site is a block of 10km x 10km located in Makueni County, with Kwa Kathoka KARI substation as the benchmark. The site is about 7km from Wote town along Wote-Makindu tarmac road.

The Wote site has two distinct rainy seasons: the long rains which are experienced between April and June and the short rains between October and December. The short rains however are the most reliable. The elevation is between 900-1000 m above sea level.

The objective of this survey was 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 aim was to capture some of the diversity in the landscape, across communities and households, with sufficient precision in some of these indicators to encapsulate changes that occur over time, as these same households will be revisited in 5-10 years and these changes observed. For full details of survey team members and villages surveyed see Appendices 1 and 2. The questionnaire and training materials associated with it, including data entry and management guidelines, can be found at www.ccafs.cgiar.org/resources/baseline-surveys. The questionnaire was divided into ten sections, as follows:

- Household respondent and type
- Demography
- Sources of livelihood
- Crop, farm animals/fish, tree, soil, land and water management changes
- Food security
- Land and water
- Input and credits
- Climate and weather information
- Community groups
- Assets

This report provides a summary of the main findings of the analysis of the household survey data.

Figure 1 shows the location of the Wote site in Makueni in eastern Kenya. The red dots show the 140 sampled households. We now turn to a summary of the main findings of the analysis of the survey data, reported on according to each section of the questionnaire.

1.1 Household types and respondents

Of the surveyed households, 66% were male-headed, 33% female headed and others 1%. It is rare to find child-headed households as in such cases the children are shared among relatives who act as their guardians or adopt them. Of the respondents, 39% were male and 61% female. The high number of the female respondents could be attributed to the fact that mostly males either work in urban areas or leave the homes in the morning to look for casual jobs while the women are left in the farm to carry out the domestic cores.

Fifteen percent of the households in the area have between 1-3 persons, 71% between 4-7 persons, 10% with more than 8-9 persons and 3% with between 10-13 persons. This data agrees with the 2009 census which indicated that a household in the area has an average of 5.5 persons.

Figure 1 Wote research site map and location of sampled villages
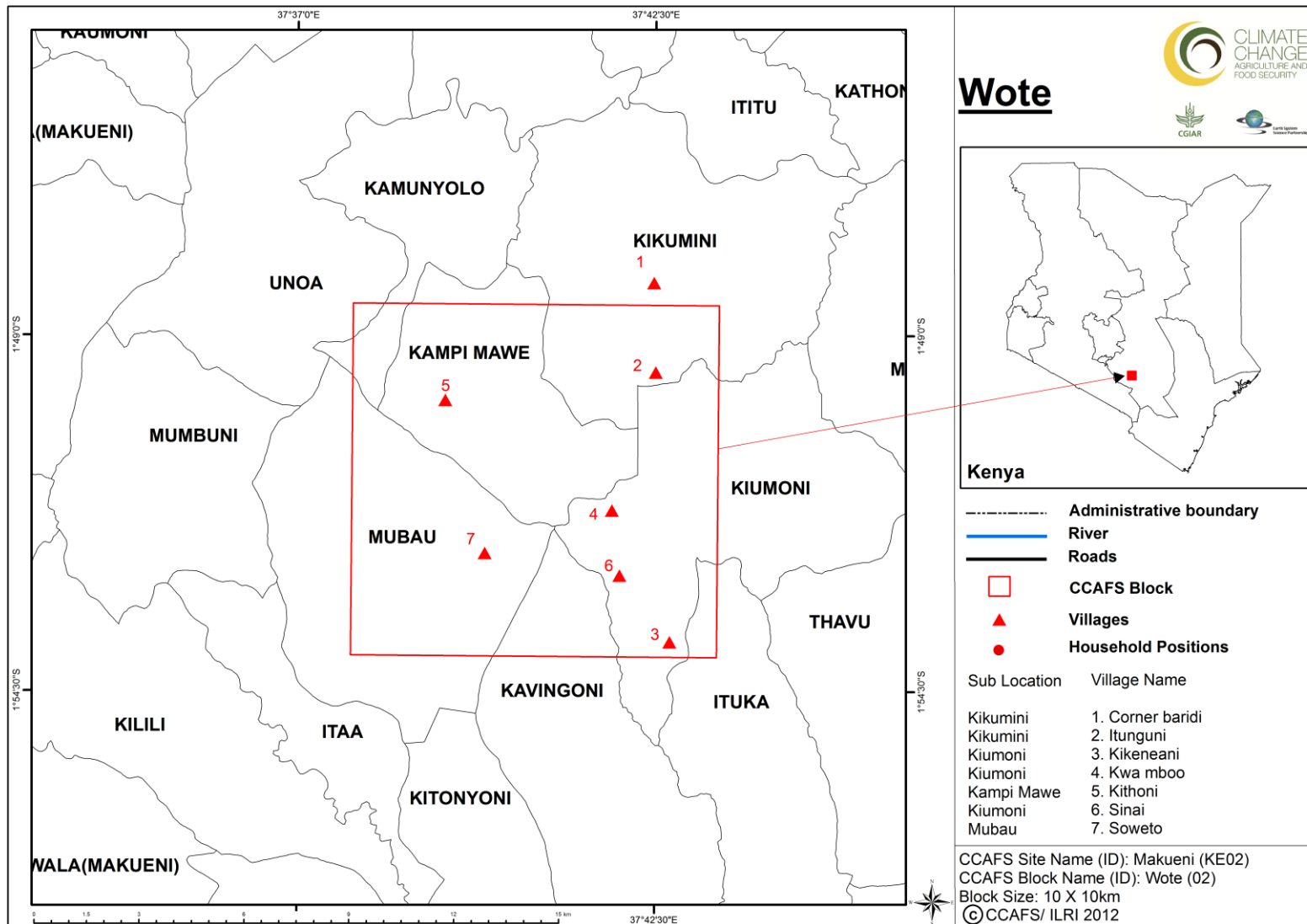
2.0 Household demographics

In household demography the following data was collected and tabulated as below.

The average persons per household are 5-6. Figure 2.1 shows that 28 (2%) households have more than 80% of household members aged <5yrs or >60yrs. i.e. these households have very few people of working age. The majority (82%) of households have more workers than non-workers in the household, as seen in the green and the blue sections below.

