Tanzania Summary of Baseline Studies:

Country Report for the GFCS Adaptation Program in Africa

Working Paper No. 124

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

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Abstract

This report reflects upon the consolidated findings from the baseline and scoping studies conducted under the auspices of Global Framework for Climate Services (GFCS) Adaptation Programme in Africa. It identifies gaps in climate information access and use at the local level, type of climate services farmers and pastoralists need in Tanzania, relevant channels to reach farmers with requested services, lead-time and gender specific requirements.

Based on what we learned from farmers and pastoralists in Tanzania during our baseline studies, we provide analysis and recommendations for the production of climate services, delivery at a large scale, determining the adequacy of climate services and improving service delivery. These recommendations intend to inform GFCS project partners' interventions to improve access and use of climate services by farmers and pastoralists in Tanzania.

We find that farmers and pastoralists in Tanzania rely more on their indigenous knowledge and personal experience than on science-based climate information to inform their crop and livestock decisions. Fewer than half of surveyed households in Kiteto and Longido acknowledged receiving climate information (with an even lower proportion in Longido). The most common climate information products currently received are seasonal rainfall onset and extreme event forecasts. Major gender differences emerged between districts; for example, in Kiteto 42% of male-headed households received forecasts versus 38% of those headed by females. In Longido, an area mainly populated by nomadic pastoralists, 42% of female-headed households received forecasts versus 25% of male-headed households. Some challenges to the use of climate information are a lack of trust in forecasts of climate events that do not unfold as predicted, timing, accuracy and the spatial scale of information.

The types of climate services farmers and pastoralists need in Tanzania are as following, ranked by order of importance: onset of rains, expected rainfall over the season, end of rainy season, number of days of rainfall and probability of extreme events. In Kiteto, men and women rank these the same way, while in Longido, men and women have different priorities. For women, forecast of expected rainfall over the season is their first priority (82%), followed by forecast of the start of the rains (59%). However the reverse is the case with men. They ranked forecast of the start of the rains first (63%) and forecast of expected rainfall over the season second (57%).

In all districts, radio emerges as the most important delivery channel. Subsequent to radio, rural women prefer to receive climate advisories and alerts as voice messages on cellphones, while men prefer extension agent visits. 47% of women own a radio while 70% of women

own cell phones. Other non-negligible sources of climate information include visits from government extension workers, NGOs, word of mouth, friends and neighbours.

Promising opportunities for improving climate services include broadening radio coverage, training government extension agents and downscaling climate information. Good radio channel coverage and better-trained government extension agents will enable the delivery of timely and accurate climate services essential for farmers' and pastoralists' agricultural decision-making. Downscaling climate information to render the data location-specific will make the service more relevant and credible for farmers.

It is our hope that these findings will offer valuable insights to the GFCS Adaptation Program in Africa and future projects working to scale up relevant climate services for farmers and pastoralists in the country.

Keywords

Climate Services; Farmers; Pastoralists; Tanzania; ICTs; Radio.

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Acknowledgements

This report consolidates findings from three studies, which CCAFS commissioned in 2014. We acknowledge the work of the World Agroforestry Center (ICRAF) researchers Jeanne Coulibaby, Joash Mango, Godfrey Kundhlande and Martha Swamila who led the baseline studies as part of a CCAFS contract under the GFCS project; Farm Radio International staff Karen J. Hampson, Rex Chapota, Japhet Emmanuel, Sheila Huggins-Rao, Mark Leclair and Kevin Perkins who led the study of rural radio needs in Tanzania; and ICRISAT researchers Dileepkumar Guntunku, VP Sharma and Nilesh Mishra who led the study on the role of ICT-based platforms to scale up climate services for farmers in rural Tanzania. We also wish to thank all of our partners on the GFCS Adaptation Program in Africa for their kind review and inputs to the development of these summary report: Sofie Sandstrom (WMO), Katiuscia Fara and Kaisuleena Rajala (WFP) and Ladislaus Chang'a from the Tanzania Meteorological Agency (TMA).

