

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

**Village Baseline Study:
Site Analysis Report for Makueni – Wote,
Kenya (KE0202)**

July 2013

**L. Onyango, J. Mango, L. Loo, H. Odiwuor, M. Mwangangi, E. Mutua,
T. Mutuo**

Edited by: C. Perez, W. Förch, L. Cramer



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CCAFS Coordinating Unit - Department of Agriculture and Ecology, Faculty of Life Sciences, University of Copenhagen, Rolighedsvej 21, DK-1958 Frederiksberg C, Denmark. Tel: +45 35331046; Email: ccaafs@cgiar.org

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The tools and guidelines used for implementation of the village baseline study across all CCAFS sites, as well as the mapping outputs at a higher resolution can be accessed on our website (<http://ccaafs.cgiar.org/resources/baseline-surveys>).

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Abstract

The village baseline study of Kithoni village in the CCAFS benchmark site of Makueni, Kenya took place from June 11th – 14th, 2012. Focus group discussions were conducted separately for men and women. The village is in a marginal landscape and is food insecure. Frequent droughts and crop failures plague the area. The biggest constraint to agricultural production is the shortage of water. Land holdings have become increasingly smaller due to the increase in human population. The government has to frequently provide relief food during times of crisis.

There are many organisations operating in the village, but there is a lack of concerted efforts between them, particularly those working in food security and natural resource management. Very few organisations are working on the food crisis situation in the area, although this is a frequently recurring issue.

Networks of information for agricultural advice are based mainly on the radio and friends/neighbours. All the organisations mentioned as providing information are those that operate beyond the locality. There is potential to link these organisations with community groups and individuals especially to develop a feedback mechanism so that the flow of information is two-way. The FM stations can also be supplied with a wider range of information to disseminate. However, this must be in line with the community needs which should be established beforehand.

Keywords

Baseline; Kenya; village study; participatory mapping; organisations; access to information

About the Authors

Onyango, Leah – Lecturer-Chairman, Department of Urban and Regional Planning, Maseno University, Private Bag, Maseno, Kenya

Mango, Joash – Senior Technician, ICRAF GRP 5 and East Africa region; World Agroforestry Centre, P.O. Box 2389, Kisumu, Kenya

Loo, Loice – Masters Student, Maseno University, P.O. Box 30119-00100, Nairobi, Kenya

Odiwour, Holiance – Freelance GIS Practitioner/Consultant. P.O. Box 3613-40100, Kisumu, Kenya

Mwangangi, Muoti – Deputy District Agricultural Officer, Ministry of Agriculture-Makueni, P.O. Box 2562-90100, Machakos

Perez, Carlos – Independent Consultant, 28 Wheeler Pl., West Nyack, NY 10994, USA

Förch, Wiebke – CCAFS science officer, Theme 4 (Integration for decision making); International Livestock Research Institute (ILRI), P.O. Box 30709, Nairobi, Kenya

Cramer, Laura – CCAFS consultant, Theme 4 (Integration for decision making); International Livestock Research Institute (ILRI), P.O. Box 30709, Nairobi, Kenya

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Introduction

The CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) is a strategic ten-year partnership between the Consultative Group on International Agricultural Research (CGIAR) and the Earth System Science Partnership (ESSP) to help the developing world overcome the threats posed by a changing climate, to achieving food security, enhancing livelihoods and improving environmental management. In 2010, CCAFS embarked on a major baseline effort at household, village and organisation levels across its three target regions, namely East Africa, West Africa and South Asia (more information about CCAFS sites is available on our website <http://ccafs.cgiar.org/where-we-work>). CCAFS trained survey teams from partner organisations in the three regions to conduct the baseline.

The baseline effort consists of three components – a household survey, village study and organisational survey. The household baseline survey, a quantitative questionnaire on 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, was implemented by CCAFS partners in 15 sites (105 villages) with nearly 2,100 households in 12 countries to date. CCAFS partners are implementing village baseline studies (VBS) and organisational surveys in one out of the seven villages within each CCAFS site where the household survey was implemented. The plan is to revisit these villages in roughly 5 years, and again in 10 years, to monitor what changes have occurred since the baseline was carried out. The goal is not to attribute these changes to the program, but to be able to assess what kinds of changes have occurred and whether these changes are helping villages adapt to, and mitigate, climate change.

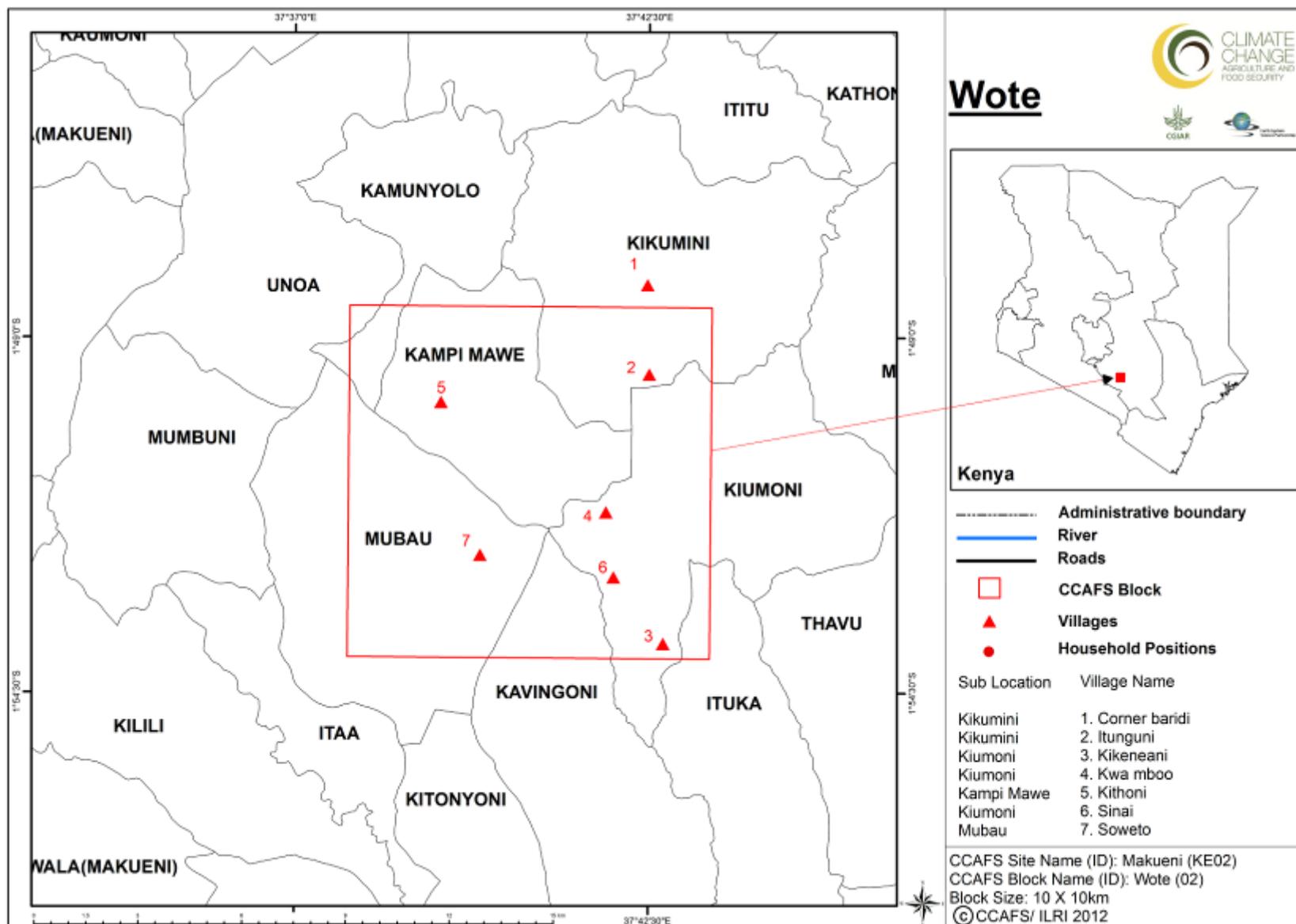
The focus of this site analysis report is the village baseline study (VBS). To date, fifteen VBS were conducted in the three CCAFS regions. The VBS aims to provide baseline information at the village level about some basic indicators of natural resource utilisation, organisational landscapes, information networks for weather and agricultural information, as well as mitigation baseline information, which can be compared across sites and monitored over time.

The objectives of the village baseline study are to:

- Provide indicators to allow us to monitor changes in these villages over time. In particular, changes that allow people to
 - Manage current climate risks,
 - Adapt to long-run climate change, and
 - Reduce/mitigate greenhouse gas emissions
- Understand the enabling environment that mediates certain practices and behaviours and creates constraints and opportunities (policies, institutions, infrastructure, information and services) for communities to respond to change
- Explore social differentiation:
 - Perceptions of women and men will be gathered separately to be able to present different gender perspectives.
 - Focus group participants will be selected to present perceptions of groups differentiated by age.

The detailed tools and guidelines used for the implementation of the village baseline study across all CCAFS sites, as well as the manuals, data and analysis reports can be accessed on our website (<http://ccafs.cgiar.org/resources/baseline-surveys>).

Map 1. Location of Kithoni village in the CCAFS benchmark Wote site, Kenya



This report presents the results of the Village Baseline Study (VBS) conducted on June 11th -14th, 2012 in the village of Kithoni, Kenya (Map 1). The village's geocoordinates are -1.836; 37.671. Kithoni was chosen for the baseline survey because of its relative central location in the block, among other criteria. There is reasonable accessibility to the village although the roads can be difficult to navigate in the event of heavy rain. The survey team arranged a visit to the village to prepare for the fieldwork. The team was composed of two facilitators, two note takers, two translators and one site coordinator. Each pair was male and female. The team consulted with the village authorities concerning the time and place of meeting. It selected the Mulaani shopping centre for both meetings.

The site coordinator sent out invitations to sets of participants who were chosen using random sampling. Each group was composed of 15 participants, men and women respectively. Three consecutive days were selected for the survey and on each day only one set of participants were expected to participate in the survey. On the first day of the survey the whole community was invited to participate in an introductory session where the team explained the survey to them and shared with them the results of an earlier household survey. After the introductory session the rest of the community was set free and only the invited group of 15 men and 15 women remained to carry on with the survey. The whole community was again invited at the end of the third day to attend a debriefing session where a summary of the findings was shared.

The survey used participatory methods of data collection. Throughout the data collection process groups of male and female members of the community worked separately. The team used a satellite image of the block and worked with each group to identify and map/sketch resources that are important to the community, their current state, past state and what caused the changes. The outputs were maps and sketches. The process of working with the community to identify the resources that are important to them depended entirely on how well they are able to understand and interpret the image.

The task on day 2 was to work with each group to understand the organisational landscape and the links that exist in relation to food security in a normal year, in a year of crisis, and in relation to natural resource management. The outputs were diagrams showing the organisational landscape. Information on each organisation was also captured in cards.

There were two main tasks on day 3. The first task was to work with each group to understand information networks in relation to weather issues and farming activities. The outputs were diagrams. The second task was to bring the male and female groups together and generate a vision of what the community would like their village to be in the future. The output was a map/sketch showing "the vision of the community."

Information generated from the survey was captured on sketches, maps, flip charts, information cards and notes. All these needed to be brought together in one debriefing report from which this final report is written. The debriefing report was prepared in the field so that it could benefit from the presence of the site team. The photographed sketches and maps were inserted in the debriefing report. In this site analysis report proper maps and diagrams derived from the field outputs replaced them.