Figure 2.1 Proportion of the household that is of non-working age

Proportion of household younger than 5 years or older than 60
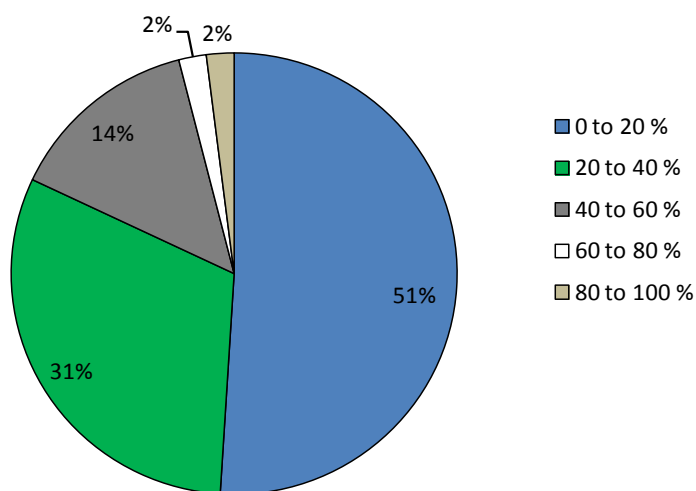
2.1 Education levels

Table 2.1 Highest level of education obtained by any household member

Highest level of education obtained by any household member	% of households
No formal education	1
Primary	43
Secondary	38
Post-secondary	18

The table above shows that in 1% of the HHs no member had received formal education. In 56% of the HHs there was at least one member who had gone through secondary or post-secondary. The community values educations and sees it as the only way out of the vicious cycle of poverty in the area. Non-continuity of education past primary is mostly due to lack of school fees.

3.0 Sources of livelihoods

3.1 On-farm livelihood sources

Table 3.1 and Figure 3.1 show the diversity in production, consumption and selling of different types of agricultural products. Seventy-five percent of the community are producing food crops mainly for consumption. However 14% are also selling some food crops. The most frequently sold food crops are cowpeas, sorghum and pigeon peas. Sixty-six percent process food crops before consumption. The crop processed is mainly maize which is milled into flour or *muthokoi* (the husk of grain removed before cooking).

The main cash crop produced by 31% of the community is cotton. Fruit trees, i.e. mango and citrus, are common in the farms with more than 70% producing and consuming. These are also a main and very important source of cash in the area with 46% selling. About 61% produces and consume vegetables but a very small number of the community sell this. However it should be noted that this is mainly cowpea leaves which are only available during rainy seasons. Eighty-six percent produce fodder and 81% consume this with only 22% selling. It should also be noted that the fodder being referred to is the maize stovers and other crop remains.

Fifty-nine percent of surveyed households keep large livestock (cattle) with 38% consuming and 18% selling. Ninety-one percent of the surveyed households keep small livestock, mainly chicken and goats. Seventy-three percent are consuming and 58% selling. More than 86% of HHs are producing and consuming livestock products (mainly eggs and milk) and 42% selling. There are no forests in the block which is dominated by bushy shrubs hence a few households(less than 5%) are producing, consuming and selling timber. Almost all the HHs produce and consume fuel wood but very few, 6%, are selling.

Table 3.1 Percentage of households producing, consuming and selling various agricultural products from their own farm

Products	% of household producing	% of households consuming	% of households selling
Food Crop	75	75	14
Food Crop (processed)	66	66	10
Other cash crop	31	27	27
Fruit	71	71	46
Vegetables	61	61	9
Fodder	86	81	22
Large livestock	59	38	18
Small livestock	91	73	58
Livestock products	86	86	42
Timber	5	4	2
Fuel wood	92	92	6
Charcoal	41	38	23
Honey	12	12	8
Manure/compost	90	90	2
Other	1	1	

Figure 3.1 On-farm diversity in products produced, consumed and sold
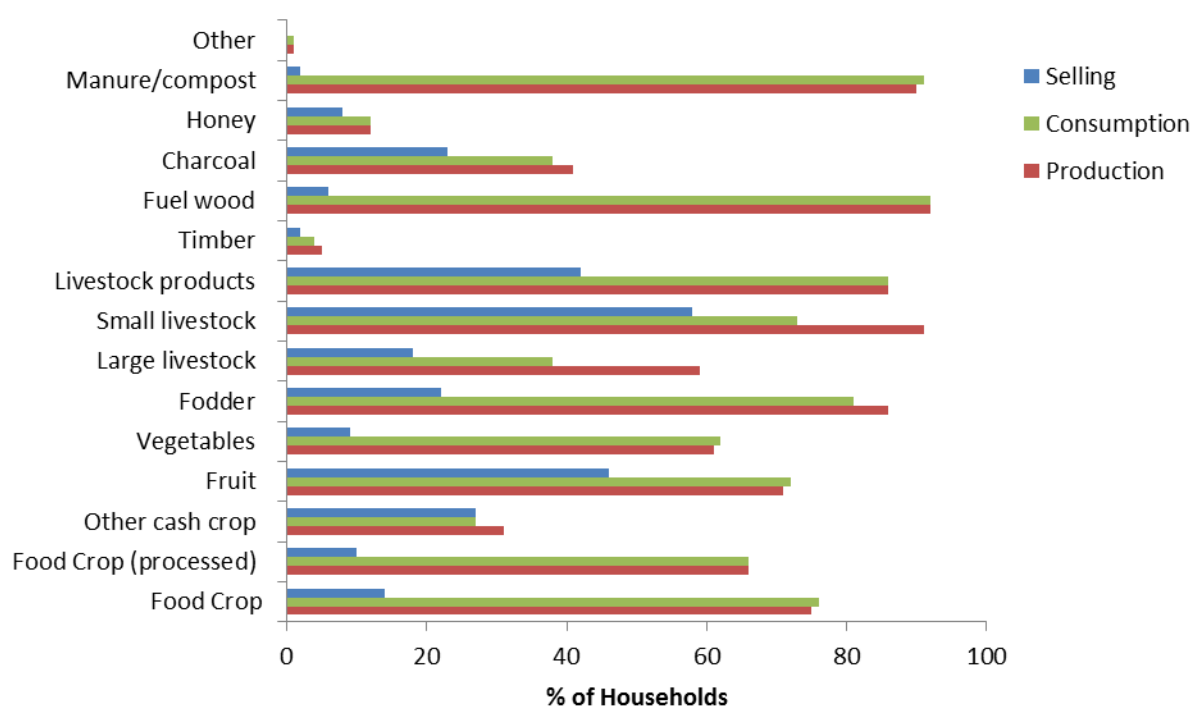
3.2 Off-farm livelihood sources

The most accessed off –farm product is fuel wood. This is a common practice whereby communities borrow fuel wood from one another. Also this could be accessed from a government land (Kwa Kathoka KARI sub-station) which is within the block and other community lands like dam sites, schools and church sites. Borrowing of fruits is also a common practice within the community especially guavas which are naturally growing even in the grazing areas.

Most of the products produced off-farm are usually consumed at household level. Moreover, selling of products produced off-farm is not common in the area as the volumes/quantities of the products are almost negligible to warrant selling.

