



CLIMATE
CHANGE
AGRICULTURE AND
FOOD SECURITY

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

**Summary of Baseline Household Survey
Results: Lushoto, Tanzania**

December 2011

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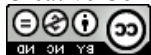


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Abstract

This report summarizes the results of a baseline household-level survey, led by the Climate Change, Agriculture and Food Security Consortium Research Program¹ (CCAFS), carried out in 7 villages and 140 households in Lushoto, Tanzania in January 2011. The objective of this baseline effort was to describe the characteristics of the farming systems found across a wide range of research sites in 12 countries, including the Lushoto site, and to better understand what kinds of farming practice changes households have been making and why.

We gathered information on the socio-economic and demographic characteristics of these randomly chosen farming households, basic livelihood and welfare indicators, agriculture and natural resources management practices and strategies, access to and use of climate and agricultural-related information, and current risk management, mitigation and adaptation practices.

The study found that there have been several changes in land use and crop management over the past 10 years, including the introduction of new, higher yielding crop varieties of maize, beans and tomatoes, and switching to disease-resistant varieties of cassava, bananas and maize.

The land use and crop management changes respondents reported having made were driven by many factors, including the availability of high yielding varieties more resistant to pests and diseases, and more profitable market prices. Less productive land was another reason given by households that were making changes to their farming practices.

Respondents also gave weather-related reasons for adapting their agricultural practices. One-third of households reported making changes due to an increase in the amount of rainfall. Maize, beans and tree-based crops (peaches, apples and coffee) have been planted in recent years to utilize the increased moisture.

Other weather-related factors cited as reasons for making farming practice changes were more erratic rainfall, less overall rainfall, more frequent droughts, and an earlier start of the rains. This led to some respondents adopting shorter-cycle and drought-tolerant crop varieties, preparing their land for planting earlier than they used to, planting earlier (particularly maize), but also planting some crops at a later date than they had previously (beans and cassava).

Land-related drivers of change were also reported, particularly 'less productive land' and 'decreasing land size'. To mitigate the low land productivity, changes such as the use of manure and mineral fertilizers have been widely adopted, mainly on maize and beans, the principal crops in the surveyed area. Investments in drought-resistant crops such as cassava have also been frequently made over the last decade by these households.

The survey also found that less than one-third of farmers have adopted the improved soil and water conservation practices that are key to combatting the challenges of a changing climate, reduced soil fertility, and marketing-related challenges.

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

This baseline survey has provided some key indicators relating to household well-being and agricultural adaptation strategies that will be monitored over time. This information will help to better target interventions aimed at improving them, as well as identifying key gaps in information that warrant further research.

About the authors

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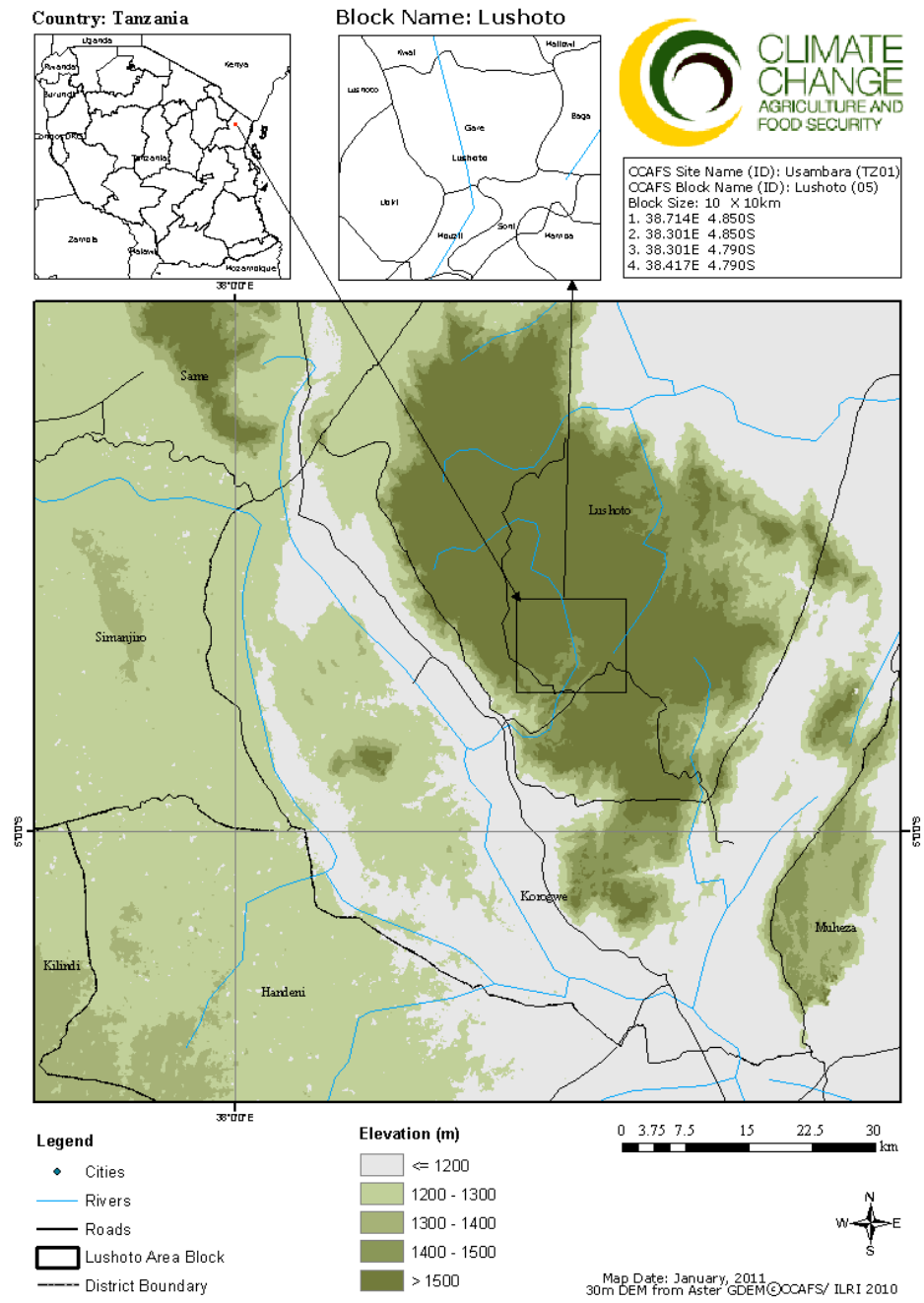
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1.0 Introduction