CCAFS undertook these baseline activities in Tanzania under the auspices and with financial support of the Global Framework for Climate Services (GFCS) Adaptation Programme in Africa. The Global Framework for Climate Services (GFCS) is an international partnership seeking to harness scientific advances and improve the availability, accuracy and use of climate information, which will help society cope with climate change and hazards such as droughts and floods. The GFCS Adaptation Program in Africa aims to increase the resilience of people most vulnerable to the impacts of weather and climate-related events through the development, implementation and evaluation of a joint program for the target countries: Tanzania and Malawi. The program seeks to build integrated frameworks within countries and will support existing initiatives to improve the provision and use of climate services for food security, nutrition and health, and disaster risk reduction. The GFCS Adaptation Program in Africa is funded by a grant from the Government of Norway, and is implemented with technical support from the World Meteorological Organization (WMO).

Contents

Acronyms

CCAFS	CGIAR Research Program on Climate Change, Agriculture and Food Security
FRI	Farm Radio International
GFCS	Global Framework for Climate Services
ICT	Information Communication Technologies
ICRAF	International Centre for Research in Agroforestry (World Agroforestry Centre)
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
NGO	Non-Governmental Organization
WMO	World Meteorological Organization

Introduction

Under the auspices of Global Framework for Climate Services (GFCS) Adaptation Programme in Africa, funded by the Government of Norway, the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) conducted baseline studies to understand the specific need, access and delivery of climate services for farmers and pastoralists in the two target countries, Malawi and Tanzania. This report consolidates findings from the three different studies commissioned by CCAFS in the year 2014 to inform planning of project activities and formulate recommendation for scaling up climate services for farmers and pastoralists in Tanzania:

- What Climate Services Do Farmers and Pastoralists Need in Tanzania? Baseline study for the GFCS Adaptation Programme in Africa (Coulibaly et al. 2015);
- Leveraging the Power of ICTs to Scale Up Climate Information Services in Malawi and Tanzania: Scoping Study for the GFCS Adaptation Programme in Africa (Guntunku et al. 2015); and
- Delivering Climate Services At Scale for Farmers and Pastoralists Through Interactive Radio: Scoping Study for the GFCS Adaptation Programme in Africa (Hampson et al. 2015).

These studies employed a range of methods (Table 1) to capture the climate services needs and access in the pilot sites, and formulate models for delivery channels for tailored climate information.

Summary of Findings

Site Characteristics

In Tanzania the following three pilot sites were surveyed: Kieto and Longido (Fig. 1). As indicated in Table 2, the two sites in Tanzania have different livelihoods and rainfall. In Kiteto the main livelihood of 56.6% of interviewed household is farming, while 33.3% are agro-pastoralists. In Longido, 15% are farmers, whereas 31% are agro-pastoralists. In terms of rainfall, Kiteto has more variable rainfall that Longido since it has different agro-ecological zones. Longido has low rainfall on an annual average.

Table 1: Summary of methods followed in 3 baseline studies.

Needs assessment baseline	Household interviews; Key informant interviews	Survey instruments derived from pilot CCAFS baseline tools to measure the value of climate services for farmers. GFCS partners contributed questions and specific input to adapt the survey to the context of country and needs of the project. A stratified random sampling design including village experiments (to receive the program) and controls (to serve as comparison) was used for the individual household data collection process. Key informants interviews involved a purposive sampling design.
Scoping Study: Rural Radio	Audience research	FRI used non-paper based survey tools – a combination of mobile phones and web-based software called Mobenzi. Enumerators underwent a one-day training on the use of Mobenzi Researcher to collect data via mobile phones.
	Key informant interviews	Small group discussions and workshops with stakeholders to assess current interventions and services related specifically to the use of radio and other ICTs for providing climate services and information. Roles of the identified national level players in relation to climate information services included: content generation, monitoring and dissemination of climate information, research and training, provision of extension and land management services and provision of relief and disaster risk management services.
Scoping Study: ICTs	Desk review	Literature review of good practices in scaling up climate services through ICTs and lessons learned from pilot episodes of delivering climate information in Africa and South Asia.
	Field visit	To validate and confirm the current role of the key organizations identified from the desk review in delivering climate information services for farmers.
	Data analysis	Analyzed the data collected in the field, and confronted them with findings from desk review to achieve a clear picture of current ICT-based climate service delivery in Tanzania.

Figure 1: GFCS pilot sites located in Tanzania.

Table 2: Site characteristics of GFCS pilot sites in Tanzania.