Data analysis

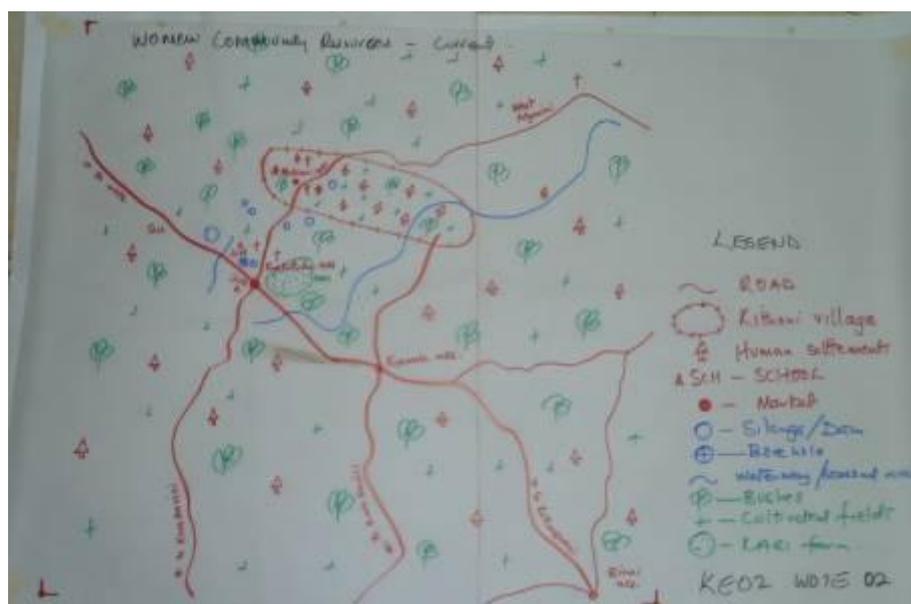
Topic 1: Community resources - participatory satellite imagery interpretation and visioning

Community infrastructure and resources and gender-differentiated access and utilisation of those resources have been analysed, based on a process of participatory visual interpretation of high resolution satellite imagery (RapidEye). The aim was to create a basic understanding of existing community resources, as well as of community dynamics in relation to its environment. The participants discussed the current state of those resources, in terms of quality, access, management, history and potential drivers of change. Later on, a mixed group developed a vision of village resources and human well-being into 2030 to understand opportunities, constraints and aspirations for the future. The detailed approach to this exercise is outlined in the CCAFS Village Baseline Study Implementation Manual (follow the link to the baseline study from our website <http://ccafs.cgiar.org/resources/baseline-surveys>).

A. Current resources

Men's and women's groups met separately to discuss the current resources in the community. The groups were provided with a satellite image of the area and asked to locate the various resources and identify the current land uses. An example of the current resources as traced onto the satellite image can be seen in Photo 1.

Photo 1. Current conditions mentioned by women regarding natural resources and infrastructure



Land resources

Farmland: All households own a piece of land which is cultivated. The average family size is 6 and the average land holding is 3–4 acres. Part of the land is cultivated and part used for pasture. Crops cultivated include maize, cow peas, pigeon peas, green grams, mangoes, citrus and pawpaw (papaya). Crop residue is used as fodder for livestock. The incidence of crop failure is very high in relation to maize production. In every 10 years, the crops fail 8 times due to inadequate rainfall. The community indicated that their farm produce can only feed them for 2 months in a year. The rest of the year the community depends on relief food which comes after 4 months. In between, the community has to purchase food. They get money for purchasing food from selling ropes, eggs and hens. They also get money from remittances. Inadequate rainfall was identified by both men's and women's groups as the main challenge to agriculture and not soil fertility.

The choice of crops is changing. The community has stopped growing some crops because of less land, less labour and less rainfall. The preferred crop is maize but it performs poorly. There is also a move to cultivate horticultural crops, as promoted by the Machakos Integrated Development Programme (MIDP) that started 20 years ago and established cooperatives such as the Makueni Farmers Cooperative Society, which is still operational. Horticulture was also promoted by the Makueni Agricultural Programme (MAP), a 10 year program by the government of Kenya and the Danish foreign development agency, DANIDA. In terms of marketing, there are cartels within the market that hinder sales. The cooperative is not operating efficiently, and farmers do not have confidence in cooperatives. There is a marketing cooperative in Makueni for the sale of mangoes but the middlemen/brokers are the main beneficiaries. Farmers breach contracts with the cooperatives when the middlemen offer a better deal. Marketing groups are structures that are in closer contact with the farmer. They meet only when they need to market and all farmers are free to register with them. Livestock keeping is becoming less prominent due to inadequate water and pasture. Family labour is reduced because most children go to school. Most of the men have gone to the cities to look for work since the households cannot subsist from the food they produce on the farm and need additional income.

Bush lands: There are no forests in Kithoni village; however there are scattered bushes from which the women obtain fuel wood. The bushes are punctuated by occasional trees which are not very large. The bush areas are not expansive and are in between cultivated fields. There is very little evidence of tree planting. The women report that they rarely cut down the whole tree but obtain fuel wood from trimming the branches of the trees.

Pasture: The community keeps goats and cattle which graze in the open. The pasture is limited and is improved through bush clearing. There is no communal pasture. Every household provides pasture for its livestock on the family land holding. Crop residue is also used as animal feed. There have been efforts to train the community on improving pasture, hay making and pasture establishment through the Ministry of Livestock and its programmes but very few households have invested in improving pasture. Dairy farming was introduced in the area and is being practiced by a few farmers. The region is able to meet its needs for dairy products during the rainy season. The community has access to improved livestock breeds such as the zebu and white goats. Chicken keeping is on the increase while other forms of livestock keeping are on the decrease. Sorghum is planted for chicken. Most people do not like keeping sheep and pigs however. They say this is because sheep and pigs eat a great deal and interfere with the practice of witchcraft. Their market is also poor since many people do not eat mutton or pork. Livestock keeping is constrained by the inadequate supply of water. Farmers are discouraged because they lose large numbers of livestock during dry spells, which are very common.

Water resources

Rivers: There are no permanent rivers in the site; however there are a few seasonal streams which only exist immediately after the rains. The women identified two rivers located outside the site: River Kwa Vita and River Thwake. River Kwa Vita is a seasonal river and water from this source is mainly used for domestic purposes. The river valley supports more vegetation than the rest of the landscape. River Kwa Vita is seasonal because it gets very limited recharge from rainfall. River Thwake is a permanent river but it is far from the village and takes 4 hours walking to walk there. It was a source of water for the community when they first settled the area in the 1950s.

Dams (water ponds): Dams identified by men include the following: Kambi dam which is one hour away from the village; Kwa Muindi which is 10 minutes away from the village; Kwa Mbatha dam which is 45 minutes from the village; Kwa Musunga which is 45 minutes from the village; Kithooni dam which is 1 hour away from the village; Ikavi dam which is one hour from the village; and Muani dam which is two hours from the village. The water in these dams is of poor quality and is brown in colour. The dams are not enclosed and animals drink from them directly. They are managed and owned by the communities.

Dams identified by the women's discussion group include the following: Kiumoni dam, Kivani dam, Kwekaa dam, and Kithooni dam which are seasonal and have poor quality water. They indicated that the dams provide water for domestic use and for watering livestock and that they are all managed by

the community. The dams store rainwater but are affected by high levels of siltation and seasonality. The maintenance of dams involves occasional de-silting by voluntary members of the community. There are dams dug by community members. Dams are the most common source of water in Kithoni village. Most are communal but there are a few private ones. The dams can collect and retain water for up to 5 months in a year. Only one dam, Kambi ya Mawe dam, is permanent and has plenty of water.

Boreholes: The men did not identify any boreholes. The women identified one borehole at Kambi ya Mawe. It provides water throughout the year. It serves four sub-locations (Kyemole, Mwambami, Mulaani and Neema). It is an hour's walk away from Kithoni village and is managed by the community. They also identified Chamusoyi borehole which is 4 hours away from Kithoni. Water from the borehole is pumped to supply other areas far away from the source. It is safe and protected from contamination. Kambi ya Mawe borehole was constructed in 2008 by the Red Cross. It is managed by a committee. The members of the community group that manage the borehole pay less for the water. Members buy a 20 litres can at 3 Kenyan shillings while non members pay 5 shillings for the same amount. The borehole has water kiosks in the 4 sub-locations that it serves. These water kiosks are managed by community members employed by the management committee.

Roads

Kithoni is connected with its hinterlands by an elaborate network of roads. Not all the roads, however, are in good condition. Road transport is the main mode of transport in the area. The road to Makindu (nearest large town) is tarmacked and is in good condition. There are smaller roads which are not in very good condition, for example the roads to Kikumini, Kwa Kavisi, Kasambani and Musini. The roads provide employment through Kazi kwa Vijana (Work for Youth programme), and they also ease the transportation of goods and services. However there are some roads that are impassable during the rainy season and cause breakdowns of vehicles, bicycles and motorcycles.

Infrastructure

Schools: There are several schools in the area which the children from the village attend. Kambi Mawe Secondary has adequate classrooms and enough staff and is 1 hour away from the village. Kambi Mawe primary has adequate classrooms, a good playground, and is 1 hour away. Kingutheni Primary has poor infrastructure and has old buildings with classrooms that lack doors and window shutters. It is 30 minutes away from the village. This set of schools is managed by the community and owned by government. St. Emanuel Academy is a boarding school. It has enough facilities and teachers and is 1 hour away from Kithoni. It is owned and managed privately.

The women identified additional schools such as Chamusoyi Primary, West Ngosini, Makueni Boys, and Makueni Youth Polytechnic, many of which were farther away. Women in the community visit children in school more often than the men.

The schools provide easier access to education due to their close proximity to the community. They also create local employment and a market for goods and services.

However many of them have only basic infrastructure and too many students. This leads to congestion of facilities. Most of the schools do not have enough teaching staff, and this compromises the quality of service delivery. The private schools have better infrastructure but cost more. They can be accessed only by those who have enough money to pay the relatively higher school fees.

Churches: Churches in the area include Kambi Mawe Catholic church which has a large seating capacity and is an hour and a half away from the village. There is a Salvation Army church which is not so large but is very old and about an hour's walk from the village. Churches are associated with the provision of social services such as education and health services. They also support orphans and vulnerable children especially in paying school fees. Other churches include the African Inland Church and Seventh Day Adventists. They reduce incidences and fear of witchcraft.