Table 3.2 Agricultural products coming from off-farm sources/areas and consumed by households

Product coming from off-farm sources	Percent of households producing	Percent of households consuming	Percent of households selling
Food crops	26	26	0
Fruits	24	24	0
Fodder	30	30	25
Fish	2	2	0
Timber	24	24	0
Fuel wood	62	60	25
Charcoal	8	8	25
Honey	8	8	50
Manure	2	2	0
Other	8	8	0

3.3 Diversification indices

A production diversification index was created by adding up the total number of agricultural products produced on-farm:

> 1=1-4 products (low production diversification)
>
> 2=5-8 products (intermediate production diversification)
>
> 3=more than 8 products (high production diversification)

On the selling/commercialization side, the total numbers of agricultural products produced on their own farms, with some of the products sold were added up:

> 0=no products sold (no commercialization)
>
> 1=1-2 products sold (low commercialization)
>
> 2=3-5 products sold (intermediate commercialization)
>
> 3=more than 5 products sold (high commercialization)

The results of these diversification indices for our surveyed households in Wote are shown in Table 3.3.

Table 3.3 indicates that the surveyed households mostly fall under the high production diversification category as 60% are classified as such, 35% on intermediate production diversification and only 5% on low production diversification. This is the true picture on the ground as the households plant several crops to spread the risks associated with farming and can also reflect the high practise of subsistence farming.

Only a small number (8%) of the households have a high commercialization index. Most households sell 1-2 products (low commercialization) while 11% show no evidence of commercialisation, selling none of their agricultural produce.

Table 3.3 Products produced/harvested on-farm– in the last 12 months

Product Diversification:	% of households
1-4 products (low product diversification)	5
5-8 products (intermediate product diversification)	35
9 or more products (high production diversification)	60
Selling/Commercialization Diversification:	
No products sold (no commercialization)	11
1-2 products sold (low commercialization)	47
3-5 products sold (intermediate commercialization)	34
6 or more products sold (high commercialization)	8

3.4 Who does most of the work for on- and off-farm products?

With respect to workload on-farm (Figure 3.2), the results show that work is mostly done by several people (85%). However the woman, who is mostly at home, does most of the work within the farm (36%).

Most of the work off-farm is almost equally shared among the family members. However, the girl child is more tasked than the male counterpart, and this can be attributed to the fact that fuel wood

collection (with most HHs) is usually done by the female child. It is also clear that man and woman do equal work when it comes to products off-farm.

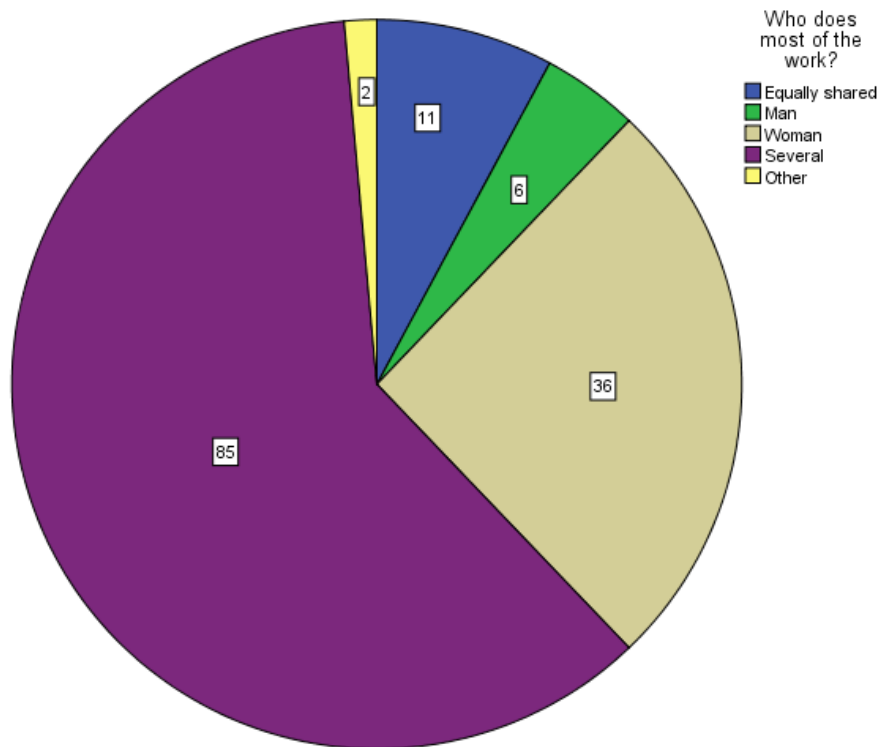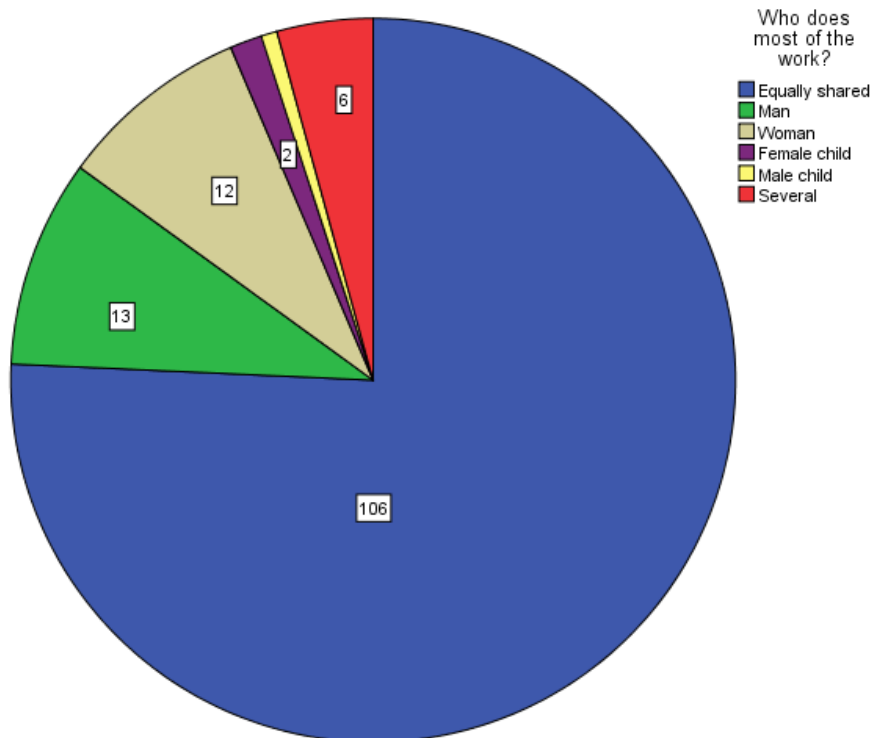Figure 3.2 Agricultural workload on-farm by gender/sex

Figure 3.3 Agricultural workload off-farm by gender/sex

3.5 Sources of cash income

At least 97% of the households have a source of cash income. Also 66% of the households have no new source of income and 29% have at least one new source. Thirty-four percent is receiving cash from at least one new source in the last 12 months, 48% no longer receiving cash income from at least one source that they did previously and in 37% there is no change from previous year.

From Table 3.5 below, 53% of the households received cash from employment on someone else's farm and this could mean that is just casual wages which is available seasonally. Thirty-six percent of the HHs obtain loan or credit from an informal source, 29% from business and 22% from remittances or gifts.