This report presents the results of an analysis of the CCAFS baseline household survey carried out in January 2011 in seven villages, with 140 households, in Lushoto, Tanzania (Figure 1).



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 Annexes 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.

2.0 Household demography

A total of 140 household respondents were interviewed, of whom 66% were male and 34% female. Over half the respondents were heads of households, 21% spouses of the household head, and 6% were parents. Twenty-two percent of households were female-headed; 5% of these reported having husbands that were away most of the time.

The ethnic group of the majority of respondents (93%) was Wasambaa, with the remainder coming from minority ethnic groups, the Wambugu (3%), Wachaga (2%), Wapare (1%) and Wazigua (1%).

The average size of the interviewed households (i.e. residents for the majority of the year) was six people, with a range of 1 to 15 persons (Figure 2.1).

Figure 2.1 Size of surveyed households

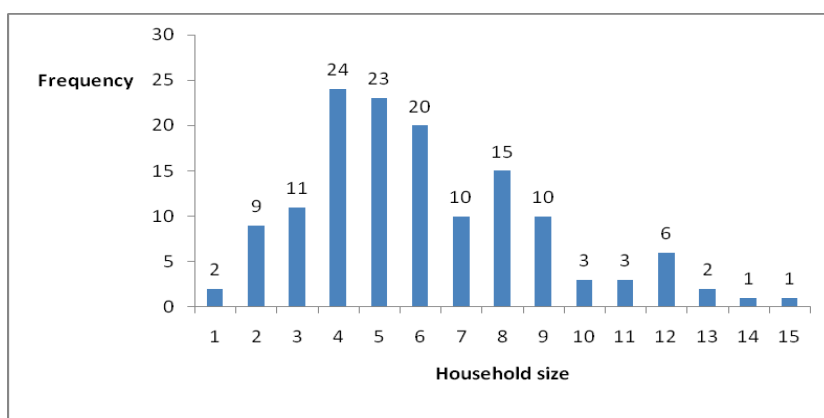
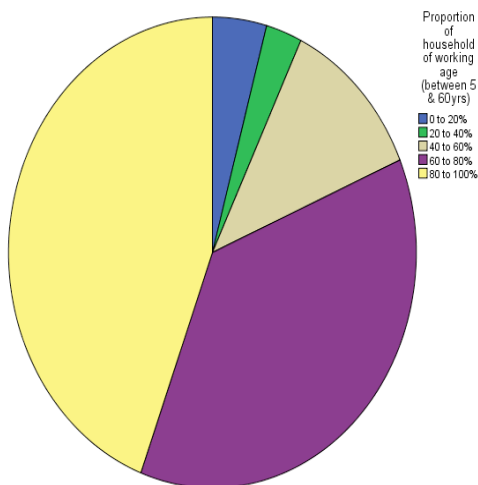


Figure 2.2 shows the proportion of the household of working age (between 5 and 60 years old). A small proportion of households, 7% (the green and blue in Figure 2.2), have relatively few members of working age (40% or less). The vast majority of households (93%) have at least 60% of family members that are of working age.

Figure 2.2 Proportion of the household of working age



2.1 Education levels

The majority (88%) of the interviewed households have a member with at least a primary education, while 12% have no-one with a formal education residing in the household. Few households have a member at a post-secondary education level

Table 2.1 Levels of education

Highest Level of education of any resident household member	Number of households	% of households
No formal education	17	12
Primary	89	64
Secondary	31	22
Post secondary	3	2
Total	140	100

3.0 Sources of livelihood

3.1 On-farm livelihood sources

All households produce and consume crops grown on their farms, and 75% of respondents said they were selling some of the food crops produced (Table 3.1). Sixty-one percent are also producing a cash crop (primarily coffee).

Fruits and vegetables are also important sources of livelihoods in Lushoto, with over two-thirds of households producing these products. Both of these are also important for home consumption as well as income, as 61% of households also sell some fruits and 60% sell vegetables.

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

Product	Percent of households:		
	Producing	Consuming	Selling
Food crops	100	98	75
Cash crops	61	51	56
Fruits	69	66	61
Vegetables	70	63	60
Fodder	45	41	11
Large livestock	43	16	21
Small livestock	84	64	58
Livestock products	78	74	48
Fish	1	1	1
Timber	46	26	21
Fuel wood	58	54	11
Charcoal	1	1	0
Honey	1	1	1
Manure/compost	75	73	8

Livestock production is also important for most households. Most (84%) produce and consume small livestock, and 58% reported selling sheep, goats and/or chickens. Cattle are raised by 43% of surveyed households and sold by 21%.