Markets: There are many markets used by the community. Mulaani market, which was the venue for the village baseline study meetings, is small with only a handful of shops offering very basic supplies. Kwa Kathoka and Kyemole markets are about 45 minutes by foot from the village. West Ngosini is

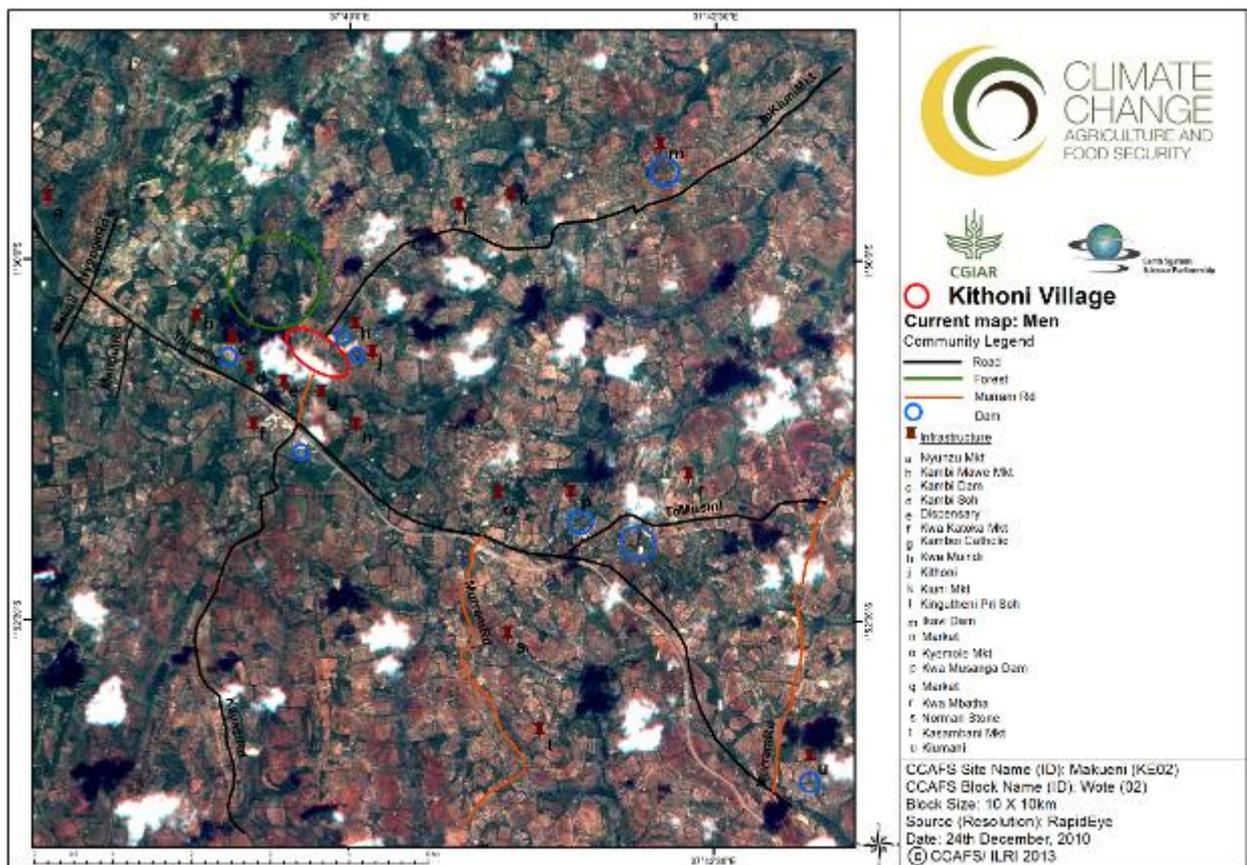
further away. Markets supply the community with goods and services but the community is very superstitious and this scares away investors. There is a strong belief in witchcraft. Kambi Mawe market is like a ghost market, closed and abandoned due to some local superstition.

Dispensaries: Kambi Mawe Community dispensary is the closest health facility. It is an hour's walk from the village and has adequate staff and affordable charges. It is managed and owned by the community. It provides employment and health care services. The population is too large for its limited resources.

Maps 2 and 3 are digitized versions of what was drawn by the men's and women's groups and represent the current conditions in the community regarding natural resources (water, forest, grazing, farmland, and degraded land) and infrastructure (roads, markets, education, and health) according to, respectively, male and female participants. The maps lay out information prepared by the community participants super-imposed on a satellite image.

Table 1 summarizes the information provided by the men's and women's groups.

Map 2. Men's map of current community resources



Map 3. Women's map of current community resources

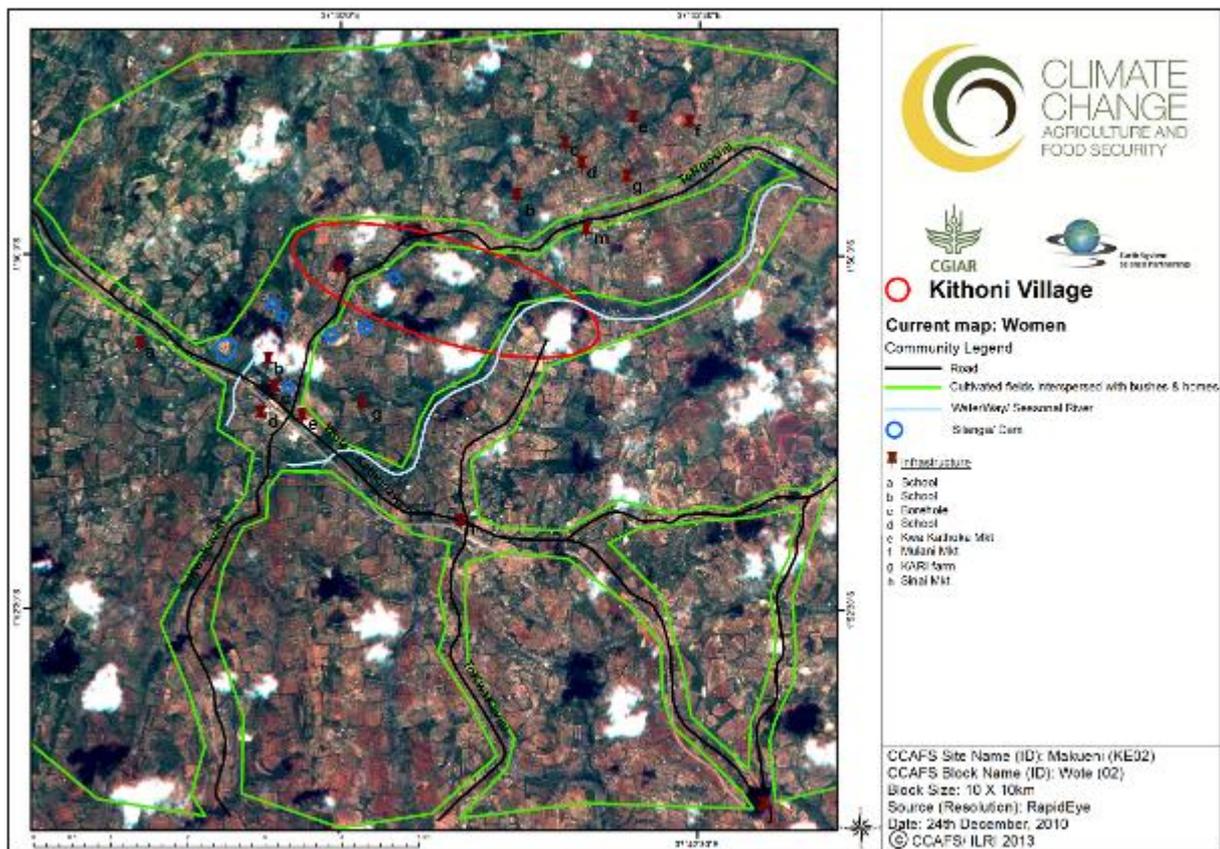


Table 1. Summary for Layer 1: current conditions, as perceived by men (M) and women (W)

Land cover class	Community determined land use	Location Names	Current state (quality)	Time to resource	Management and ownership issues	Environmental Benefits	Opportunities	Limitations
Farmland (M)	Cultivation of crops, source of fodder, herding livestock		Bad, not enough rainfall thus are dry	Kithoni village	Managed and owned by individual			Inadequate rainfall
Farmland (W)	Crop cultivation and livestock rearing	Kithoni	Average of four acres per household; land is mostly inherited		Individual owner manages plot			Depletion of vegetation cover.
Grassland (W)	Pasture	On the farm holding	Reduced in size; all pasture is held individually and not communally		Managed by individual plot owners	Protects the soil	Grows quickly even with small amounts of rainfall	Very limited during the dry season
Woodlots (M)	Source of firewood and timber, used for charcoal production		Not good, degraded with few trees	Kithoni village	Managed and owned by individuals	Control soil erosion, provide shade, source of biomass that improves soil fertility, bee forage	Bee keeping	none
Forest (W)	Source of fuel (charcoal)	On the farm holding	Reduced in size.		Managed by individual owners of plots.	Wind shield	Institutions sensitizing and providing community with seedlings	Some farm holdings do not have trees
Dams (M)	Water sources	Kambi Kwa Muindi Kwa Mbatha Kwa Musunga Kithooni Ikavi Muani	All are bad, brown water, not enclosed, animals drink directly from the dams	1 hour 10 minutes 45 minutes 10 minutes 1 hour 2 hours	Managed and owned by community			none
Dams (W)	Providing water for domestic use and for watering livestock	Kiumoni dam Kambii ya mawe dam Kivani dam Kwekaa dam Kithoni dam	Most are seasonal with poor quality water; One is permanent and has a lot of water	½ hr 1hr 1½ hr 10 min	Managed by community	Reduces surface water flow	Water for livestock Rain water storage	Siltation and seasonality

Land cover class	Community determined land use	Location Names	Current state (quality)	Time to resource	Management and ownership issues	Environmental Benefits	Opportunities	Limitations
Rivers (W)	Water for domestic uses	River Kwa Vita River Thwake	Dries up seasonally Not seasonal	4hrs.	Community.	Support survival of vegetation cover.	Provides water for domestics use and livestock	There is limited recharge from rainfall Very far away from the village
Borehole (W)	Source of water; Water point for livestock	Kambi ya mawe Chamusoyi	Provides water all year. Serves four sub-locations (Kyemole, Mwambami, Mulaani and Neema)	1 hr 4 hrs	Managed by committee. Community	Provides safe water as water is protected	Members get cheaper access; Water pumped to member sub-locations	
Roads (M)	Transport	To Makindu To Kikumini To Kwa Kavisi To Kasambani To Musini	Good, is tarmacked and wide Bad, has potholes, has muddy sections Too bad, lacks bridges and has potholes Bad, lacks bridges Bad, has many potholes	30 minutes 5-20 minutes 1 hour 2 hours 3 hours	Managed by County Council and owned by Government		Makes transport easier, reduces cost of transport	None Impassable during rainy season, causes breakdowns of vehicles, Lacks bridges etc
Roads (W)	Transport	Wote-Kathonzweni Kwathoka-Kithooni	Tarmacked and wide. Dirt road	1/2hr	Local authority Community		Encourages commerce	
Schools (M)	Education	Kambi Mawe Secondary; Kambi Mawe primary	Good, has adequate classrooms and enough staff	1 hour	Managed by community, owned by government		Employment, Education of young people, Sale of farm produce (maize, fruits and chicken)	None Few teachers, many pupils
Schools (M)	Education	Kingutheni primary	Bad, old structures, class rooms lack door and window shutters	30 minutes	Managed by community, owned by government		Sale of farm produce (maize, fruits and chicken)	Inadequate teaching aids