Table 3.5 Sources of cash income other than from own farm

Sources of Cash Income	% of households
Employment on someone else's farm	53
Other paid employment	34
Business	30
Remittances/gifts	22
Payments for environmental services	14
Payments from government or other projects/programs	12
Loan or credit from a formal institution	9
Informal loan or credit	36
Renting out farm machinery	7
Renting out your own land	9
No off-farm cash source	3

3.6 Discussion

The area is situated outside the main towns and the available source of income other than from selling of farm produce is mainly from employment on other farms. However, this is not readily available hence not a guarantee to get it when needed.

Informal loan or credit is also an important source and this is usually from merry go rounds (groups that lend money to each member in turn) and table banking[2] by groups. Other paid employment includes charcoal burning/selling, brick making, etc. Remittances/gifts are mainly from children or relatives working in the urban centres.

Payments for environmental services and payments from government or other projects/programs can be combined as there are projects which pay the community to do soil and water conservation activities in their farms, e.g. food for assets (FFA) programme.

The machinery usually rented out is the oxen plough and/or the oxen. Others include brick making box and oxen drawn cart.

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[2] Group members' periodical contributions are put in a basket from where a member in need can borrow at relatively small interest and usually no collateral needed. The group's money need not be banked as it is usually in circulation among the members. Dividends are also availed to members.

4.0 Crop, farm animals/fish, tree, soil, land, and water management changes

4.1 Crop-related changes

Adopters of new crops/varieties

Ninety-six percent of surveyed households have introduced 3 or more new crops and/or new varieties in their farms in the past 10 years as shown in Table 4.1 below. This can be said to a coping strategy by the farmers to deal with the changes in weather patterns.

Table 4.1 Adoption of new crops/varieties over the last 10 years

Change in practice	% of households
Have introduced 1 or 2 new crops and varieties	4
Have introduced 3 or more new crops and varieties	96

Cropping related changes

With respect to cropping-related changes, we examined whether households had made one or more of the following changes over the last 10 years:

- Introduced intercropping
- Earlier land preparation
- Earlier planting
- Later planting
- Expanded area
- Reduced area
- Started using pesticides/herbicides
- Integrated pest management
- Integrated crop management
- Introduced new crop varieties
- Planting high yielding variety
- Planting better quality variety
- Planting pre-treated/improved seed
- Planting shorter cycle variety
- Planting drought tolerant variety
- Planting disease resistant variety
- Planting pest resistant variety
- Testing variety
- Stopped using variety

The results showed that 91% of households had made 3 or more of these cropping related changes in the last decade.

Water management related changes

For the water management-related changes, the following changes in practice were considered:

- Started irrigating
- Introduced micro-catchments
- Introduced improved irrigation
- Introduced improved drainage
- Introduced mulching

Here, we found that 90% of households had made two or more water management-related changes

Soil management related changes

The possible management changes considered were:

- Stopped burning
- Introduced intercropping
- Introduced cover crop
- Introduced micro-catchments
- Introduced/built ridges or bunds
- Introduced terraces
- Introduced stone lines
- Introduced hedges
- Introduced contour ploughing
- Introduced rotation
- Started using more mineral/chemical fertilizers
- Started using manure/composite

The results show that 100% of households reported having made two or more soil management related changes in the last 10 years.

Tree/agroforestry management related changes

The results show that 97% of households have made some tree/agroforestry management related changes in the last decade. Here we considered whether households have either:

- Planted trees within the last year
- Protected trees within the last year

Other changes

We also looked at whether households have made any other changes to crops not specified in the questionnaire. Our findings show that no households reported making any additional changes.

4.2 Reasons for crop-related changes

Several factors were cited as reasons for change. These include markets, climate, land, labour, pests/diseases and projects. All the households sampled cited these factors except in projects, where only 1% said projects were a reason for change.

Table 4.2 Reasons for changing cropping practices, by category

Reason for changing cropping practices, related to:	% of households citing
Markets	97
Weather/climate	64
Land	91
Labour	65
Pests/diseases	34
Projects	1

On markets, farmers are growing green grams as a result of new opportunities to sell. Green grams have been unpopular but are becoming a cash crop in the area. On marketing factors, cotton has been abandoned due to poor prices as compared to the cost of production. Also the crop is labour intensive during harvesting and sorting and pests and disease management. It is also highly pest infested. In order to realise economical/meaningful output cotton production requires growing under large areas hence land is also limiting.

Gadham sorghum is being promoted in the area but is not taken up because of the birds menace. Bird scaring is usually done by young children, and they are all in school. Sorghum is a traditional crop in the area but has been dropped because of this problem.

Climate-related reasons

Ninety percent of the households have made changes to their most important crops because of climate reasons. The most important crops in the area were cited as maize, cowpeas, green grams and pigeon peas.

Table 4.3 Weather/Climate-related reasons for changes in cropping practices

Weather/Climate related Reason	% of the households that cited at least one weather-related reason
Earlier start of rains	2
Less overall rainfall	84
More frequent droughts	19
Later start of rains	3
More frequent floods	20
Higher temperatures	2
Strong winds	3
Lower groundwater table	49

4.3 Livestock-related changes

The results show that 94% of the households have livestock whereby 54% have more than three types of animals, 26% have two types and 14% have only one type of animal. With respect to changes over the last 10 years, we see that the majority of households (66%) have 2 or 3 animal types and either these are all the same as 10 years ago or they have only changed one type of animal.

The most important/common animals are beef cattle, chicken, goats and oxen in that order. Ten years ago the order was beef cattle, goats and chicken.

Eighty-seven percent of the households have made changes to their most important animals. On average the changes made affected 3 animal types.

Adopters of new animal types/breeds

The results suggest that 90% of the households introduced 3 or more new animal types and/or new breeds. Only 10% of households have not introduced any new types of animals/breeds

Herd related changes

For herd related changes the following indicators were considered:

- Reduction in herd size
- Increase in herd size
- Change in herd composition

126 households (90%) made 3 or more herd-related changes over the past 10 years.

Animal management related changes

For animal management related changes we consider the following changes:

- Stall keeping introduced
- Fencing introduced
- Cut and carry introduced

126 households (90%) made animal management related changes in the past decade.

Feed related changes

For feed related changes we consider the following:

- Growing fodder crops
- Improved pastures
- Fodder storage

Ninety percent of the surveyed households made feed-related changes in the last 10 years.

However it should be known that no new animals have been introduced in the area and the changes are purely on breeds. The community is introducing improved breeds and reducing the number of the herd for cattle as grazing area is being cleared for crops. During the dry season it becomes quite hard to keep a large herd.

Chicken have increased in number as a result of good prices and a ready market. There have been massive campaigns on poultry vaccination and diseases–which were a threat to poultry–and these can presently be contained.