Related to livestock, fodder is produced by 45% of households and sold by around one-fifth of them, and manure/compost is produced by three-quarters (with few households also selling manure).

Fuelwood (produced by 58% of households) and timber (46%) are also important on-farm livelihood sources, mostly for own-consumption, but some households are also selling these products.

3.2 Off-farm livelihood sources and diversification indices

Off-farm livelihood sources were fairly limited (Table 3.2), with 22% of households producing/harvesting food crops (and 15% selling it) and 8% gathering fruit (and all of those selling some) from places other than their own farms. Very few households reported gathering fuelwood or timber outside of the land they own.

Table 3.2 Off-farm livelihood sources

Product	% of households:	
	Producing/ harvesting	Selling
Food crops	22	15
Fruits	8	8
Fodder	3	0
Timber	6	1
Fuel wood	4	0
Charcoal	0	0
Honey	0	0
Manure	3	0

3.3 Diversification Indices

An agricultural production diversification index was created by adding up the total number of agricultural/livestock products produced on-farm, where 1=1-4 products (low production diversification); 2=5-8 products (intermediate production diversification); and 3=more than 8 products (high production diversification).

On the selling/commercialization side, the total numbers of agricultural/livestock products produced on their own farms, with some of those products also sold, were added up, where: 0=no products sold (no commercialization); 1=1-2 products sold (low commercialization); 2=3-5 products sold (intermediate commercialization); and 3=more than 5 products sold (high commercialization).

The results of these diversification indices for our surveyed households in the Lushoto site are shown in Table 3.3. We found that 16% produced 4 or fewer different types of agricultural products. One-half produced 5 to 8 products. Thirty-four percent of households produced more than 8 products.

On the selling side, 3% of households obtained no income at all from agriculture or livestock. Eighteen percent sold only one or two types of products, and one-half sold 3-5 different products. Almost one-third of households fell into the highly diversified category (selling more than 6 types of agricultural products).

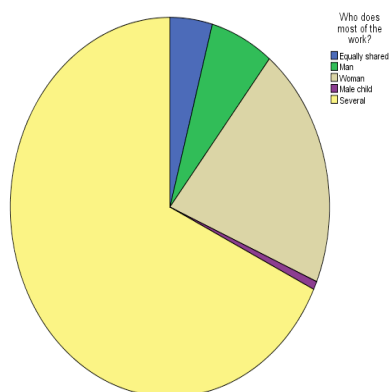
Table 3.3 Diversification Indices

Product Diversification:	% of households
1-4 products(low product diversification	16
5-8 products(intermediate product diversification)	50
9 or more products(high production diversification)	34
Selling/Commercialization Diversification:	
No products sold (no commercialization)	3
1-2 products sold (low commercialization)	18
3-5 products sold (intermediate commercialization)	49
6 or more products sold (high commercialization)	31

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

Respondents were asked who did the majority of the work in order to produce the different agricultural outputs. While an imperfect indicator of detailed labour allocation, nonetheless, it does give an idea of types of agricultural work that are considered women’s versus men’s responsibility. Most households reported that several people within the household shared the workloads for many products (yellow section in Figure 3.1). Women bear the majority of the workload for around 1/3 of total agricultural tasks (brown section in Figure 3.1). Women appear to be particularly involved in food crop production and rearing small livestock, where one-fifth of households reported that women do most of the work. This increased to 27% with respect to tasks relating to production of livestock products (e.g. milk, eggs).

Figure 3.1 Labour responsibilities, all agricultural products, by sex



3.5 Sources of Cash Income

Table 3.4 shows diversity of cash income sources from off-farm activities. Only 14% of households have no other source of off-farm income. Employment on other peoples' farms is a source of income for just over one-half of households. Remittances are also an important source of cash income for one-half of surveyed households. Thirty-four percent are receiving some income from small businesses. Households report not receiving any loans or credit from formal sources such as banks, and 14% are accessing informal credit.

Table 3.4 Sources of cash income

Sources of Cash Income	% of households
Employment on someone else's farm	54
Other off farm employment	6
Business	34
Remittances/gifts	50
Payments for environmental services	2
Payments from government or other projects/programs	1
Loan or credit from a formal institution	2
Informal loan or credit	14
No other source	14

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

4.1 Crop related changes

Almost all households (90%) have been living in this locality for at least 10 years. Of the 124 households that are long-time residents, only 5% reported making no changes to their cropping practices in the last decade. Maize was mentioned by 87% of the households as one of their main crops (i.e. first, second or third in importance in terms of overall livelihoods). Beans were mentioned by 75% of the households as a main crop currently, and tomatoes were the third most widely cited main crop, grown by 27% of households. Potatoes, bananas and cassava are also important crops in Lushoto, mentioned as main crops currently grown by roughly one-quarter of households.

Respondents were also asked about the main crops they produced 10 years ago. These remained the same as 10 years previously - maize (77%), beans (71%) and tomatoes (25%).

Adoption of new crops and/or varieties

When asked about what changes they had made in terms of adoption of new crops or new varieties, 78% of long-time residents said they had introduced three or more new crops and/or varieties, and 10% had introduced no new crops or varieties (Table 4.1).

Table 4.1 Adoption of new crop varieties over the last 10 years

Change in Practice	% of households
No introduction of new crops or varieties	10
Have introduced 1 or 2 new crops and/or varieties	12
Have introduced 3 or more new crops and/or varieties	78

As maize is an important crop for most households, we further examine what kinds of changes were made with respect to maize varieties (Table 4.2). Introduction of higher yielding varieties, pre-treated/improved seeds, shorter-cycle varieties and drought tolerant varieties were most frequently adopted. However, some households at the same time adopted longer-cycle maize varieties. Disease and pest resistant varieties were also introduced.