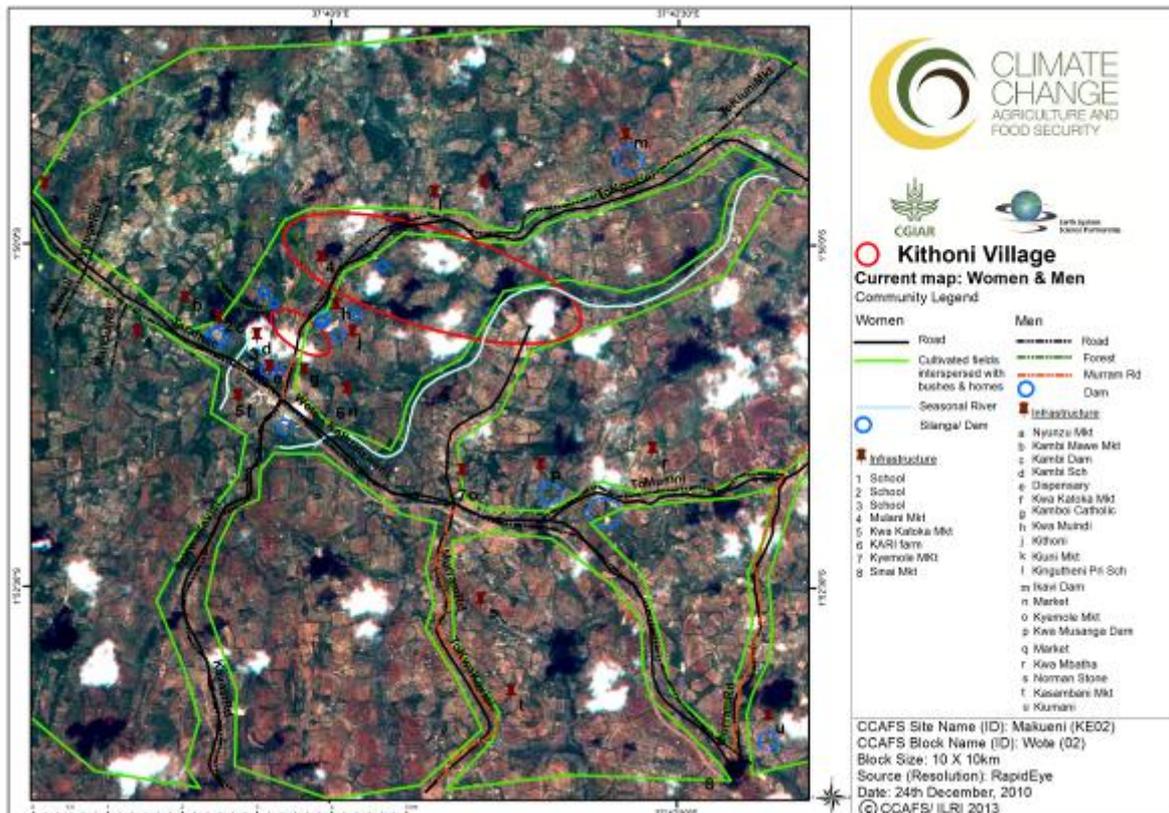
Land cover class	Community determined land use	Location Names	Current state (quality)	Time to resource	Management and ownership issues	Environmental Benefits	Opportunities	Limitations
Schools (M)	Education	St. Emanuel Academy	Good, is boarding school, has enough facilities and teachers	1 hr	Managed and owned by individual		Sale of farm produce (maize, fruits and chicken)	High cost of school fees
Schools (W)	Education	Kambi mawe Primary School; Chamusoyi Pri.; West Ngosini; Makueni boys; Makueni youth polytechnic	Basic infrastructure	45 minutes – 4 hrs	Public school		Easier access to education due to close proximity to community	
Churches (M)		Kambi Mawe Catholic; Jeshi La Uokovu	Good, has large seating capacity, well light	1 hour	Managed and owned by the community		Training of youths; Pay school fees for disadvantaged children	None
Churches (W)		Salvation army; Catholic church; AIC; SDA					Reduce incidences of witchcraft	
Markets (M)		Kambi Mawe	Bad, always closed, abandoned buildings	1 hour	Managed by individual owners		None	Goods not available
		Kwa Kathoka	Very active, buildings are good	45 minutes	Managed by tenants, owned by individuals owners of plot and structures		Employment, source of info and news; Mechanic services	Theft, robbery and contributes to prostitution

Land cover class	Community determined land use	Location Names	Current state (quality)	Time to resource	Management and ownership issues	Environmental Benefits	Opportunities	Limitations
Markets (W)		Mulaani.	Small in size; Close to chief's camp	10 minutes	Local community		Platform for commercial activity Provides services close to village Provides highest level of service	
		Kwa kathoka	Mix of temporary and permanent buildings	30 minutes	Shops owned and managed by individuals			
		Wote		2 hrs	Local authority			
		Kathonzwi	A few permanent buildings	45 minutes	Local authority			
		Kyemole						
		West Ngosini			1 1/4 hrs	Shops managed by owners		Provide only basic items
Dispensaries (M)		Kambi Mawe Community dispensary	Good, has adequate staff, dispense drugs affordably	1 hour	Managed and owned by community		Employment, health care services	None
Hospital (W)		Kimani hospital						Pop. too large for its limited resources

B. Gender-differentiated comparison of current conditions

Male and female participants had differing views of their community's resources. Men viewed the low rainfall totals as the main limitation on farmland while women viewed the small land holding as the main limiting factor. The women were concerned about the depletion of vegetation cover on the farm holdings because this was their main source of wood fuel. The small size of the farm holdings also limited their ability to increase the tree population on the land. Men identified beekeeping as an opportunity presented by the bush land. The women brought out the link between business and witchcraft and the role played by the church to reduce the negative impacts of local superstitions.

Map 4. Overlay of current conditions, comparing men's and women's maps



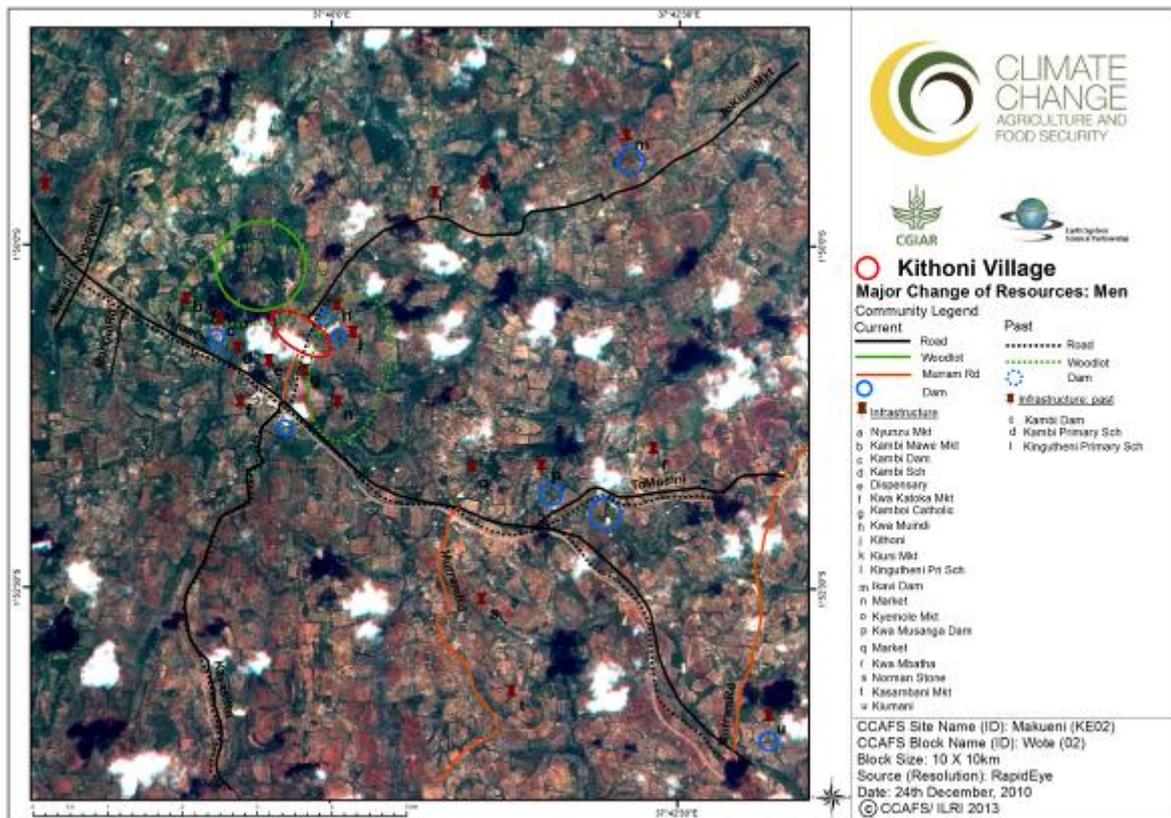
C. Major changes of resource conditions

Participants were asked to consider the resources they had in their community, to discuss the history of land use, and to identify major changes that had occurred in the landscape. In addition, participants were to examine how the resources got to the current condition and the major drivers of those changes, as well as the opportunities and constraints for the future.

The men reported that this area was initially a wildlife reserve before people settled here in the 1950s. In the past there were fewer people living here, however there has been a steady population growth causing pressure on the land resources. The women noted that natural sources of water were initially further away from the people when the area was first settled. Both groups indicated that there were more trees in the area in the past. Animals such as monkeys and birds inhabited the forests and woodlots that previously existed. Women noted that land holdings used to be larger and farm production was better. The rivers used to have more water that was cleaner than it is today. Less rainfall was cited as the reason for reduction in the amount of water in the rivers. Hospitals and churches were smaller in the past, but with more resources they have grown.

Maps 5 and 6 compare past and present resource conditions for men and women, respectively. Table 2 summarizes the information provided during the discussion.

Map 5. Major changes in resources (comparing past and present) for men



Map 6. Major changes in resources (comparing past and present) for women

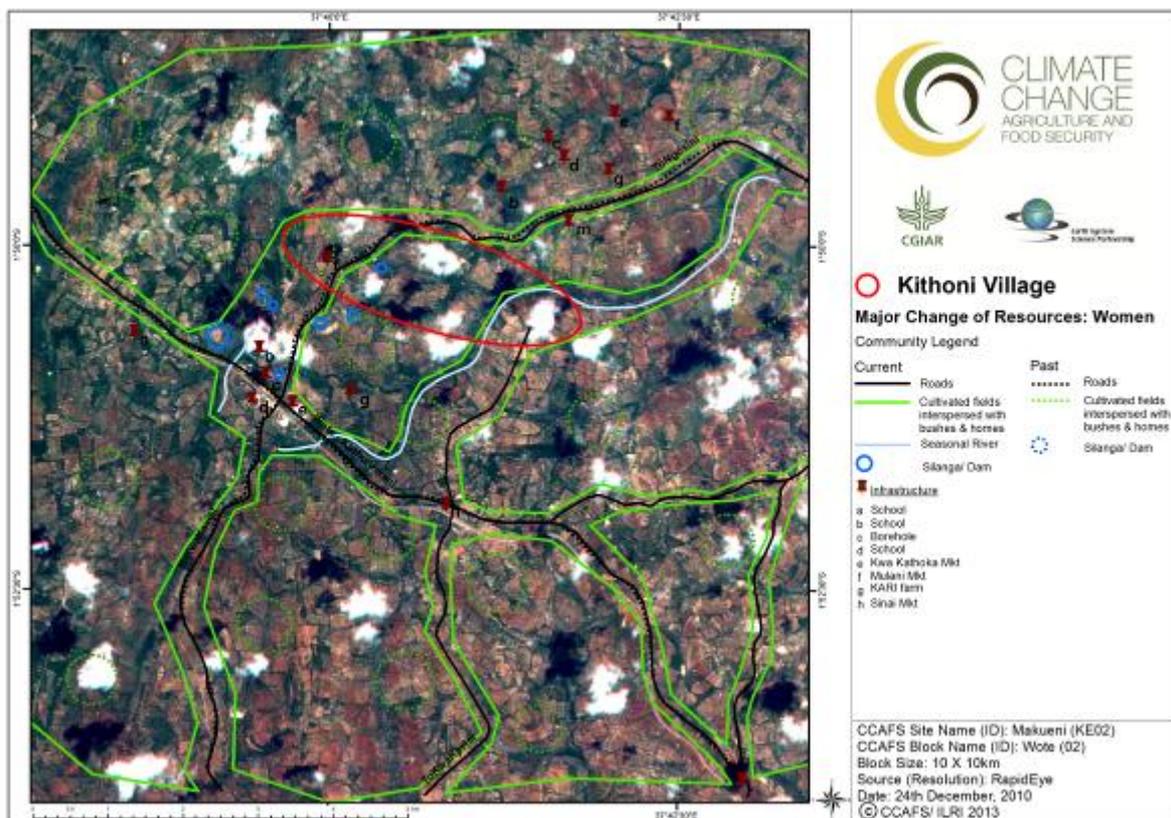


Table 2. Major changes and drivers of change in the last 10 years, as perceived by men (M) and women (W)