Reasons for changes to livestock rearing practices

Table 4.4 Reasons for changing livestock practices, by category

Reason for changing livestock practices, related to:	% of households citing
Markets	100
Weather/climate	100
Labour	100
Pests/diseases	100
Projects	100

One hundred percent of the households cited markets, climate, labour, pests/diseases and projects as the reasons for changes. Labour is a contributing factor to change especially when it comes to goats. The young children who usually look after them have been absorbed in schools/learning institutions. The number has then been reduced to remain with a few animals which can be tethered or zero grazed comfortably.

Land is also a contributing factor to change as the grazing areas have reduced in number and size as more land is opened for crop production.

4.4 Adaptability/Innovation index

An adaptability/innovation index was defined as the following:

0-1=zero or one change made in farming practices over last 10 years (low level)

1=2-10 changes made in farming practices (intermediate level)

2=11 or more changes made in farming practices (high level)

We see in Table 4.5 that 25% of households made zero or only one change in what and how they farm over the last 10 years, 20% of households made between 2 and 10 changes, and 55% made 11 or more changes. Further analysis, particularly of these more adaptive households, is needed to better understand exactly what adaptations they have made and why.

Table 4.4 Adaptability/Innovation index

Number of changes made in farming practices in last 10 years:	% of households citing
Zero or one (low)	25
2-10 changes (intermediate)	20
11 or more changes (high)	55

4.5 Mitigation indices

Several climate mitigation-related behavioural changes were used to create the following indices:

Tree management:

This index shows whether a household has either protected or planted trees within the last year.

Soil amendments:

This index shows if the household has used fertilizer in the last year, or has started using fertilizer or manure on at least one crop.

Input intensification

There are 7 'changes in agricultural practices/behaviour over the last 10 years' considered here to create an index with 3 levels - no intensification (none of the following), low intensification (1-3 of the following), and high intensification (4-7 of the following). They are:

- Purchased fertilizer
- Started to irrigate
- Started using manure/compost
- Started using mineral/chemical fertilizers
- Started using pesticides/herbicides

- Started using integrated pest management techniques
- Planted higher yielding varieties

Productivity Index

This index shows if a household has reported achieving a better yield from any crop, or that their land is more productive for any crop over the last 10 years – such households are classified as showing an "increase in productivity".

Table 4.5 shows the results for the mitigation-related indices for the surveyed households in Wote. Only 9% of households reported some tree management activities over the last year. Seventy four percent undertook soil amendment (e.g. fertilization) actions. Most households (74%) had experienced increases in agricultural productivity while 25% have not increased their input use. Of the households that intensified their output, 15% were at a low level and 60% at a higher level.

Table 4.5 Mitigation-related indices

Index	No (% of hh's)	Yes (% of hh's)
Tree management	91	9
Soil amendments	26	74
Increase in productivity	26	74
Input intensification	25	Low-15 High-60

4.6 Discussion

Farmers in the area have soil amendments through structures like terracing their farms, application of farm yard manures and a small percentage use inorganic fertilizers. These have increased production. Other factors that have led to these are adoption of new farming technologies and application of the appropriate enterprises.

The inputs intensification/use is high. This could be attributed to the fact that most farms have improved fruit trees (mango & citrus) where use of agrochemicals for pests and disease management is a must.

Tree/forestry management is not prominent because there are no major forests. Trees are short shrubs in the grazing areas.

5.0 Food security

About 70% of the households do not have enough food for 6 months in a year. Only 2% have enough food throughout the year.

Figures 5.1 and 5.2 indicate that many households suffer a shortage in the period August to December which corresponds to the time when there is less food available from on-farm sources.

However, in February and March, even when there is a total crop failure, mangoes are being harvested which is a major source of income at the time. Citrus harvesting also brings a relief to the households.

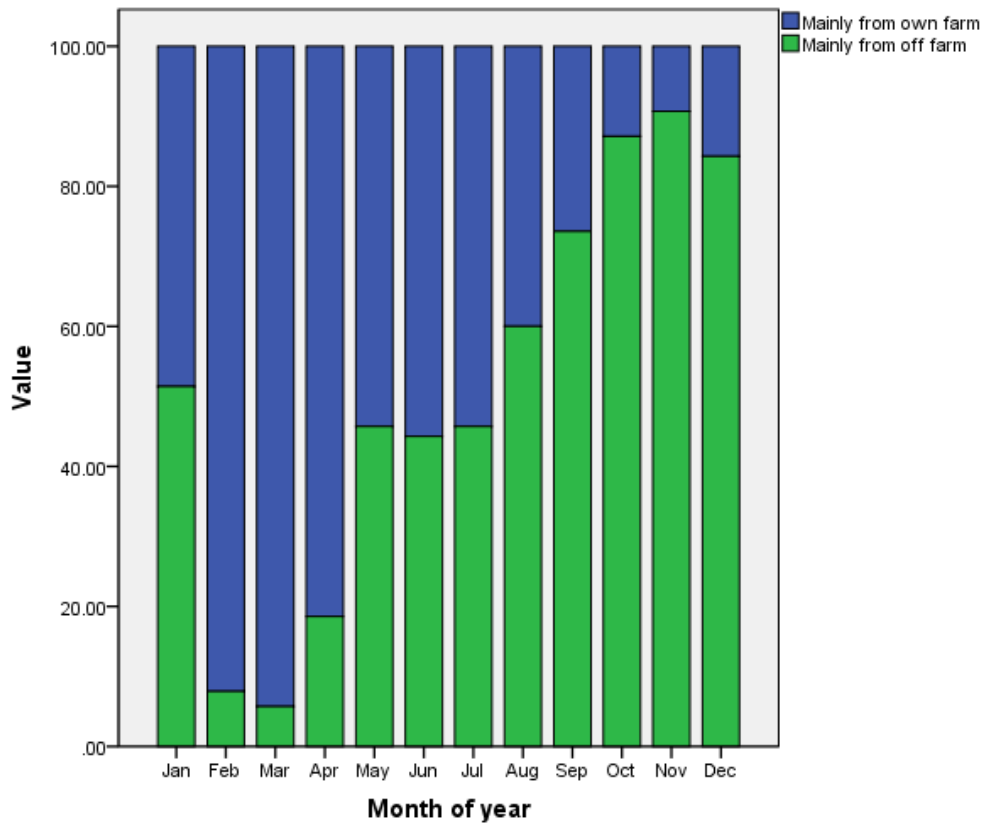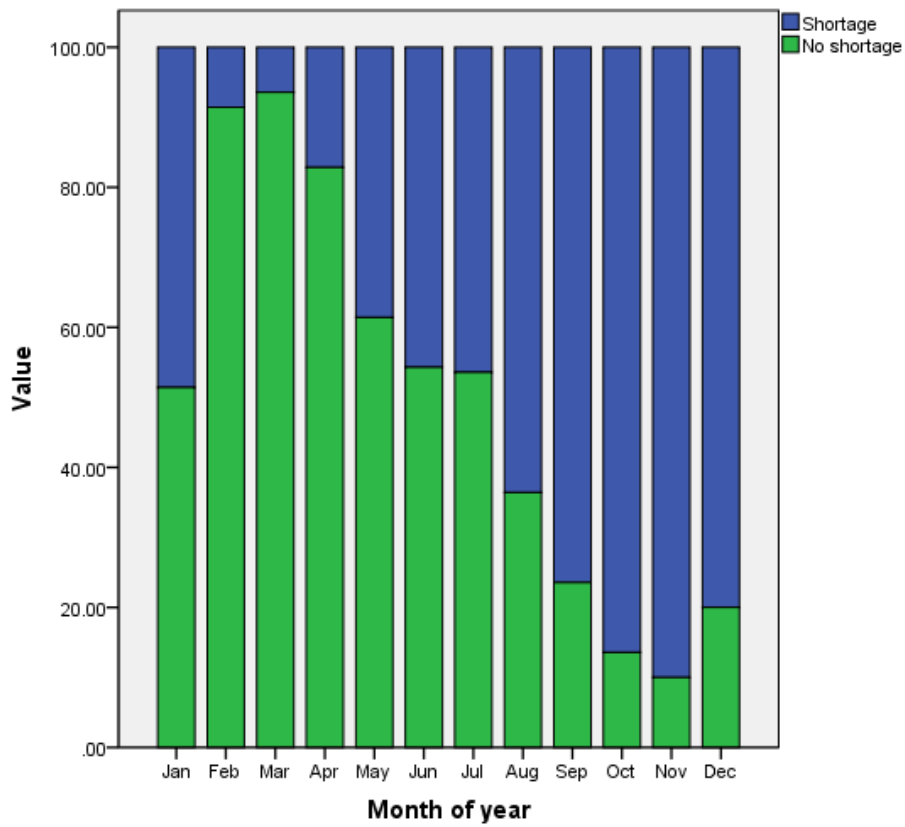Figure 5.1 Main source of food for the household