Table 4.2 Varietal changes made to maize

Type of varietal change - maize	% of cases*
Planting higher yielding variety	67
Planting pre-treated or improved seed	68
Planting shorter cycle variety	53
Planting longer cycle variety	18
Planting drought tolerant variety	30
Planting disease resistant variety	28
Planting pest resistant variety	28

*multiple responses possible

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.

Here, we found that 44% of households had made no water management-related changes over the last 10 years, 36% had made 2 such changes, and 19% had made two or more of these changes.

Soil Management related changes

For the soil management related changes, we explored the following possibilities:

- Stopped burning;
- Introduced crop cover;
- Introduced ridges or bunds;
- Introduced mulching;
- Introduced terraces;
- Introduced stone lines;
- Introduced contour ploughing;
- Introduced rotations;

- Started using or using more mineral/chemical fertiliser;
- Started using manure/compost.

7% of respondents reported making no soil management-related changes in the last 10 years. 12% had made one such change, and 81% said they had made 2 or more.

We examine in further detail the land management-related changes that have been made relating to maize in the Lushoto site (Table 4.3).

Table 4.3 Land management-related changes made to maize

Type of varietal change - maize	% of cases*	Type of varietal change - maize	% of cases*
Expanded area	27	Reduced area	3
Started irrigating or improved irrigation	18	Stopped irrigating	3
Stopped burning	4		
Introduced intercropping	84		
Introduced crop cover	1		
Introduced micro-catchments	26		
Introduced ridges, bunds or stone lines	5		
Introduced mulching	24		
Introduced terraces	22		
Introduced hedges	19		
Introduced contour ploughing	12		
Introduced rotations	14		
Introduced improved drainage	3		
Earlier land preparation	88		
Earlier planting	82	Later planting	7
Started using purchased fertilizers	26	Stopped using fertilizers	0
Started using manure and/or compost	72	Stopped using manure	8
Started using pesticides	5	Integrated pest management	1

*multiple responses possible

Tree/Agroforestry management related changes

The results show that 41% of households made no tree/agroforestry management-related changes in the last decade, and 59% reported having made some kind of changes here. When asked how many trees they had planted on their farms in the last year, 55% of households had planted no trees, 14% had planted less than 10 trees, 23% had planted 11-50 trees, and 9% had planted over 50 trees. Only 22% of households had produced or purchased tree seedlings.

Respondents reported that they grow both indigenous and exotic types of trees. All indigenous trees are endangered and hence protected by district and village by-laws. Farmers can grow them in their fields but when they want to harvest them for either timber or fuel wood they must seek permission from the district authorities. Indigenous trees grown in the study area are Ng'weti (*Rauvolfia caffra*), Mshai (*albizia spp*), Mkuyu (*Ficus nataeleusis*), Mvumo (*Ficus thonningii*), Ng'weng'we (*Dacaena usambarensis*), and Mlombelombe. Respondents reported that they value indigenous trees as they are perceived as good for soil improvement and water availability. "Anywhere you find an indigenous tree growing there is good vegetation underneath and plenty of water," said some older respondents.

Exotic trees are Mkabela (*Grevillea spp*) which is the most popular tree grown, Eucaliptus spp, and Mwati (*Acasia mearnsii*), Mpera (Guava spp), Apple (*Mulrus silvestris*), Matunda damu (Plums), Mfyoksi Peach (*Prunus Persia*), and Avocado (*Persea amaericana*). Trees are normally grown around the homesteads. Grevillea is intercropped with other crops such as maize, coffee and beans. Woodlots are not a common practice but wherever they occur, they are mainly planted with *Acacia mearnsii* and occasionally *Eucalyptus*.

Reasons for Crop-related changes

Households who made crop-related changes did so for various reasons (Table 4.4). One or combinations of factors/reasons typically triggered the changes.

Table 4.4 Reasons for crop-related changes

Reasons	Responses		Percent of Cases
	N	Percent	
Markets	126	20	93
Climate	120	19	89
Land	114	18	84
Labor	95	15	70
Pests/diseases	108	17	80
Projects	84	13	62

Markets. As can be seen in Table 4.4, market forces were a key reason behind many of the changes made. These included better yield, price and/or more opportunities to sell as major factors influencing them to make the changes.

Land. Land-related reasons were also key drivers of change. In 89% of cases, land-related reasons, including shortage of farm land or loss in productivity were reasons given for making changes.

Pests and diseases. Pest and disease problems were also drivers of change in many cases (80%).

Projects. Project or program-related drivers of change were also mentioned by many households (62%).

Climate. Eighty-nine percent of respondents made changes due to climate-related reasons. When these were examined in more detail (Table 4.5), we see both perceptions that overall rainfall is now lower (77%), and higher (39%). More erratic rainfall was given as a reason in 75% of cases. More frequent droughts are also a frequently cited factor behind changes in practices. Some felt that the rains were starting later (65%), while 77% thought the opposite, i.e. the rains were now starting earlier than they used to.

Table 4.5 Weather/Climate-related reasons for changes in cropping practices

Weather/Climate related Reason	% of cases*
More erratic rainfall	75
Less overall rainfall	88
More overall rainfall	39
More frequent droughts	71
Later start of rains	65
Earlier start of rains	77

*multiple responses possible

4.2 Livestock-related changes

The majority of respondents (84%) keep small animals (sheep, goats, chickens or other poultry, and/or pigs), whereas only 43% of them keep large livestock (mainly cattle, but some buffalo for traction). Only seven households had no livestock at all.