Site	Location	Livelihood strategy (%)		Agro-ecological Zone	Mean annual rainfall (mm)	Rainfall
		Farming	Pastoralism			
Kiteto	Manyara Region	56.6	33.3	Rift Valley Highlands	800-1000	Moderately high
				Semi-arid Midlands	450-700	Moderately low
				Bushed Maasai Steppe	350-400	Short and unpredictable
Longido	Maasailand	15.1	31.9	Semi-arid	300-600	Low rainfall

Rising Food Insecurity

The analysis of the food supply component of food security shows that majority of households interviewed did not produce enough food to meet their food requirement. This was revealed by 56% of the respondents in Kiteto and 78% in Longido (Fig. 2). The same proportions of the interviewees added that food supply has been on a decreasing trend over the years in the two districts (Fig. 3).

Figure 2: Household food supply in Tanzania sites in 2013 crop season, CCAFS baseline survey.

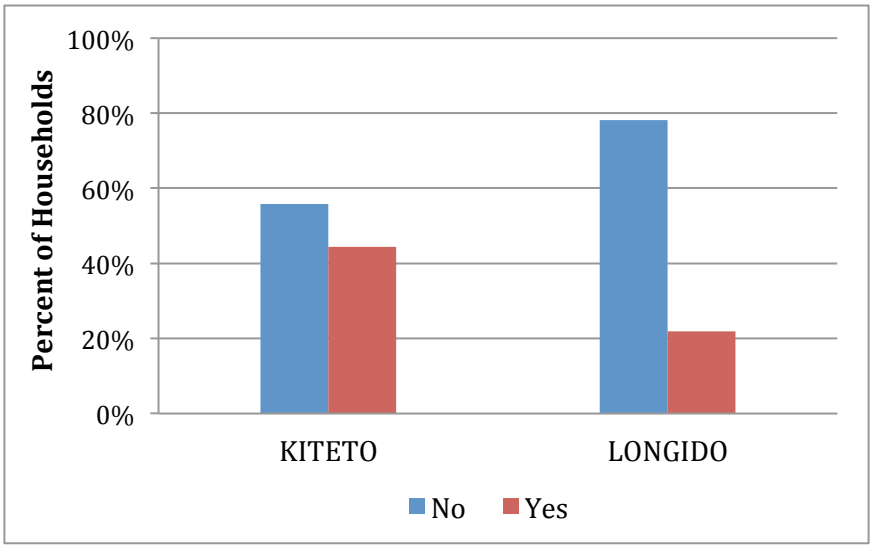
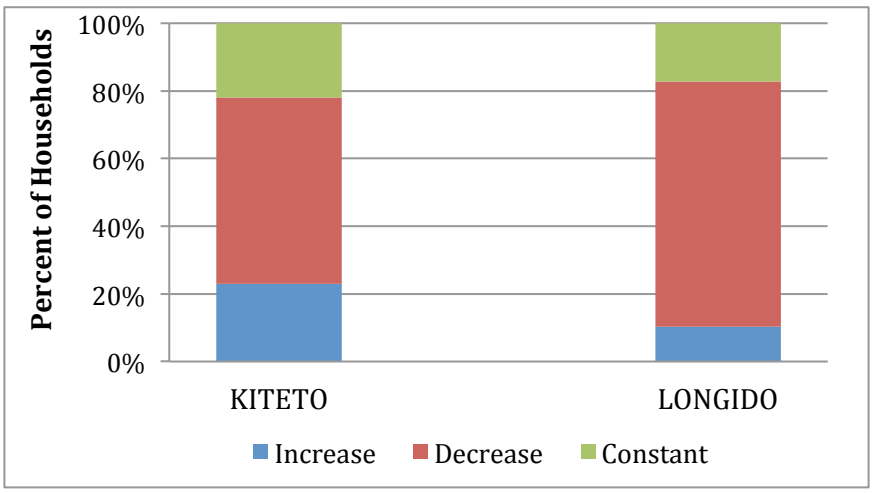


Figure 3: Household food supply trend in Tanzania sites in 2013 crop season, CCAFS baseline survey.