Land cover class	Community determined land use	Location Names	Past state (quality)	Time to resource	Drivers of change	Management and ownership issues	Environmental Benefits
Woodlots (M)	Source of timber, firewood and charcoal production	Varied	Many trees, wild animals (monkeys and birds)		Population increase, charcoal production	Managed and owned by individual farmers	Attract rainfall, Attract bees
Forest (W)	Source of firewood and charcoal	Everywhere	Thick and vast.		Increased population resulting in depletion	Colonial government	Home for game
Grassland (W)	Pasture	Everywhere	Extensive grass lands		Increase in population hence livestock and practices like cultivation.	Pastures are owned individually	Protected the soils
Farmland (W)	Pasture and cultivation	Kithooni	Households had large parcels and production was better				
River (W)	Domestic uses.	River Kwa vita River Thwake	More water		Less rainfall in the area	No form of management	Encourages vegetation cover
Dam (M)		Kambi	Plenty of clean water Sufficient water, surrounded by trees	4hrs. 1 hour	Change in weather patterns (little rainfall)	Managed and owned by colonial government	
Dam (W)	Providing water for dams	Kambii mawe dam	More water	1hr.	Less rainfall less pressure	Managed by the colonial government	Watering point for livestock
Borehole (W)		Kambi mawe	Served less people	1hr.	Population increase	Owned communally	Provision of safe water
Schools (M)		Chamusoyi Kambi primary Kingutheni primary	Bad, inadequate structures/classes, few teachers	4hrs 1 hr 30 min	Change of government	Managed and owned by the community	

Land cover class	Community determined land use	Location Names	Past state (quality)	Time to resource	Drivers of change	Management and ownership issues	Environmental Benefits
Schools (W)		Kambi mawe Primary School; Chamusoyi Primary; West Ngosini	Poor infrastructure		Population increase and more resources	The government	
Hospitals (W)		Kimani	Smaller		Population increase and more resources		
Churches (W)		Catholic; AIC; Salvation army	Smaller		Population increase and more resources	Missionaries	
Roads (M)	Transport cattle to market, Used for wildlife management	To Makindu To Kikumini	Bad, was not tarmacked Bad, impassable during rainy seasons	30 minutes 10 minutes	Transition of government	Managed and owned by colonial government	
Roads (W)	Transport	Road from Wote to Kathonzweni	Dirt road		Increase in population	Local authority	

Human settlements: The community did not believe in moving out to settle in other areas even with an ever increasing population. They had a vision of an increase in the number of houses built within the community. There is an opportunity to improve living standards as result of better housing. A major constraint is the reduction in the size of land holdings and farmland for all households.

Cultivated fields: Since the community did not plan to move out to settle in other areas they saw a vision of reduced farmland area and increased human settlement. This causes a constraint because fragmentation of land is a result of the increasing population.

Woodlots: The community anticipates that the area under woodlots/ bushes will reduce in size because of competition between farmland and human settlements and continuous harvesting of trees for firewood and charcoal production.

Seasonal waterways: The community has a vision of improvement in surface water availability in the seasonal stream. This will create an opportunity for the water to be used for domestic use and irrigation. It can be channelled into dams. Constraints are inadequate rainfall and clearing of woodlots and bushes.

Table 3. Vision of the future

Items	Preferred condition for 2030	Opportunities	Constraints	Organisations to be involved
Roads	Want tarmac on Kwa Kathoka – Kavisi road with a bridge over river Thwake; Propose that Makindu road is made a super highway with dual carriage way; Wish to have Mulaani – Wote road that starts from Kithoni Village to be tarmacked complete with bridges at rivers Kivesi and Kamunyolo	Employment by working as construction labourers besides selling food to road constructors; Improve ease of transport; Open up the area for trade with other parts of the country; Tarmac roads reduce thieves; Can sell murrum from land and excavated ground can catch water	This will also attract people from other areas	Government
Dams	Want to have all dams enlarged and desilted regularly to improve water availability and quality.	Irrigation of crops Establishment of tree nurseries		Government
Schools	Want to have more schools built in the area. These should include both primary and secondary schools	Education of their children Employment Educated children will build a better future		The government and the private sector
Human Settlements	An increase in number of houses built within the community	Improved living standard as result of better housing	Reduction in size of land holdings and farmland	Community
Cultivated fields/ farmland	The farmland area will reduce		Fragmentation of land as a result of the increasing population	Community
Woodlots/ bushes	Woodlots/ bushes will reduce in coverage		Pressure from farmland and human settlements; Harvesting for firewood and charcoal production	Community
Seasonal rivers/ waterways	Improvement of water flow	Water for domestic use and irrigation; Channel water into dams	Inadequate rainfall; Clearing of woodlots and bushes	Community

Topic 2: Organisational landscapes

This topic aims to show evidence of organisational capacities that help address food security and manage resources. This will inform CCAFS about how prepared the village is to respond to the challenges envisaged as a consequence of climate change or other future challenges and to engage with CCAFS partners at a collective level.

Specifically, this section presents the different formal and informal organisations involved in the community in general terms, as well as with respect to food security in different situations (i.e. average and crisis conditions), and natural resources management (NRM). It also elaborates on what types of activities the organisations are engaged in, who their members are, whether the organisations are useful, etc.

A. Basic spheres of operation

Participants, separated into male and female groups, were asked to draw three large concentric circles on the ground. The inner circle would represent the community, the middle circle the locality and the outer circle beyond the locality. Participants were then asked to name organisations working in the area, whose names were written on cards, and then place the cards in the appropriate circle. Thus, the groups placed in the inner circle the cards of organisations that worked in the community, in the middle circle the cards of organisations operating in the locality, and in the outer circle those that operated beyond the locality. See Photo 2 for an example of the activity as carried out with the study participants. The results are shown in the diagrams that follow. Throughout the activity, the men identified 17 organisations operating within the village while the women identified 27.

In Table 4, more detailed information is provided on the five most important organisations as they were ranked by the men's and women's groups.

Photo 2. The organisational landscape activity in progress



Figure 1. Organisational landscape of the men's group

- Legend**
- 1 Mulaani Centre group
 - 2 Jasho
 - 3 World Vision
 - 4 Red Cross
 - 5 Mbiwangwiwe
 - 6 Ngone Mwaitu
 - 7 KARI (Kenya Agricultural Research Institute)
 - 8 Kisinga group
 - 9 CDF (Constituency Development Fund)
 - 10 Ivati group
 - 11 Wimukye
 - 12 European Union
 - 13 NALEP
 - 14 LATIF
 - 15 Kanini Kaseo
 - 16 WFP (World Food Programme)
 - 17 Ministry of Agriculture

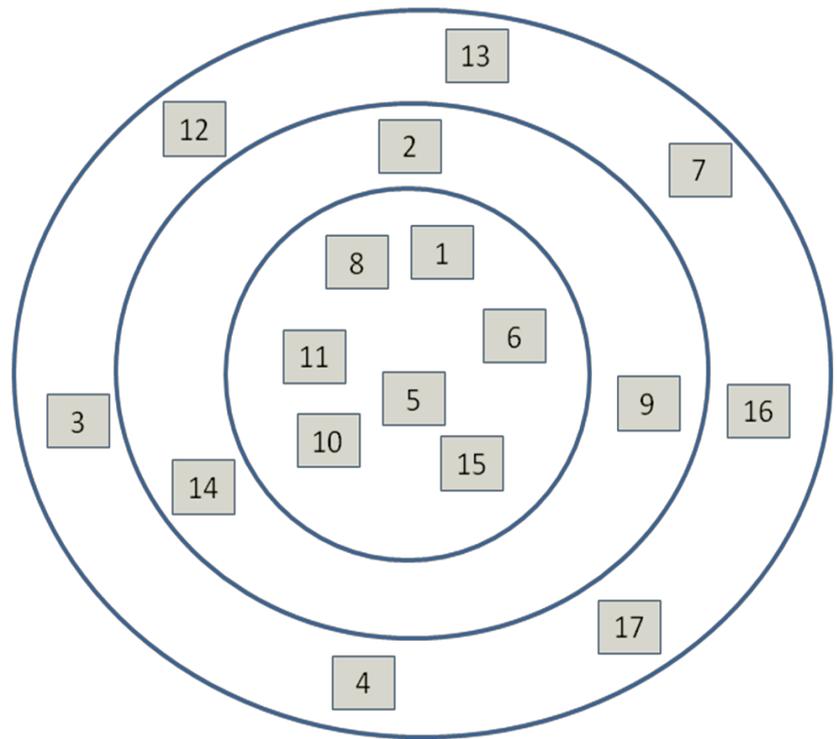


Figure 2. Organisational landscape of the women's group

- Legend**
- 1 World Vision
 - 2 AMREF
 - 3 Africa Harvest
 - 4 Farm Care
 - 5 Jasho group
 - 6 Kyemole Poultry Keepers
 - 7 KWFT
 - 8 KREP
 - 9 Faulu Kenya
 - 10 Equity Bank
 - 11 Kenya Red Cross
 - 12 Utui wa Mulaani
 - 13 Kisinga
 - 14 Muuo wa mwinga
 - 15 Wendo wa Mwinga
 - 16 Kanini Kaseo
 - 17 Wendo wa Kisomo
 - 18 Wendo waa Ka
 - 19 Jumwia
 - 20 Mulaani centre
 - 21 Mwamba wa AIC
 - 22 Mwamba welfare
 - 23 Kyemole welfare
 - 24 Ngwate ngukwate
 - 25 Mbiw'a ngwiwe ngosini
 - 26 Amiran
 - 27 Provincial Administration