Livestock in the surveyed area and in neighbouring villages is largely kept under a zero-grazing system, associated with tethering around the homestead during the day. Feeding resources are mainly local and cultivated fodder, banana leaves and pseudo stems, and crop residues. A few farmers who have interacted with development partners, such as researchers and NGOs use fodder trees.

When asked what their main animals kept now are (in terms of overall importance to their livelihoods), chickens, dairy cows and goats were most frequently cited. This has not changed significantly from 10 years ago (Table 4.6).

Table 4.6 Three most important animals in terms of livelihoods now and 10 years ago

10 years ago		Now	
Animal	% of cases	Animal	% of cases
Chickens	87	Chickens	82
Dairy cows	62	Dairy cows	56
Goats	40	Goats	39

Households have been adopting new animal types or breeds – 41% said they had introduced 1 or 2 new animal types and/or breeds, and 19% said they had introduced 3 or more. Forty percent of households had made no changes in breeds or animal types raised over the last decade.

There have also been changes made in livestock management practices (Table not shown). Thirty percent of households had started producing chickens over the last 10 years, and another 22% had increased the numbers of chickens kept (table not shown). Over the same period, 11% reduced their chicken numbers and 7% of households stopped producing chickens altogether. Only 6% had introduced new chicken breeds.

For dairy, the most frequent change cited was the introduction of cut and carry, by almost all dairy producers, while 2/3 of them had introduced new breeds, and half had introduced stall keeping. Sixty households reported introducing fodder crops, and 22 had improved their pastures. But only one-fifth of dairy producers are now storing fodder.

Reasons for livestock management-related changes

The reasons given for making livestock management changes are shown in Table 4.7. Pests and diseases were one driving force behind the changes made. Market-related reasons, described as having more productive animals, getting better prices, and having new opportunities to sell, were also important. Projects were behind one-fifth of the responses as to why these changes were made. Climate-related changes were not important drivers of change with respect to livestock practices.

Table 4.7 Reasons for changing livestock practices, by category

Reason for changing livestock practices, related to:	% of responses
Markets	29
Weather/climate	11
Labor	8
Pests/diseases	31
Projects	20

4.3 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)

As can be seen in Table 4.8, 82% of households made over 11 different kinds of changes to their agricultural practices in the last 10 years and 16% made between 2 and 10 changes. Two households had made virtually no changes over the last decade.

Table 4.8 Adaptability/Innovation index

Number of changes made in farming practices in last 10 years:	% of households
Zero or One (low)	2
2-10 changes (intermediate)	16
11 or more changes (high)	82

4.5 Mitigation Indices

Several climate mitigation-related behavioral 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 have started using fertilizer or manure on at least one crop.

Input intensification. There are 7 'changes in agricultural practices/behavior 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 4.9 shows the results for the mitigation-related indices for the surveyed households in the Lushoto site.

Three-quarters of households reported having made some changes in terms of agroforestry practices (e.g. planting trees on their farms). The vast majority are taking actions to improve their soil fertility. Most (90%) also encouragingly reported seeing some productivity increases over the last decade. In terms of the degree of intensification (i.e. higher input use), almost half reported a low level and half have been intensifying their production systems at higher levels of input use.

Table 4.9 Mitigation-related indices

Index	% of households	
	None	Some
Tree management	23	77
Soil amendments	6	94
Productivity increase	10	90
Input intensification	1	Low-43 High-55

5.0 Food Security

The monthly source of food for the family was queried, i.e. whether it came mainly from their own farm or elsewhere, for each month (in an average and not extreme rainfall year). Households were also asked during which months of the year they struggled to have enough food to feed their family, from any source.

The survey shows that food deficits are high from January to June, May being the highest, when 81% of households report that food comes mainly from off-farm sources (Figure 5.1). The food deficit months are those before harvesting (Figure 5.2). Respondents reported that these are the months where cash is especially needed to buy foodstuffs from shops and markets; hence the reasons why quick cash-earning crops such as tomatoes are currently surpassing traditional cash-generating crops like coffee. Harvesting starts in May with early maturing crops like beans and vegetables, and peaks in August-September when most of the households have just enough food.