Risks to Agricultural Productivity

In Kiteto and Longido, climate variability and extreme climate events were identified as the key challenges to agricultural productivity by individual households and key informants (Fig. 4). Specifically, drought, pest and diseases were listed as the biggest threats to farmers' livelihood. Almost 40% of the respondents in Longido and 26% of the interviewees in Kiteto have identified drought as their biggest threat. These are also the climate shocks that have affected households over the past 5 years. As a result of drought, many households have lost their cattle because of water and pasture scarcity. Further, depletion and increased pressure over these natural resources have led to some conflicts between pastoralists and peasant farmers as most pastoralists invade crop farms to graze on crops planted, especially pigeon peas. Pest and diseases are largely prevalent in Kiteto, as claimed by 38% of respondents compared to Longido where it was reported by 26% of households interviewed. Key informants have also corroborated drought, pest and diseases as major constraints to agricultural production in Kiteto (Fig. 5). However, in Longido, key informants have identified drought as the main threat to agricultural production and lack of inputs as the second.

Figure 4: Top 5 risks that jeopardize livelihood activity according to households, CCAFS baseline survey.

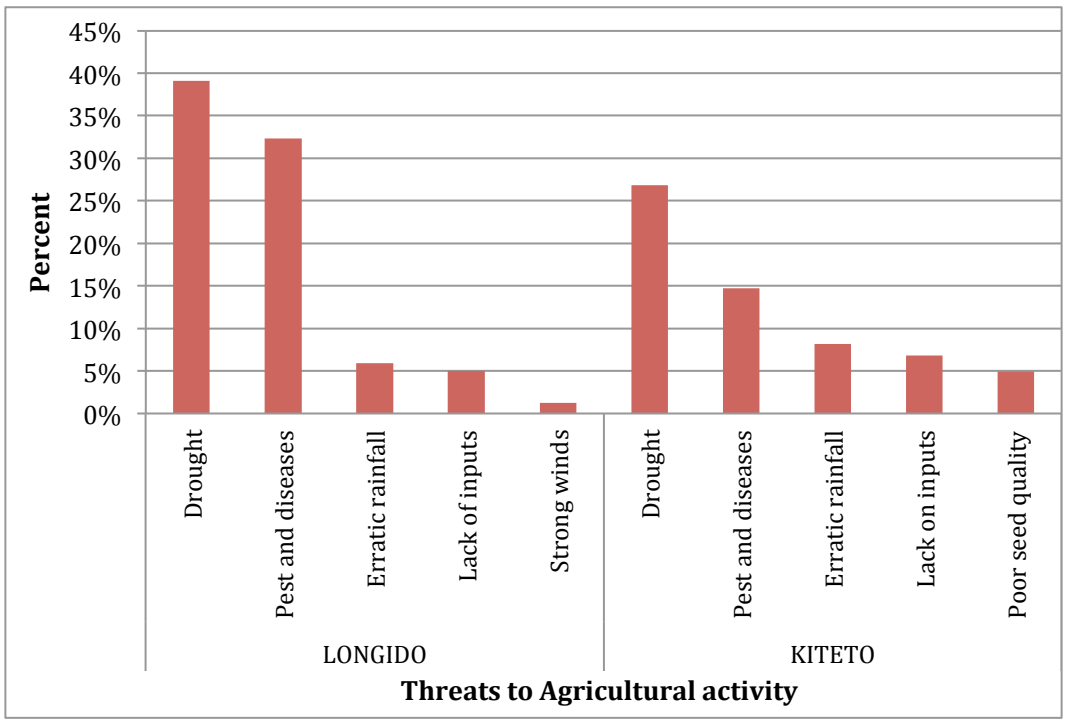
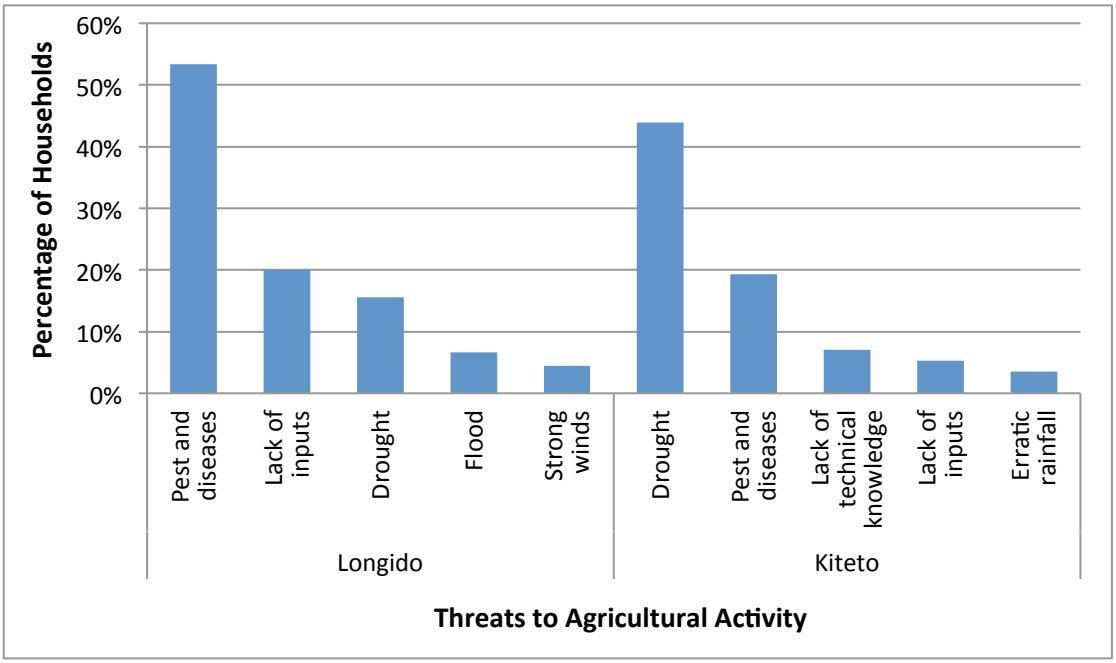
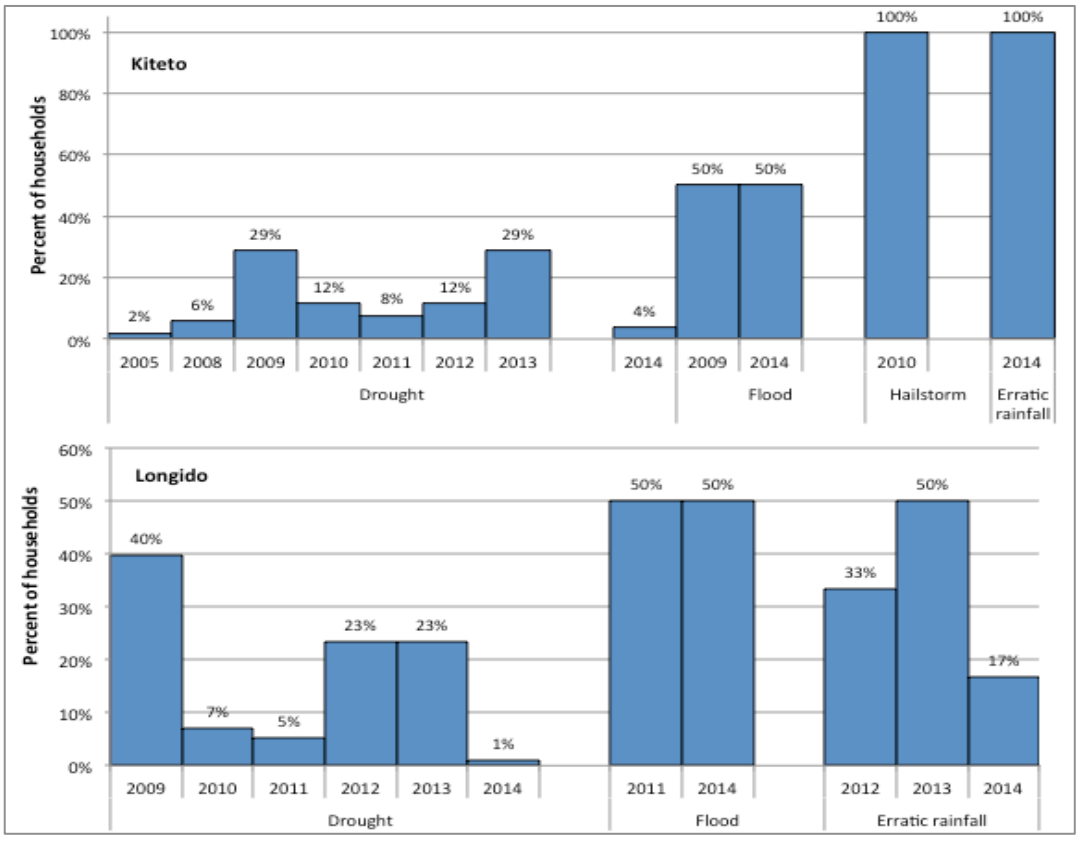


Figure 5: Top 5 risks that jeopardize livelihood activity according to key informants, CCAFS baseline survey.