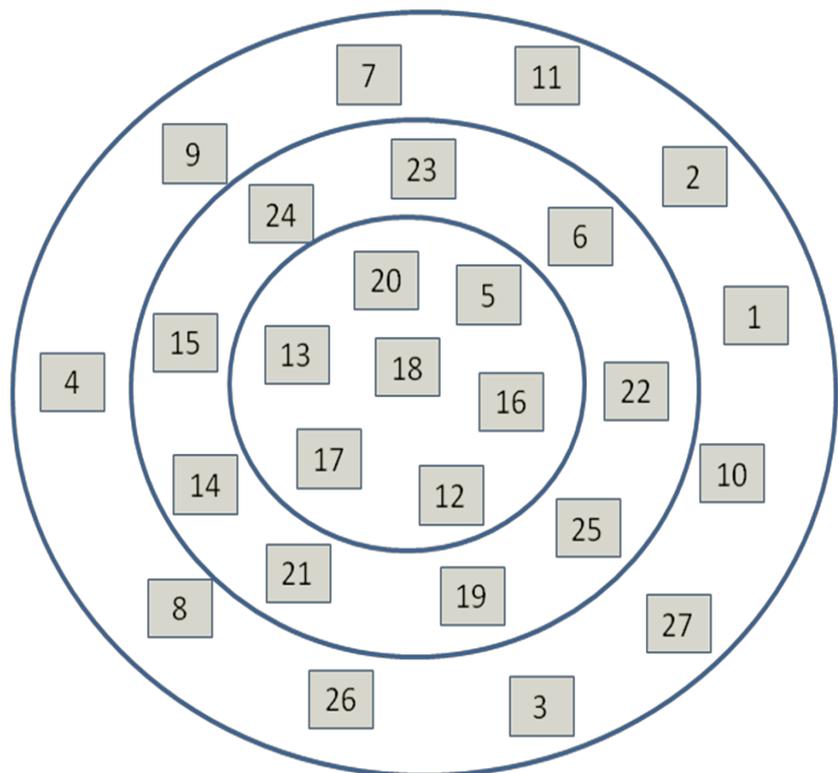


Table 4. Information on the first five organisations ranked by the men and women

	Organisation name	Main activities	Number of members (estimate)	Access (open or restricted to...)	Origin (indigenous, state, NGO, project)	Sphere of operation: community, local, beyond local	Sources of funding (members, external, both)	Existed how long (less than 1 yr, 1-5, longer)	Formal or informal
Men's top ranked organisations	1	Mulaani centre group	200	Open to both men and women, but membership is restricted to people from the area	Indigenous	Community	Members	Longer	Formal
	2	Jasho	24	Open	Indigenous	Local	Members	1-5 yrs	Formal
	3	World Vision	665	Restricted to the elderly, widows, people living with HIV/AIDS	iNGO	Beyond local	External	Longer	Formal
	4	Red Cross		Open	National NGO	Beyond local	External	Longer	Formal
	5	Mbiwangwiwe	87	Open	Indigenous	Community	Members	Longer	Formal
Women's top ranked organisations	1	World Vision		Restricted	NGO	Beyond local	External	Longer (10 yrs)	Formal
	2	Mulaani centre	250	Restricted	Indigenous	Community	Members	Longer (12 yrs)	Informal
	3	Red cross		Restricted	NGO	Beyond local	External	Longer (12 yrs)	Formal
	4	Mbwiwe ngwiwe ngosini	250	Restricted	Indigenous	Community	Members	Longer (16 yrs)	informal
	5	Kitui wa mulaani	200	Restricted	Indigenous	Community	Members	10 yrs	Informal

B. Organisational landscape of food security

The goal of this exercise was to get an improved understanding of how the organisational landscape contributes to the food security of the group. Food security is mostly measured at the household level. Nonetheless, community-level organisations and interactions influence the food security of different groups within the community differently. Male and female participants were asked to discuss the concepts of food availability, access and utilization, and then review each organisation they had previously identified by asking which of them had activities that fell under these categories.

The area is generally food insecure due to its perennial water problems. Out of the total 38 organisations identified by both the men's and women's discussion groups, 37% were involved in food security. Out of the 17 groups identified by men, 18% were engaged in addressing food security and of the 27 identified by women, 48% were involved. Only three organisations address food crisis in the community. They are the provincial administration, World Food Program and World Vision, making up 8% of the groups identified. These figures are relatively low considering the fact that this is a highly food insecure area. One would expect a higher percentage of groups to be involved in addressing food security and crisis. However it can be explained in part by the fact that over the years the government has been providing relief food and the people have become complacent and developed a high level of dependency on government food. The difference between the male and female outcomes can be explained by the fact that it is traditionally the role of the women to procure food for the family therefore they are likely to have deeper knowledge of the groups that contribute to their doing so.

The score card in terms of how many organisations were involved in the various aspects of food security reads as follows:

- Production: 46%
- Distribution: 23%
- Exchange: 8%
- Affordability: 38%
- Allocation: 8%
- Preference: 8%
- Nutritional value: 15%
- Food safety: 23%
- Social value: 8%

There were very few linkages in the organisational landscape. Most organisations do link with others in their operations. The men identified only one linkage between World Food Program, who provides World Vision with food to distribute in times of food crisis. The women identified two links. One in which Amiran supplied Jasho with greenhouses and supervised their use and another in which Africa Harvest provided Kanini Kaseo with goats. In general, most groups address the production aspects of food security.

Most of the groups addressing food security operate beyond the locality (77%) while 23% operate at the community level. World Vision scores highest in terms of involvement with food security, and it is followed by Jasho.

Figures 3 and 4 show the men's and women's organisational landscapes for food security, respectively.

C. Organisational landscape of food crisis situations

The purpose of this exercise was to understand how organisations help people to cope in times of food crisis. Participants identified a food crisis situation that they all remembered (e.g. a bad year or the lean season), and discussed how the organisational landscape of food security operated in that situation.

The participants were asked to define a time when there was a food crisis in the community, identify the organisations that were involved in providing support during that period, and indicate their role in the diagram. The men’s group defined food crisis as “food shortage, no rains, no hope of harvesting”. The most memorable food crisis occurred in 1997 and was called *Ng’ethya Ukwe* – having no hope, waiting to die. Many people died of malnutrition especially the elderly and children. In Kitui (an area nearby) people ate dogs while within the community people ate snakes. The men based their diagram on this crisis, although during the discussion it became apparent that there was another food crisis in 2009 due to a prolonged drought which had severe consequences on the community such as death of livestock, starvation and death of persons particularly the old and children. However this crisis could not compare to *Ng’ethya Ukwe* of 1997. The women described food crisis as a situation where food, specifically maize, is lacking in a household, rains have failed, food prices have escalated and crops have failed in the whole region.

The village falls in a region where crop failure is very common and the government has to come in with relief food on a very regular basis. This has created a serious dependency syndrome. It is part of the government’s recurrent budget and therefore other organisations do not see the need to address the food crisis. It is generally viewed as the work of the government, although the men identified World Vision and the World Food Programme as the two nongovernmental organisations that are involved during food crisis situations.

Figure 5. Organisational landscape of food crisis – men

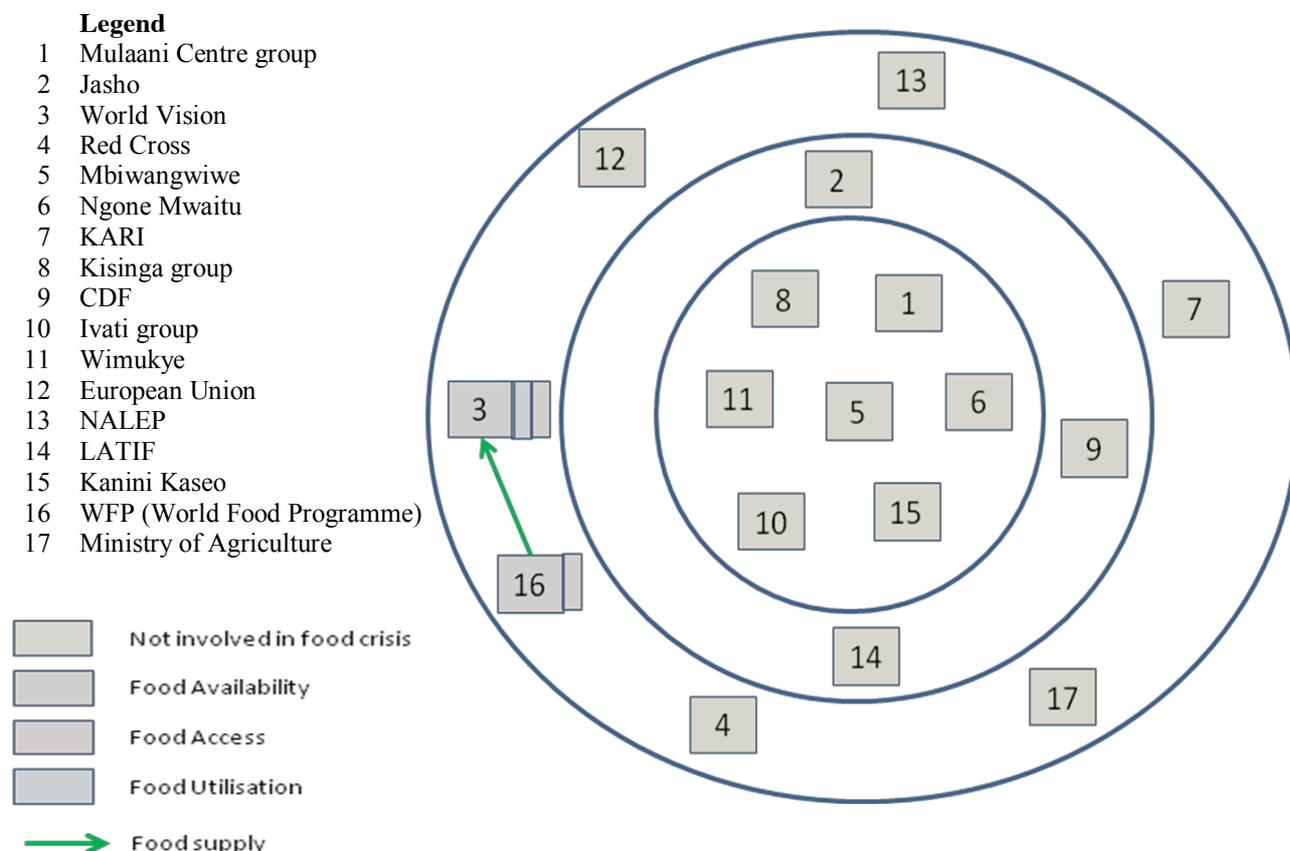
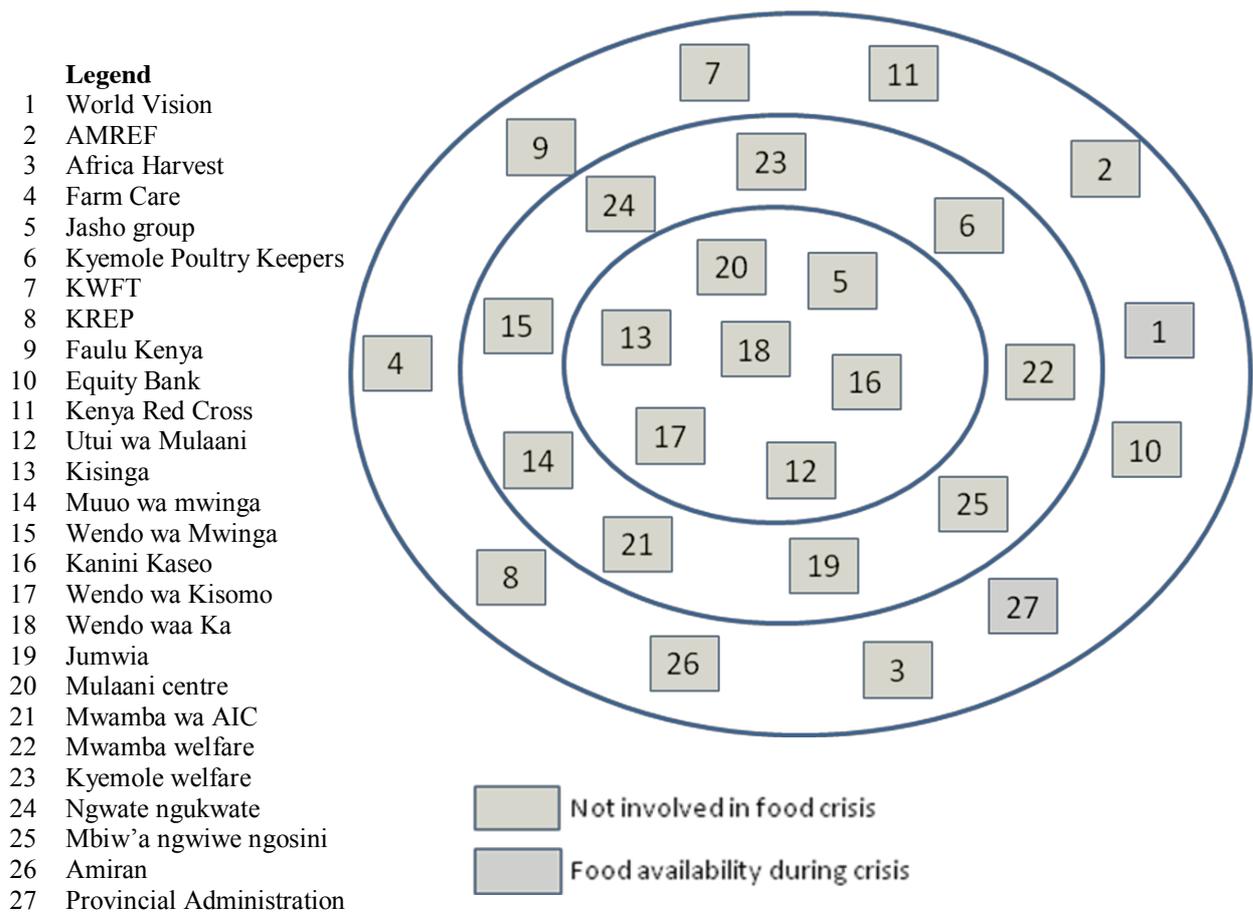