Figure 5.2 Hunger/Food shortage months

5.1 Food security index

The food security index we created is based upon the number of months that the household has difficulty getting food from any source (i.e. from their own farm or off-farm, from stores, gifts, purchases or transfers).

For our surveyed households in Wote, only 2% are 'food secure' all year long. Only 1% has enough food for their families for at least 10 months of the year, and 97% of these households struggle to get enough food to feed their family for more than 2 months out of a year (Table 5.1).

Table 5.1 Food Security Index

Percent of households reporting:				
More than 6 hunger months	5-6 hunger months	3-4 hunger months	1-2 hunger months	Food all year round/No hungry period
44	34	19	1	2

5.2 Discussion

In a year, harvesting for the short rains (the most reliable season in the area) starts late December and peaks in February and March hence the availability of food from own farm. The long rains season is not reliable and the harvest, if any, starts in June throughout July. From then the stocks in the stores start being depleted until the month of December when there is harvesting of cowpea leaves (vegetable) and beans (green) and the cycle continues. This explains the two graphs, i.e. Figures 5.1 and 5.2, which follow a similar pattern.

6.0 Land and Water

6.1 Water for agriculture

Water is very scarce in the area, and only 9% of the households are practising irrigation most of which is under kitchen garden. Seventeen percent have tanks for water harvesting, 34% have dams or water ponds, 4% have boreholes/shallow well, and less than 1% have either water pumps (other type) or inlet/water gate.

Fifty eight percent of the households have none of those mentioned above. These households get water from communally owned sources namely dams, boreholes and rivers

Table 6.1 Water sources for agriculture on-farm

On-farm water sources	% of households
Irrigation	9
Tanks for water harvesting	17
Dams or water ponds	34
Boreholes	4
Water pumps (other type)	1
Inlet/water gate	1
None of the above	58

6.2 Land use

Land availability in this case means both land owned by the household and that which is rented.

Majority of the households in the area have access to land between 1 and 5 hectares, 14% have more than 5 hectares and 16% have less than one hectare.

Sixty-six percent of the households have between 1 and 5 hectares which is available for crops although 59% have it dedicated to crops.

Table 6.2 Total land size accessed by households, available for crops & currently dedicated to crops

Number of hectares of land owned and rented in	% of households	Land available for crops	% of households	Land currently dedicated to crops	% of households
Less than one hectare	16	Less than one hectare	26	Less than one hectare	40
Between 1 and 5 hectares	71	Between 1 and 5 hectares	66	Between 1 and 5 hectares	59
More than 5 hectares	14	More than 5 hectares	8	More than 5 hectares	1

Land holdings in the area are quite substantial and the majority of the households in the area have access to land which is between 1 and 5 hectares. Forty nine percent of the households have less than one hectare available for expansion and 20% have more than one hectare available for expansion.

Communal land

For our surveyed households, 95% said that they do not use communal land.

Hired machinery or labour

The results show that 30% of households sometimes hire farm labour and 49% sometimes hire animal drawn ploughs. Very few households hire tractors.

6.3 Discussion

Land holdings in the area are quite substantial and the majority of the households in the area have access to land between 1 and 5 hectares and 68% of the households have at least some land which is available for expansion.

7.0 Input and credit

Table 7.1 Use of farm inputs

In the last year did you use	% of households
Purchased seed	96
Purchased fertilizer	6
Purchase pesticides	84
Purchase veterinary medicine	69
Received credit for agricultural activities	2
None of the above	1

The data in Table 7.1 indicate that 96% of the community used/purchased certified seeds in the last 12 months. However, it should be understood that the certified seed used is usually relief seed distributed by the government. Only a very small percentage (if any) purchase seed and even when they do it is small quantities not for every crop. In other cases, farmers buy seeds from other farmers (farmers' seed) or grains being sold as food and use them as seed especially when there has been progressive crop failure and the farmers' seed is unavailable. Without government and other institutions assistance in certified seed, its use would not be very different from that of fertilizer.

Fertilizer/manure purchase is not common as evidenced by only 6% of the households purchasing. In the use of pesticides, 84% are said to have used/purchased the same. The use of pesticides in the area can be attributed to the fact that mango (improved/grafted) and citrus are major crops in the area and use of pesticides is a must if meaningful yields are to be realised. Use of dust for dressing grains against weevils and grain borers is a common practise in the area. Also in the last 12 months there was infestation of bollworm in crops and the government issued pesticides to farmers and these also could have raised the percentage of households which used the same.

Use of veterinary medicine is common in the area and this is so through periodical government vaccinations of livestock. Vaccination of chicken is also common especially carried out by private service providers.

Credit acquisition is not common due to the risks associated with farming because rains are not reliable. Also the credit facilities do not give a substantial grace period enough to have realised yields/products.

7.1 Fertilizer use

More than 94% of the households do not use fertilizer.