In addition to these risks, farmers and pastoralists in Tanzania also indicated that major climate shocks in the past 5 years have been erratic rainfall, hailstorms, floods and droughts. Kiteto and Longido mostly faced erratic rainfalls, hailstorms and floods.

Figure 6: Climate shocks that have affected households during the last 5 years, CCAFS baseline survey.



The primary impact of the shocks in Kiteto was a decline in crop yield, which often led to food insecurity in the household. In Longido, drought and flood often resulted in the death of animals, as reported by 55% to 100% of the respondents. Erratic rainfall led to several impacts including decline in crop yield, food insecurity and loss of assets, equally reported by 25% of respondents (Fig. 7).

When faced with food shortage, many households interviewed in Kiteto (39%) failed to cope (Fig. 8). Those who adopted some coping strategies preferred to sell their assets, particularly livestock, as declared by 26% of the respondents in Kiteto and 63% in Longido. Livestock is indeed a major household asset used to cope with food insecurity. The other most popular coping mechanism was the purchase of food, reported by 23% to 27% of the respondents in the districts. The staple foods consumed in Kiteto and Longido were sorghum and maize. These foods were consumed almost every day in Kiteto and at least 4 times a week in Longido.

Figure 7: Impact of climate shocks experienced in the last 5 years, CCAFS baseline survey.