Figure 6. Organisational landscape of food crisis – women



D. Organisational landscape of natural resource management

In this section, the organisational landscape in relation to natural resource management (NRM) is discussed. Specifically, what organisations were actively working to protect the environment, manage natural resources, etc.? The process entailed asking the group to highlight what organisations are involved in the management of natural resources in the community; developing a list of natural resources important to the livelihoods of the community; and asking the group to decide on a symbol for each type of natural resource listed.

Kithoni village is located in an area that can be described as marginal. These are areas with fragile ecosystems of low carrying capacity and can easily degrade. Of the 17 organisations identified by men, only 18% were involved with natural resource management and for the women's discussion it was 15%. In general, 18% of the groups identified by both the men and the women were involved in natural resource management. This seems to imply that conservation is not high on the list of community priorities.

Figures 7 and 8 depict the organisational landscape as drawn by the men's and women's groups for natural resource management activities.

Figure 7. Organisational landscape of natural resource management – men

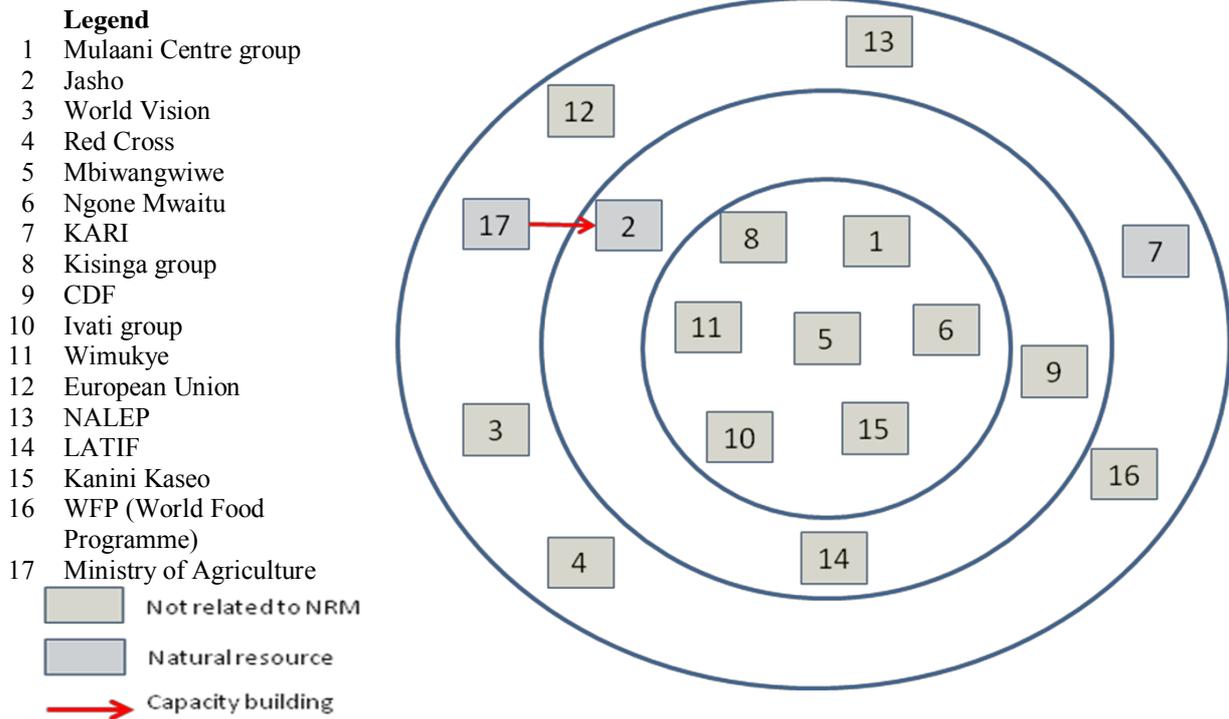


Figure 8. Organisational landscape of natural resource management – women

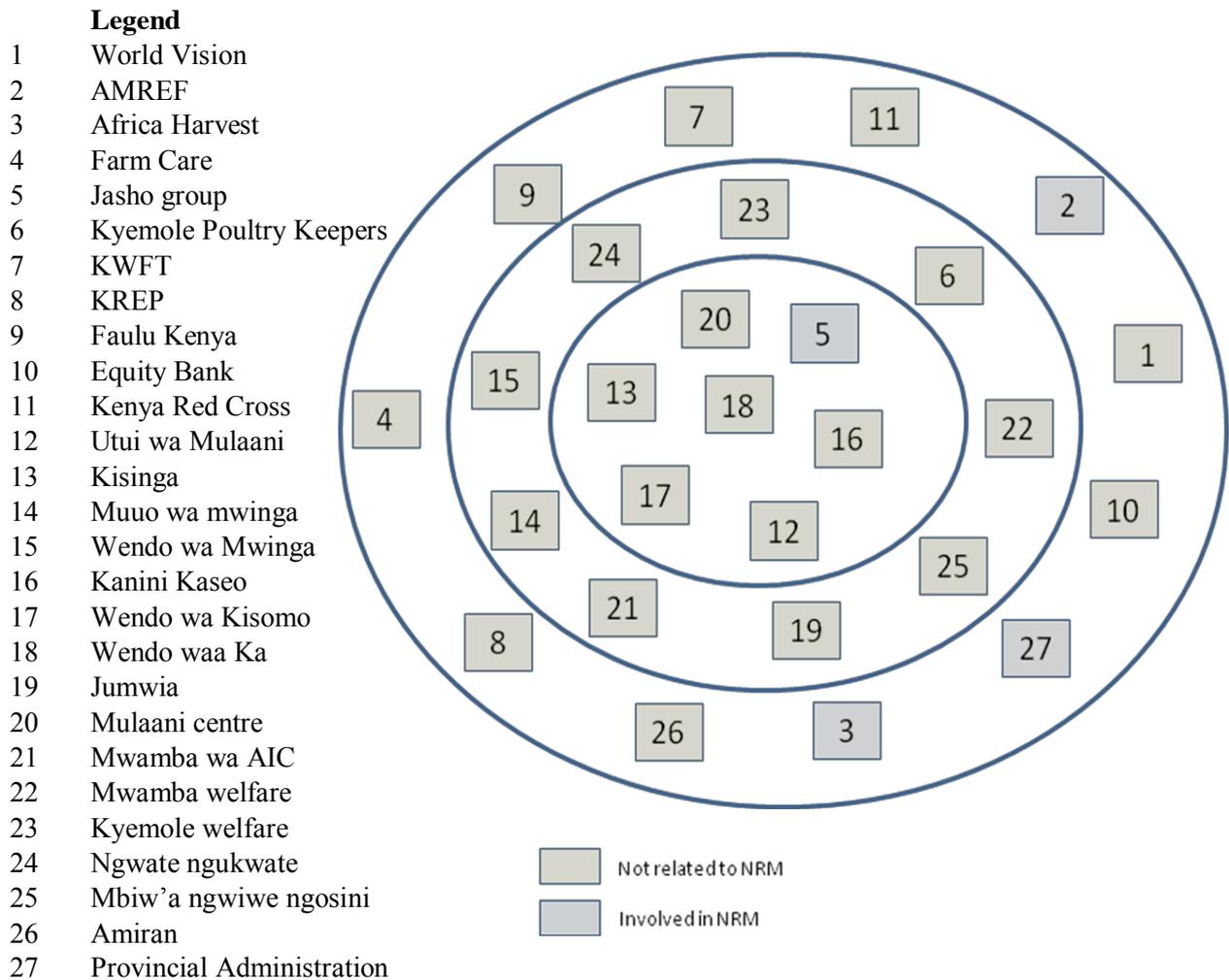


Table 6 below summarizes information on all the organisations identified separately by male and female participants. The organisations are classified according to their role in supporting food availability, access and/or utilization, as well as the provision of relief in times of food crisis, and the management of natural resources.

Table 6. Information on highlighted organisations of men and women (unless otherwise noted, 1=yes, 0=no)

Organisation name	Identified by men	Sphere of operation: 1=community, 2=local, 3=beyond local	Food security	Food crisis	NRM	Identified by women	Sphere of operation: 1=community, 2=local, 3=beyond local	Food security	Food crisis	NRM
1. Mulaani Centre group	1	1	0	0	0	1	1	0	0	0
2. Jasho	1	2	1	0	1	1	1	1	0	1
3. World Vision	1	3	1	1	0	1	3	1	1	0
4. Red Cross	1	3	0	0	0	1	3	1	0	0
5. Mbiwa ngwiwe	1	1	0	0	0	0				
6. Ngone Mwaita	1	1	0	0	0	0				
7. KARI	1	3	1	0	1	0				
8. Kisinga group	1	1	0	0	0	1	1	1	0	0
9. CDF	1	2	0	0	0	0				
10. Ivati group	1	1	0	0	0	0				
11. Wimukye	1	1	0	0	0	0				
12. European Union	1	3	0	0	0	0				
13. NALEP	1	3	0	0	0	0				
14. LATF	1	2	0	0	0	0				
15. Kanini Kaseo	1	1	0	0	0	1	1	1	0	0
16. WFP	1	3	0	1	0	0				
17. Ministry of agriculture	1	3	0	0	1	0				
18. AMREF	0					1	3	1	0	1
19. Africa Harvest	0					1	3	1	0	1
20. Farm Care	0					1	3	0	0	0
21. Kyemole Poultry Keepers	0					1	2	1	0	0
22. KWFT	0					1	3	1	0	0
23. KREP	0					1	3	1	0	0
24. Faulu Kenya	0					1	3	1	0	0
25. Equity Bank	0					1	3	1	0	0
26. Utui wa Mulaani	0					1	1	0	0	0
27. Muuo wa Mwinga	0					1	2	0	0	0

Organisation name	Identified by men	Sphere of operation: 1=community, 2=local, 3=beyond local	Food security	Food crisis	NRM	Identified by women	Sphere of operation: 1=community, 2=local, 3=beyond local	Food security	Food crisis	NRM
28. Wendo wa Mwinga	0					1	2	0	0	0
29. Wendo wakisomo	0					1	1	0	0	0
30. Wendo wa aka	0					1	1	0	0	0
31. Jumuia	0					1	2	0	0	0
32. Mwamba Wai AIC	0					1	2	0	0	0
33. Mwamba Welfare	0					1	2	0	0	0
34. Kyemole welfare	0					1	2	0	0	0
35. Ngwate Ngukwate	0					1	2	0	0	0
36. Mbiwe Ngwiwe Ngosini	0					1	2	0	0	0
37. Amiran	0					1	3	1	0	0
38. Provincial administration	0					1	3	0	1	1
Totals	17	1=7 2=3 3=7	3	2	3	27	1=7 2=9 3=11	13	2	4

Topic 3: Information networks

The aim of this exercise was to understand the diversity of options people use for accessing information on agriculture and weather, how people take advantage of sources of information available, and if some sources are not used and why. We want to describe networks of how people access and share information within the community.