Table 7.2 Type of fertilizers used

Fertiliser Type	% of Households
Urea	13
Nitrogen Phosphorous Potassium (NPK)	13
Di-Ammonium Phosphate (DAP)	38
Calcium Ammonium Nitrate (CAN)	88

As in Table 7.2 above, of the few households (less than 6% of the HHs) who use fertilizer, 88% usually use CAN for top dressing. At this stage the crop looks promising and the farmers are almost sure it will be harvested. DAP; NPK and Urea are also used by 38%, 13% and 13% respectively. One hundred percent of these HHs said the fertilizers are used in maize (the most important crop).

7.2 Discussion

Fertilizer use in the area is not common probably because rain is not reliable and farmers do not risk investing a lot in rainfed seasonal crops. However, farm yard manure is applied to fruit trees and irrigated vegetables which are a major source of income in the farms where they are present.

The manure is also used in the farm and mainly applied where maize is planted.

8.0 Climate and weather information

8.1 Who is receiving information?

An analysis of which households are receiving any type of climate- or weather-related information shows that almost all households (97%) are receiving some type of weather or climate-related information. We next looked at who is receiving what kinds of weather-related information within the households.

8.2 Types of weather-related information

Next we examine the different types of weather-related information that households are using and who is receiving it and if is being used (and for what).

Forecast of extreme events

Nearly 95 % of households received information about extreme events (e.g. droughts, floods). Radio is the main source of information as 93% of households received the information through the radio, 40% from friends, relatives, or neighbours, 38% from local groups or gatherings and 26% from government agricultural extension or veterinary officers.

Table 8.2 Sources of information about extreme events

Source of information	% of HH
Radio	93
Television	5
Government agricultural extension or veterinary officers	26
NGO project officers	2
Friends, relatives, or neighbours	40
Meteorological offices	2
Newspaper	5
Traditional forecaster/Indigenous knowledge	8
Your own observations	5
Local group/gatherings/meetings	38
Religious faith	1
Other	1

Forecast of pest or disease outbreak

Sixty-nine percent of the HHs changed crop type as a result of information received on forecast of extreme event, 57% changed crop variety, 42% changed land management and change in timing of farming activities, 14% on use of manure/compost/mulch and 11% made changes in inputs (seed, fertiliser, pesticides) usage. Less than 9% of the HHs made changes on other aspects of farming like land area, field location and soil and water conservation. Two percent of the HHs did not make any change on aspects of farming.

Table 8.3 Actions taken upon receipt of pest/disease outbreak forecasts

Aspects of farming changed	% of HH
None	2
Land management	42
Crop type	69
Crop variety	57
Change in inputs (seed, fertiliser, pesticides)	11
Use of manure/compost/mulch	14
Land area	2
Field location	4
Change in timing farming activities	42
Soil and water conservation	8
Irrigation	1
Water management	1
Tree planting	7
Livestock type	1
Feed management	7

Forecast of the start of the rains

This information in most cases includes the onset and distribution in both time and space and cessation time.

More than 97% of the households have received information on forecast of the start of the rains. Radio is the main source of information as 90% of households received the information through the radio, 42% through friends, relatives, or neighbours, 30% through local group/gatherings/meetings, 21% government agricultural extension or veterinary officers and 15% through their own observation. Other sources could be considered as minor as less than 5% of the HHs received information through them. Forecast of the start of the rains is important to farmers as it influences land preparation and planting time. It also influences/determines the crop varieties and or crops that a household cultivates.

Table 8.4 Sources of information on the predicted timing of the start of the rains

Source of information	% of HH
Radio	90
Television	2
Government agricultural extension or veterinary officers	21
NGO project officers	4
Friends, relatives, or neighbours	42
Meteorological offices	2
Newspaper	5
Traditional forecaster/Indigenous knowledge	18
Your own observations	15
Local group/gatherings/meetings	30
Religious faith	1
Other	1

Weather forecast for the next 2-3 months

Forty-nine percent of the HHs changed crop type as a result of information received on forecast of weather for next 2-3 months, 24% changed crop variety, 27% changed land management, 41%

changed timing of farming activities, 42% on use of manure/compost/mulch, 24% made changes in inputs (seed, fertiliser, pesticides) usage and 29% made changes on soil and water conservation, and 24% tree planting. Less than 7% of the HHs made changes on other aspects of farming like land area, field location, water management, livestock type and breed. Five percent of the HHs did not make any change on aspects of farming.

Table 8.5 Aspects of farming changed with 2-3 month forecast information

Aspects of farming changed	% of HH
None	2
Land management	27
Crop type	49
Crop variety	24
Change in inputs (seed, fertiliser, pesticides)	24
Use of manure/compost/mulch	42
Land area	7
Field location	5
Change in timing farming activities	42
Soil and water conservation	29
Water management	5
Tree planting	24
Livestock type	5
Livestock breed	7

Forecast for next 2-3 days

Information on forecast of weather for the next 2-3 days is not common as it is received by only 30% of the households.

Radio is the main source of information as 81% of households received the information through the radio, 45% through own observations, 38% through friends, relatives, or neighbours, 26% through traditional forecaster/indigenous knowledge and 21% through local group/gatherings/meetings. Other sources could be considered as minor as less than 10% of the HHs received information through them.

Table 8.6 Source weather information

Source of information	% of HH
Radio	81
Television	10
Government agricultural extension or veterinary officers	5
NGO project officers	2
Friends, relatives, or neighbours	38
Meteorological offices	2
Newspaper	10
Traditional forecaster/Indigenous knowledge	26
Your own observations	45
Local group/gatherings/meetings	21

8.3 Discussion

For all types of weather related information radio is the most common source of information. This could be so as radio listening especially the local FM Stations is rampant in the area. In most of the

cases women tend to receive more weather related information than men, which may reflect their day to day involvement in the farm as compared to men. With the exception of the short term weather information, the rest of the information received included some advice on what to do in such cases.

The most changed aspects of farming upon receipt of all the information were crop type, crop variety, land management and change in timing of farming activities.

The least changed aspects of farming upon receipt of relevant information were land area, field allocation, water management, livestock type and livestock breed.

9.0 Community groups

Group membership is common with at least 88% of the households with a member who is a member of a group(s). Only 11% of the households are not in any group.

Most of the government and NGO activities target groups, and farmers have joined/formed groups to benefit from such services.

Also farmers are in groups so that they can assist one another especially the merry go round groups. Most of the household members in groups are women. Table banking is popular in this group and that is where the credit/loans are accessed from.

Seventy-seven percent of HHs are in a savings or credit group, 20% in tree nursery/planting group and 20% in productivity enhancement group.

Table 9.1 Group membership

Does someone in your household belong to the following groups	% of HH
Tree nursery/planting group	20
Water catchment management group	3
Soil improvement activities group	2
Crop introduction/substitution group	6
Irrigation group	6
Savings or credit group	77
Agricultural product marketing group	2
Productivity enhancement group	20
Vegetables production group	2
Not a member of any group	11

9.1 Climate related crises

We looked at whether households have faced a climate related crisis in the last 5 years and whether or not they received help to deal with the impacts of such a crisis. For those who received help we inquired as to the source of this help.