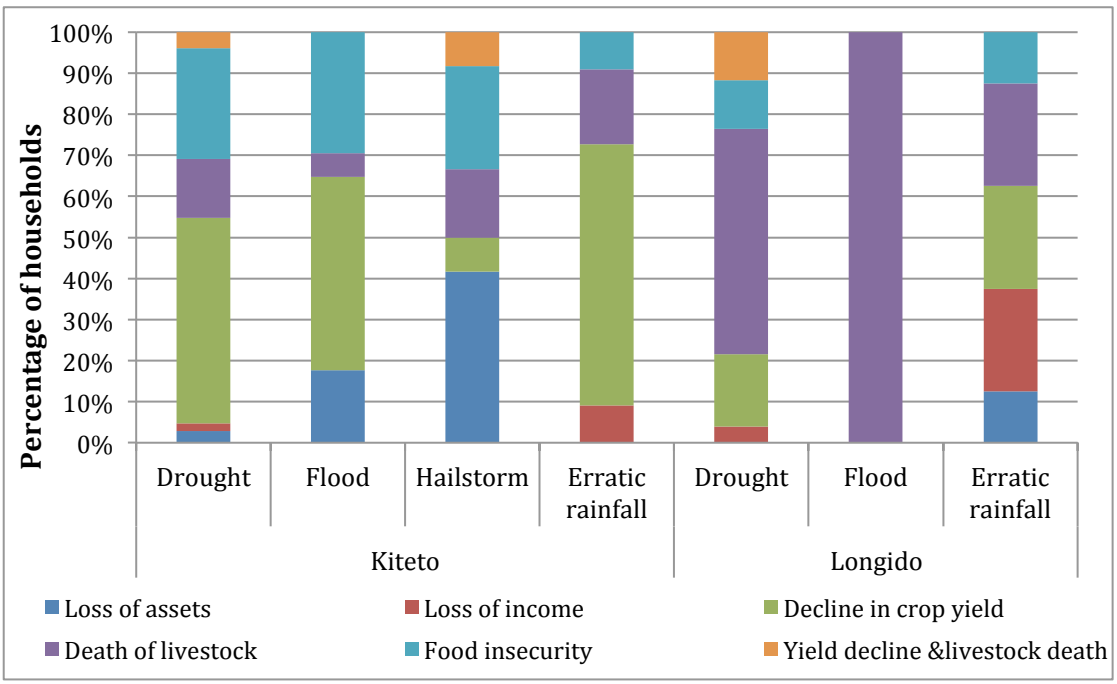
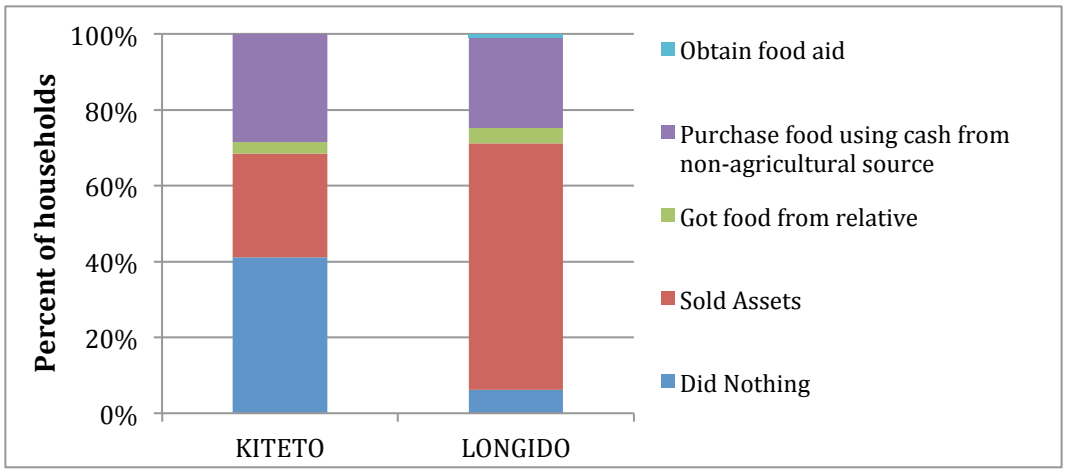
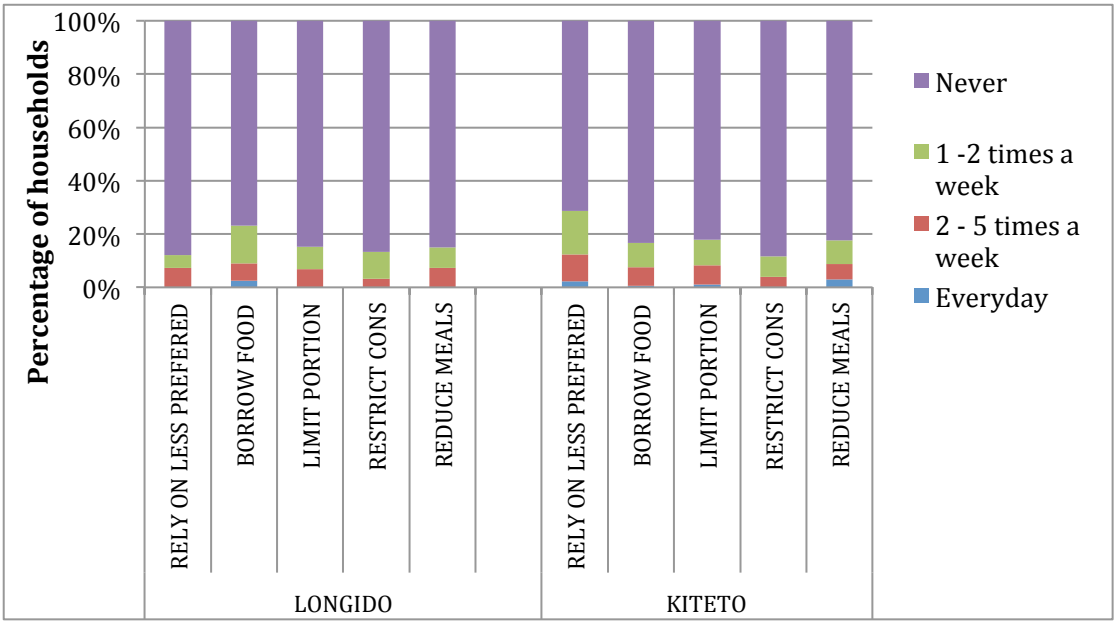


Figure 8: Strategies households adopted to cover the gap in food supply, CCAFS baseline survey.



Reliance on less-preferred food and a reduction of the number of meals per day were the most common strategies adopted in Kiteto. In Longido, households preferred to borrow food or rely on help from relatives. The frequencies of the short-term food measures across the districts are reported in Fig. 9.