Figure 5.1 Main source of food for the household

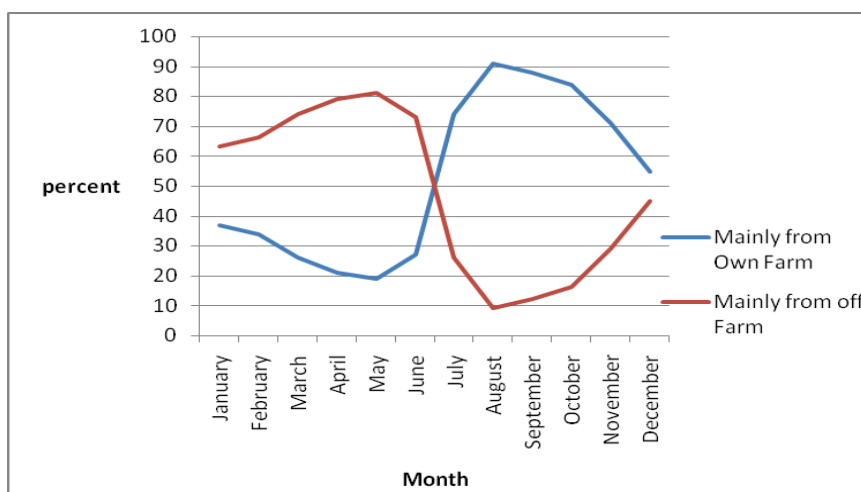
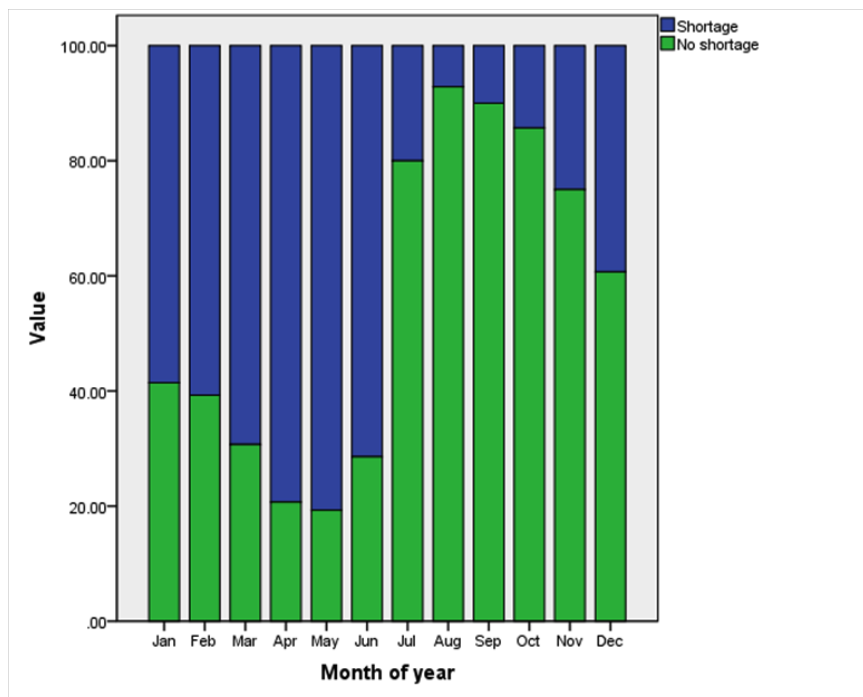


Figure 5.2 shows the percentage of households reporting that they have difficulty in finding sufficient food, from any source, by month. It shows that over one-half of households are dealing with food deficits for 6 months of the year.

Figure 5.2 Food deficit/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 stores, gifts, purchases or transfers).

For our surveyed households in Lushoto, only 4% are ‘food secure’ all year long (Table 5.1). 7% access enough food for their families for at least 10-11 months of the year. 26% of these households struggle to get enough food to feed their family for 3-4 months/year, 27% face 5-6 food deficit months, and over one-third deal with more than 6 food deficit months per year.

Table 5.1 Food Security Index

Percent of surveyed households reporting:				
More than 6 food deficit months/year	5-6 food deficit months/year	3-4 food deficit months/year	1-2 food deficit months/year	Food all year round/No food deficit period
35	27	26	7	4

6.0 Land and water

6.1 Water for Agriculture

Households' access to different types of on-farm water for agriculture is shown in Table 6.1. It shows that 42% of households have sources of water for irrigation on their own farms. The area surveyed, like the most of Lushoto, has V-shaped valleys with narrow flat bottoms with rivers and streams. These valleys are mostly used as a source of water and to produce vegetables, off-season maize, Irish potatoes and sugarcane.

Table 6.1 Water sources for agriculture on-farm

On-farm agricultural water source	% of households
Irrigation	42
Dams or water ponds	4
Boreholes	0
Tanks /water harvesting	0
None of the above	54

6.2 Land Use

The land available for each household includes both land that is owned by the household and land that is rented. As seen in Table 6.2, two-thirds of households have access to less than one hectare of land and one-third have between 1 and 5 hectares. None of the surveyed households own more than 5 hectares.

Table 6.2 Total land size accessed by households

Number of hectares of land owned and rented in	% of households
Less than one hectare	66
1-5 hectares	34
Over 5 hectares	0

7.0 Inputs and Credit

When asked about input use on their farms, 70%, 81% and 66% of respondents said they had used purchased seeds, fertilizer and pesticides, respectively, in the last 12 months (Table 7.1). Fifty-nine percent had used veterinary drugs. Only 9% of households had received any credit for agricultural activities during the previous year.

Table 7.1 Purchased input use

In the last year, did you use:	% of households
Purchased seeds	70
Purchased Fertilizers	81
Purchased Pesticides	66
Veterinary medicine	59
Received credit for agricultural activities	9

The most commonly used fertilizer is urea (used by 69% of those that applied fertilizer, followed by DAP at 29% and a local mixture by 26% of these fertilizer-using households). Other fertilizers used by very few households are NPK and CAN (Table 7.2). Fertilizers were most frequently applied to maize, followed by tomatoes, cabbage and potatoes.

Table 7.2 Type of Fertilizers used

Fertilizer type	% of fertilizer-using households
Urea	69
DAP	29
CAN	1
NPK	8
Local mixture	26

Credit and loans

Credit and insurance facilities are few in Lushoto, and available only in towns - probably the reason why only 9% of respondents reported that they have received credit for their agricultural activities (see Table 7.1). No respondents had taken out any crop or livestock insurance.