The men's discussion group identified the following as the topics for which a farmer seeks information to help him make decisions related to his farming activities:

- Seed variety
- Farming methods
- Types of manure
- Market for produce
- Rainfall duration
- Start of rainfall
- Post harvest handling
- Start of planting
- Start of drought
- Causes of drought

The women's discussion group came up with the following list:

- Onset of the rains
- Type of seeds
- Price of farm produce
- Construction of terraces
- Weather related knowledge before planting
- Choice of crops
- Manure/soil fertility
- Storage of farm produce
- Preservation of farm produce
- Soil conservation technology

A summary of the information networks as described by the study participants is provided in Table 7. Local radio stations and organisations emerged as the most significant sources of information for farmers. Friends are the most significant in the category of individuals.

Radio: Syokimau and Musyi FM radio stations are very popular within the community. The FM stations provide the community with information on the following issues: seed varieties available in the market and their suitability; post harvest crop handling; information on effective preservatives released into the market; weather reports indicating the start of drought and updates; programmes with information concerning causes of drought; information about the start of the rains; advice to farmers to reduce their livestock during drought; information on when drought is likely to be experienced; advice to farmers on what to plant, where, how and when; and the prices of different crops in different markets on a daily basis. The radio is widely used because it is relatively cheap and is readily available in the markets. The FM stations use local language which the local communities easily identify with. As a result the community trusts the radio stations and their broadcasts.

Organisations: The Kenya Agricultural Research Institute (KARI) has a centre not far from the village. It provides reliable and trusted agricultural information such as post harvesting handling, seed types and seed prices. Farmers observe when fields in the KARI station are being planted and know it is time for planting. The Ministry of Agriculture educates farmers on various farming methods and provides farmers with market intelligence.

Individuals: Farmers get information from their friends and neighbours. Farmers share information on prices of produce as they move from one market to the next. Farmers often contact grain stockists and store keepers in various towns to provide them with reliable information regarding prevailing

prices of various farm produce. This information is shared among neighbours and fellow farmers. Individual fellow farmers play a significant role in sharing information regarding post harvest handling. This is a source of reliable indigenous knowledge such as use of wood ash and hot pepper to control weevils in cereals. Individual farmers also have knowledge on the start of planting; there are farmers who can predict the cycle of seasons by counting of the seasons.

Table 7. Networks of information

Source	Topic (men)						Topic (women)			Total
	Type of seed	Farming methods	Market	Rain-fall	Drought	Planting & post harvest handling	Rainfall & weather information	Type of seed	Market info	
<i>Individuals</i>										
Family	0	0	1	0	0	1	0	0	0	2
Friends	0	0	1	0	0	0	1	1	1	4
Neighbours	0	0	0	0	0	0	0	1	0	1
Old women	0	0	0	0	0	0	0	0	0	0
Organisations	0	1	0	0	1	1	1	1	1	6
<i>Media</i>										
Radio	1	0	0	1	1	0	1	1	1	6
TV	0	0	0	0	0	1	0	0	0	1
Newspaper	0	0	0	0	0	0	0	0	0	0
<i>Other</i>										
Observation	0	0	0	0	0	0	0	0	0	0
Functions/ meetings	0	0	0	0	0	1	0	0	0	1

Conclusion and recommendations

Community Resources: The main constraint to crop production and livestock keeping is inadequate water supply. The government interventions in the area have yielded good results and the community is able to obtain a range of agricultural products in spite of the ecological challenges. The range of crop options that can do well in the area needs to be expanded. There are crops that have been introduced but are not adopted so there is a need to investigate the barriers to adoption of these crops. Soil and water conservation needs to be enhanced since water is the main constraint to farming. Rain water harvesting for crop and livestock production should be further developed.

There are no forests in Kithoni village. The natural vegetation of the area can be described as scrub. It has scattered bushes punctuated by the occasional clusters of trees from which the women obtain wood fuel. Although wood fuel is the only source of domestic fuel in the community, there is very little evidence of efforts to increase the tree population in the area. The women report that they rarely cut down whole trees but obtain wood fuel from trimming the branches of the trees. Increasing the tree population is constrained by the small size of the farm holdings and the absence of public land to plant forests. In view of the above the better option is to increase the range of agroforestry trees available and promote adoption. Termites are also a challenge to tree planting in the area therefore termite-resistant trees such as *acacia albida* should be promoted.

The community is moving away from keeping larger livestock to keeping smaller stock to adapt to the problem of inadequate pasture, water and labour. Capacity building in relation to livestock should therefore focus on expanding options related to zero grazing goats, expanding poultry and use of the crop residue especially from the legumes to produce animal feed.

Inadequate water for domestic use and agricultural production is the main problem in the area. There are no permanent rivers in the site and dams are the main sources of domestic water in the community. Dams are used for both livestock and households needs and are managed by committees. However most of the dams are not able to retain water throughout the year. The use of these dams is also not regulated and there are serious issues of hygiene and water quality since people and livestock use the same watering points. There are new dam designs which have a separate watering point for livestock. Such designs should be made the accepted standard design for dam development to improve water quality and hygiene. The dam committees need capacity building on water management. Hydrological surveys to identify ideal spots for dam construction can be done to ensure optimal locations so that the dams have water all year round and not just part of the year. There are a few boreholes which are piped to supply market centres through kiosks. The supply network needs to be expanded to households. There is no irrigation practiced in the area. A few farmers are using an innovative approach that waters fruit trees using bottles to conserve the little water available. Irrigation potential in the area has not been exploited. This can be done by increasing the numbers of dams to harvest and store surface runoff for use in irrigation. Roof catchment for clean water has not been adequately developed especially in schools and households.

In terms of infrastructure, the road network is good but the condition of the earth roads not good. Bridges and culverts need to be constructed on sections of the loose surface to improve connectivity of the network. The schools are overcrowded and many of the buildings are old. There is a general need to improve infrastructure in the schools. There is a need to increase the number of health facilities.

Organisational landscape: The area is generally food insecure due to its perennial water problems and 37% of the groups identified are involved in addressing food security. Only three organisations (8%) address food crisis in the community. These figures are relatively low considering the fact that this is a food insecure area. However it can be explained in part by the fact that over the years the government has been providing relief food and the people have become complacent and developed a high level of dependency on government food. This dependency needs to be reduced and it can be done by sensitizing the many groups on the landscape and building their capacity in the relevant areas.

There were very few linkages in the organisational landscape. This needs to be improved to develop and make use of synergy especially at the community level. Most of the groups addressing food security operate beyond the locality (77%) while 23% operate at the community level. There is need to increase involvement at the community level.

Kithoni village is located in an area that can be described as marginal but only 18% of the groups identified were involved with natural resource management. This seems to imply that conservation is not high on the list of community priorities. This situation needs to be changed and conservation given more attention especially in the light of an increasing population. The existence of many groups is already an advantage. Sensitization, facilitation and mechanisms to sustain the gains should be undertaken.

Information networks: Local radio stations and organisations emerged as the most significant sources of information for farmers. However all the organisations mentioned are those that operate beyond the locality. It is important to link these organisations with community groups and individuals especially to develop a feedback mechanism so that the flow of information is two-way and not one-way as is the case at present.

The FM stations which are currently doing a good job can also be supplied with a wider range of information to disseminate. However this must be in line with the community needs which should be established beforehand. This has so far not been done.

Implications for CCAFS

Soil and water conservation needs to be enhanced since water is the main constraint to farming. Rain water harvesting for crop and livestock production should be further developed. The range of crop options that can do well in the area needs to be expanded. CCAFS can partner with other organisations to address this challenge especially building on the work that has been done by the Makueni Agricultural Programme (MAP).

Due to the lack of forests in Kithoni village, wood fuel is the only source of domestic fuel in the community. There is very little evidence of efforts to increase the tree population in the area, however. Agro forestry trees are the best option to increase the tree population in the area. Women are very directly affected and would be the easiest to bring on board. CCAFS can work with the many women's groups that exist in the community towards this end.

Capacity building in relation to livestock should focus on expanding options related to zero grazing goats, expanding poultry and use of the crop residue especially from the legumes to produce animal feed. CCAFS can collaborate with others to build capacity in this sector.

Dams, which are the main source of water, are not able to retain water throughout the year. CCAFS can participate in hydrological surveys to identify ideal spots for dam construction so that future dams are strategically located to ensure they have water all year round. CCAFS can also participate in developing dam designs that have a separate watering point for livestock to promote water quality and contribute to building capacity of dam management committees

CCAFS can collaborate with relevant organisations/groups and local radio stations to identify and disseminate information needed by the community.

Table 8 lists potential partners for CCAFS in the area.

Table 8. Potential CCAFS partners

ORGANISATION	SPHERE OF OPERATION	ACTIVITIES	STRENGTH
Ministry of Agriculture/KARI	Beyond locality	Agricultural Extension	Technology and crop/livestock variety research and development
World Vision	Beyond locality	Material support	Resource mobilisation
Mulaani Center group	Community	Welfare	Community mobilisation
Jasho	Locality	Production and marketing of agricultural produce	Community mobilisation
Kyemole Poultry Keepers	Community	Poultry keeping and capacity building	Community mobilisation in poultry

Recommendations for major opportunities

Table 9 lists the recommendations for major opportunities that have become evident as a result of this village study.

Table 9. Recommendations for major opportunities

Gaps in knowledge/ current constraints that could provide opportunities/niches for CCAFS and partners	Opportunities for research (CCAFS)	Opportunities for Action Research (CCAFS partners)	Development Interventions (Partners)
Crop varieties that are suitable for the region		X	
Range of crop options that can be grown by the farmers			
Barrier to adoption of other crops	X		
Enhance soil and water conservation since water is the main constraint to farming			X
Rain water harvesting for crop and livestock production			X
Increase the range of agro forestry trees	X	X	
Anti termite trees recommending (<i>acacia albida</i>)			
Build local capacity in Pasture establishment , management and conservation			X
There is a lack of labour to keep goats/seek breeds that can survive/those that can be zero grazed		X	
Make use of the crop residue from the legumes to produce animal feed		X	
Use of water not regulated. Develop the capacity of water managers in the community/hygiene to protect the sources from pollution			X
Increase the number of dams			X

Gaps in knowledge/ current constraints that could provide opportunities/niches for CCAFS and partners	Opportunities for research (CCAFS)	Opportunities for Action Research (CCAFS partners)	Development Interventions (Partners)
Promotion of water harvesting at household and institutions for domestic consumption			X
Hydrological survey to identify ideal spots for dam construction..to guide future developments	X		
Bridges and culverts required on sections of the loose surface			X