More than 99% of the households confirmed having faced a climate related crisis in the last 5 years and 91% said they had received assistance to combat the crisis or its effects. Ninety-eight percent of the households who received assistance got it from government agencies, 85% from NGOs and 41% from friends and other minor sources as per Table 9.2 below. Eighty percent of households surveyed got assistance from savings and credit groups, 20% from tree nursery groups and 20% from water catchments management as per Table 9.3 below.

Table 9.2 Sources of assistance for climate related crises

From where did you receive assistance?	% of households
Got help from friends	41
Received help from government agencies	98
Receive help from politicians	2
Received help from NGOs	85
Received help from church organizations	4
Received help from a group that you are a member of	4

Table 9.3 Types of groups that give help for climate related crises

From which group did you receive assistance?	% of households
Tree nursery	20
Water catchment management	20
Savings and credit	80

The area falls in the arid and semi-arid lands (ASALs) of Kenya and weather related crises are very common. For this reason the government and NGOs usually assist the community in such times through several programmes. Some of the assistances are water trucking, fuel subsidy for water pumps, relief seeds, relief food, food for assets, livestock off-take, relief feeds, cash for food and other aids.

10.0 Assets

10.1 Asset indicator

Households were asked about what assets they owned, from a set list. The assets they were asked about include the following:

Energy: generator (electric or diesel), solar panel, biogas digester, battery (large, e.g. car battery for power);

Information: radio, television, cell phone, internet access, computer;

Production means: tractor, mechanical plough, thresher, and mill;

Transport: bicycle, motorbike, car or truck;

Luxury items: refrigerator, air conditioning, fan, bank account, improved stove.

The total number of assets in all categories was added up and the following asset indicator created:

      0= No assets (basic level)

      1=1-3 assets (intermediate level)

      2=4 or more assets (high level)

Table 10.1 Asset index

Number of queried assets	% of Households
No assets (Basic Level)	9
1-3 assets (Intermediate Level)	47
4 or more assets (High Level)	44

Ninety-one percent of the households surveyed have at least one asset. However the most owned assets are the radio and the cell phone as seen in Table 10.2 below. It is also evident in the table that most of the households have improved housing that includes improved roofing. This should not be used as an indicator for wealth because construction materials are locally available hence relatively cheap and accessible. For the improved roofing, grass (which is a cheap material) is not available in the area and the community has to struggle to purchase iron sheets.

Only 2% of the surveyed households have electricity and 9% have running water in their homes. In relation to food security, only 49% have improved storage facilities for crops. Over two-thirds have separate housing for their livestock.

Table 10.2 Asset ownership

Assets/utilities	% of households
Radio	80
Cell phone	80
Bank account	21
Bicycle	64
Motorcycle	7
Car	4
Solar panel	11
Mechanical plough	32
Battery	11
Liquefied petroleum gas	6
Improved storage facility for crops (food and feed)	49
Improved housing (e.g. concrete, bricks, etc.)	72
Improved roofing (e.g. tin, tiles, etc.)	75
Improved storage tank (for household water, > 500 litres)	19
Well/borehole (for household water)	4
Electricity from a grid	2
Running/tap water in the dwelling	9
Separate housing for farm animals	67
Improved stove	16
Wheelbarrow	47
Ox cart	19

10.2 Discussion

More than 87% of the households do not have assets related to energy, 60% have no assets for production means, 35% have no assets providing transport and 73% have no luxury items. Eighty percent have assets for information and 54% have assets providing transport which is mostly bicycles.

Information assets are cell phones and radio which are common in the area as the main source of communication. The cell phone has become popular as it is also a means of money transfer.

Bicycles have been the main source of transport to the interior although they are being replaced by the motorcycles popularly referred to as *boda boda*.

Appendix 1: Survey Process and Implementation

The survey team was led by Muoti Mwangangi of the Ministry of Agriculture based in Makueni district, Makueni County. The team was comprised of three experienced enumerators, Rosemary Kyalo, Justus Ngesu and Benson Mutua. We all took part in a 5-day training that included a field test of the questionnaire at the end of April 2012. The questionnaire was translated from English into Kamba and then back translated. In the field, we worked closely with the respective village elders and chiefs/sub-chiefs to identify the survey respondents, following the sampling frame as per the training we had undergone. As the supervisor I went through each questionnaire upon completion to check for errors, which were corrected immediately while still in the village.

Before the questionnaire was administered, a sensitization meeting was convened within each sub-location will all village elders and the assistant chiefs. The survey's objectives of better understanding households' farming practices, how they have changed and why particular practices have changed were discussed at this time. A list of all the villages identified to be within the 10KM x10KM block was drawn.

A total of 53 villages was identified and subjected to randomization where 7 villages for the survey were selected. A further list was made for all the households within each village. It was at this stage when we realised that in one of the 7 villages all the households were falling within a shopping centre where the traders came during the day and went back (to other villages) in the evening. Since it was not possible to get the required information from such a village, it was discarded and another village randomly chosen. The households per village were then randomized and a total of 20 HHs per village chosen giving a total of 140 HHs for the survey. However, during the actual survey one household declined to be interviewed, absented herself for three days and later she advised the village elder to select another household. Another household was randomly selected from the village and the exercise continued smoothly.

The village authorities then informed community members as to the procedures and forthcoming household visits by the team, so as to avoid suspicion or conflict as to the household listing procedure and enhance cooperation with the team.

The community was very receptive and cooperative and there were no major challenges encountered.

Household Structured Interviews

The activity was carried out from 16th April to 11th May 2012. Data entry started one week later and continued four weeks after which the data was cleaned. First cleaning was done with the use of CS-Pro software and a second cleaning using SPSS.

Appendix 2: Sampling Frame – List of Villages

Kiliani

Sinai

Makutano

Kikeneani

Kitandamboo

Kiumoni

Kituneni

Kwa mboo

Kilaani

Kyemole (Shopping centre Kiumoni Sub Location)

Noman

Kiuani

Kasambani

Yumbuni

Matithini

Muusini

Matulani

Harambee

Kiatineni

Ndivuni

Itulani

Kiluluini

Manyanzaani

Sikia

Itunguni

Corner Baridi

Kiusini

Lower west

Upper West A

Upper West B

Mwinga

Kampi Mawe

Kithoni

Kivani

Kyemole (Kambi Mawe Sub Location)

Muambani (Kambi Mawe Sub location)

Kwa Kathoka

Mulaani

Iviani

Nguumo

Senda

Nthembe

Muvau

Ngunu

Soweto

Kathoka

Kasalani

Nzaai

Kaseve

Ndukuma

Nyunzu (Mubau Sub Location)

Muambani (Kamunyolo Sub Location)

Nyunzu (Unoa Sub Location)

List of sampled villages

- Kikeneani
- Sinai
- Itunguni
- Corner Baridi
- Soweto
- Kithoni
- Kwa Mboo