Hiring of labour and farm machinery

All respondents reported that they do not use tractors, and only one rented an animal drawn plough. Tractors are not used mainly due to the steep and narrow terrain, and animal drawn ploughs have traditionally not been used in this area for various reasons. Only 14% of household reported hiring any farm labour. This is consistent with Lyamchai *et al* (1998) who reported that 90% of the labour supply for farm activities in Kwalei catchment in Lushoto, which is neighbouring the surveyed area, comes from the family.

8.0 Climate and weather information

Most households (78%) reported having received some kind of weather or climate-related information during the last year. The types, sources, recipients and use of this information are described below.

8.1 Types of weather-related information

We see in Table 8.1 that forecasts on the start of the rains is the type of information received most frequently, by 71% of households. Forecasts of extreme events are heard by 63% of households, and pest or disease outbreak predictions by just over one-half of households. Only 28% and 27% of the respondents said they had heard a longer-run (2-3 month) weather forecast, or a short-term (i.e. daily) forecast of the weather for the next 1-3 days.

Table 8.1 Type of weather-related information received and used

Type of information	Proportion of Farmers Receiving and Using Weather-related Information to Change Practices		
	% of households receiving information	% of those households also receiving advice with information	% of households receiving advice that were able to use it
Forecast of extreme event	63	99	95
Forecast of pest or disease outbreak	54	96	100
Forecast of the start of the rains	71	95	99
Forecast of the weather for 2-3 months	28	100	100
Forecast of the weather 1-3 days	27	68	85

For those that are receiving weather-related information, virtually all are also receiving some kind of advice with it that they are able to make use of, except in the case of short-term weather forecasts, where around one-third of households are receiving no other agricultural-related advice alongside that information.

8.2 Who is receiving weather-related information

The results suggest women are not quite as well informed regarding weather predictions as are the men (Table 8.2). In one-half of surveyed households, only the males are hearing weather forecasts. Women are receiving predictions as to the timing of the start of the rains, pest and disease outbreaks, and extreme events in 60% or more of households.

Table 8.2 Gender breakdown of different kinds of weather-related information

Type of weather-related information	Of those households accessing this type of information		
	% of households reporting women receiving this information	% of households reporting both women and men receive this information	% of households reporting only men receive this information
Extreme events	17	40	43
Pest or disease outbreak	15	37	48
Start of the rains	14	36	49
Weather for the next 2-3 months	13	51	36
Weather for the next 2-3 days	11	53	32

8.3 Sources of weather-related information

Regarding sources of weather-related information, Table 8.3 shows the most common sources of different types of information for those households that are receiving it. It suggests that the radio is the most common source of all types of information. These households are also relying heavily on friends and relatives, as well as their own observations, particularly when it comes to forecasting the weather, both in the short and longer run. The government is a key source of information regarding pest and disease outbreak projections, and traditional sources/indigenous knowledge are still relied

upon by some, particularly with respect to forecasts of extreme events and the timing of the start of the rains. Newspapers, local groups and NGO's/projects are not common sources of weather-related information in this area.

Table 8.3 Type and Sources of Climate and Weather Information

Type of information	Percentage of those households that have received information by source								
	Radio	TV	Govt	NGO	Trad'l	Friend	News- paper	Own Obs	Local group
Forecast of extreme event	92	18	23	0	21	55	1	30	0
Forecast of pest or disease outbreak	89	17	63	1	9	49	0	11	0
Forecast of the start of the rains	90	14	17	0	24	53	3	32	1
Forecast of the weather for 2-3 months	90	8	8	0	6	59	0	74	0
Forecast of the weather for 1-3 days	89	24	11	0	5	14	3	60	0

8.4 Use of weather-related information

In terms of making changes to their agricultural practices upon receiving weather-related information, Table 8.4 suggests that all types of weather-related information is being used to make changes to how their farmland is managed, and adjustments to the timing of their activities. The type of crop planted changes in response to news on extreme events, predicted start of the rains, and long run weather forecasts, as does change to the particular variety planted. Adjustments in input use are much more influenced by predicted pest and disease outbreaks than other types of weather information. The only use of daily weather forecasts is reported to be changes in land and/or feed management practices.

Table 8.4 How Weather Information was used

Practices changed	Percent of households receiving information regarding:				
	extreme event info	start of the rains prediction	pest & disease outbreak prediction	2-3 month weather forecast	2-3 day weather forecast
Timing of farming activities	48	15	1	8	5
Crop type	81	38	0	51	0
Crop variety	54	20	3	13	5
Input use (seed, fertiliser, pesticides)	10	0	19	0	0
Manure/compost/mulch use	0	29	1	62	0
Field location	2	0	0	0	0
Planted trees	1	2	0	0	0
Land management practices	43	75	44	85	57
Soil and water conservation practices	1	1	1	0	5
Irrigation practices	4	3	3	0	0
Feed management	2	20	46	18	24

Note: the percentages above are with respect to households receiving information with advice that they were able to use.

9.0 Community groups

When asked whether they belong to any group related to agricultural or natural resource management-related activities, 87% of respondents reported that they belong to no such group (Table 9.1).

Six households have a member that belongs to a tree nursery group. Having members belonging to groups related to vegetable production, soil, land or water management activities, savings and credit, and soil improvement activities were reported by 2 households each.

Table 9.1 Group membership

Does someone in your household belong to the following type of groups?	Number of households
Tree nursery/tree planting	6
Water catchment/management	1
Soil improvement related	2
Crop improvement related	1
Irrigation	1
Savings/credit related	2
Agricultural productivity enhancement related	1
Seed production	1
Vegetable production	2
Other group not mentioned above	2
No member of such ag/NRM groups	123

10.0 Assets

10.1 Asset Indicator

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

Energy: Solar panel, Generator (electric or diesel), Battery (large, e.g. car battery for power), Biogas digester;

Information: Radio, Television, Cell phone, Computer, Internet access;

Production means: Tractor, Mechanical plough, Mill, Thresher;

Transport: Bicycle, Motorcycle, Car or truck;

Luxury items: Fridge, Air conditioning, Electric 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)

It is important to note that this indicator is not intended to include every possible type of asset, and that the checklist includes some indicators that we expect to see becoming more important in the future than they may be at present. It also does not include a critical asset for resource-poor households, livestock assets.

The results of the analysis for the respondents show that 16% have none of the household assets we inquired about, 79% of the surveyed households have between 1 and 3 of these assets, and 5% own 4 or more of these assets (Table 10.1).

Table 10.1 Asset Indicator

Number of queried assets	% of households
None (basic level)	16
1-3 (intermediate level)	79
4 or more	5

Table 10.2 shows the percentage of households with various assets and access to utilities. 75% of households own a radio and 60% have a cellphone. Nine percent own a bicycle, 2% have a motorcycle, and 2% own a car or truck. Next to none have electricity or running water in their homes. Only 4% of these households have a bank account. Improved stoves have been adopted by only 4% of households, and one household has a solar panel. None has a computer.

Table 10.2 Asset Ownership

Type of Asset	% of hhs	Type of Asset	% of hhs
Radio	75	Electric fan	0
Television	4	Thresher	0
Cell phone	60	Liquid pressurised gas	0
Bicycle	9	Internet access	0
Motorcycle	2	Boat	0
Car or truck	2	Fishing nets	0
Computer	0	Bank account	4
Solar panel	1		
Tractor	0		
Mechanical plough	0	Improved food/feed storage facility	6
Mill	2	Water storage tank (>500litres)	1
Improved stove	4	Well/borehole (for household water)	5
Generator (electric or diesel)	2	Running water in dwelling	2
Battery (large, e.g. car battery)	0	Electricity from a grid	1
Water pump/treadle pump	0	Improved housing (brick, concrete)	21
Biogas digester	0	Improved roofing (tin, tiles)	55
Refrigerator	0	Separate livestock housing	53
Air conditioning	0		

With respect to food security-related assets, only 6% of households have some type of improved grain/food storage facility, although around one-half of them have separate housing facilities for their livestock, suggesting how important those are to these families' wellbeing. Only a few households have a mill for grinding their grain, and none has a mechanical plough or a tractor.

We see evidence of improved roofing by over one-half of households (55%), which is typically one of the first investments rural households make when they have met their food and other basic needs. Fewer have been able to make improvements to their houses in terms of bricks or concrete, though (21%).

While these are imperfect indicators of household well-being, they will be monitored over time and hopefully we will see more investments of these sorts as households continue to cope with their changing environment (social, economic and physical).

ANNEX 1. Tanzania CCAFS team members

Prof. Pius Yanda Coordinator

Mr. Charles Lyamchai Team leader

Mr. George Sayula Supervisor

Ms Fatuma Chelangwa Enumerator

Ms Elizabeth Msoka Enumerator

Mr Herman Basis Enumerator

Mr Erick Osmond Enumerator

ANNEX 2. Village selection and data collection process

The 10 km x 10 km block was chosen by the CCAFS team according to the established criteria. Within this block, all the villages were listed, and seven were chosen randomly. The topography of all the seven selected villages is composed of undulating relief with steep slopes of 10° - 15° but slopes of 25° - 30° are frequent. Valleys are V-shaped with narrow flat bottoms of alluvial and colluvial origin (Pfeifer 1990). In all villages the valleys are used for vegetable production – mainly cabbage, tomato, carrot, sweet pepper and potato – and there are relatively large open fields where maize and beans are cultivated during the long rainy season of March to July. Within the seven villages, a list of all households was generated with the help of village authorities, and a total of 20 households were then randomly selected for each of them (140 households in all), and visited.

Features of the selected block are shown in Table A1. The villages covered in the survey are highlighted in bold in Table A2.

Table A1. Features of the selected block

Agro – ecological zone	Altitude (m) above sea level)	Rainfall (mm)	Average air temperature (°C)	Soil type	Crop types
Humid warm	800 -1500	800 -1700	22	Chromic Luvisol Rhodic ferrasol	Tea, coffee, vegetables, sugar cane, maize, beans, sunflower paprika, Vanilla
Humid cold	900 - 1700	600 -1200	18	Luvic phaezem Chromic Luvisol	Coffee, vegetables, banana, irish potato, temperate fruits, beans, maize, paprika, vanilla

Table A2: Block Villages, those randomly selected in bold, by agroecological zone

Humid warm zone	Humid cold zone
Boheloi	Gare
Lwandai	Yamba
Mshizii	Magamba
Nyasa	Migambo
Mbuzii	Kwefingo
Kwang'wenda	Milungui
	Masange
	Kwemashai

Table A3: Number of Households/Surveyed Village and previous/ongoing agricultural programs

Village	Verified number of households	Previous/Ongoing Agricultural Programmes within Village
Masange	735	SECAP, District Council,
Kwang'wenda	408	SECAP, District Council,
Mbuzii	481	SECAP, District Council, AHI, SARI, TIP, FARM-Africa,
Boheloi	882	SECAP, District Council, AHI, SARI
Gare	538	SECAP, District Council,
Yamba	657	SECAP, District Council,
Milungui	-	SECAP, District Council,