Figure 9: Frequency of food shortage coping strategies undertaken by households, CCAFS baseline survey.



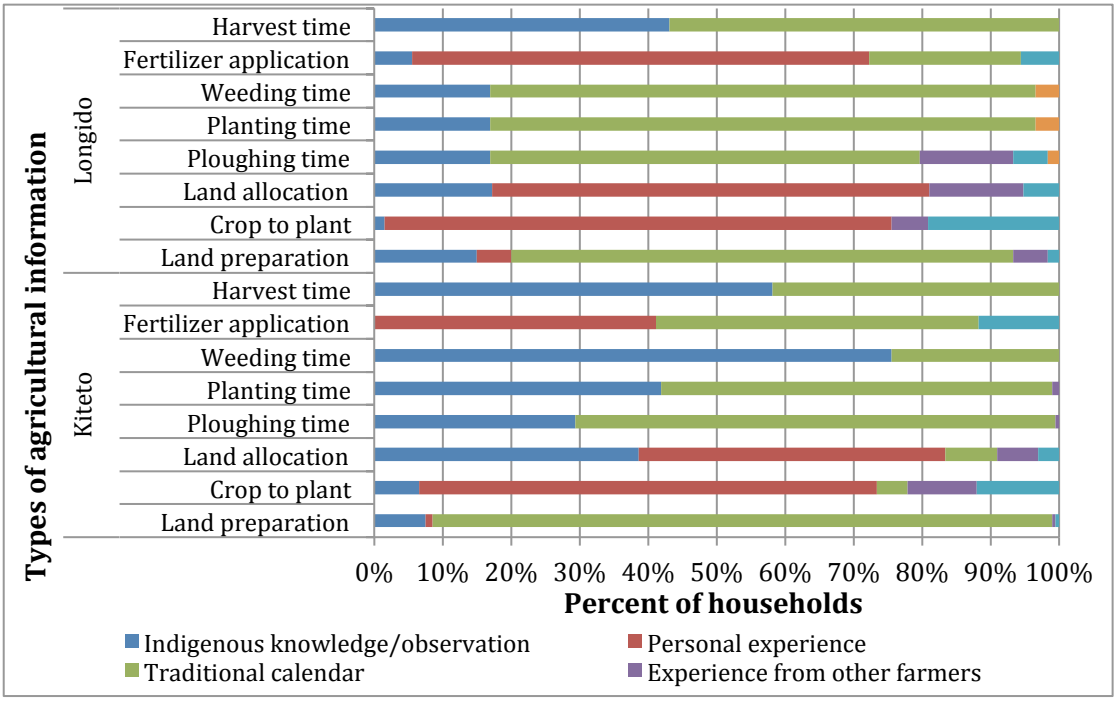
Local Gaps in Climate Information Access and Use

The sources of information households have been using over the last 3 years to inform their agricultural decisions are reflected in Fig. 10. These findings can be used to monitor changes in the types of information households will be using over the course of the project and whether the relative importance of these information has changed overtime. The sources include climate forecast, extension agents, indigenous knowledge, observations, personal experience, traditional cropping calendars and advice from agricultural experts.

In both districts, farm households relied on the same types of information to inform their agricultural decisions (Fig. 10). Land preparation was informed, in more than 70% of cases, by the traditional calendar. Generally, land preparation occurred from September to December. Decisions on the types of crop to plant were primarily based on personal experience. On average 75% of households interviewed used the seeds from the previous season since improved seeds are not always available and farmers stick to the crop varieties that are adapted to their climatic conditions. At least 80% of the respondents relied on indigenous knowledge and personal experience to guide their land allocation decisions. They based their decisions on priority crops such as maize and sunflower. Two-thirds of the respondents relied on their traditional calendar (October to December) to know the right time to plough the land. Planting time was informed by traditional cropping calendars (on average 60%) and indigenous knowledge (on average 30%). When guided by their traditional calendar, farmers usually plant in December/January.

Similarly, for pastoralists, indigenous knowledge followed by personal experience are the most frequent sources of information to inform their livestock decision making in Tanzania (Fig. 11). In Kiteto and Longido, extension agents' advice is only taken for vaccinating livestock. Some pastoralists in Kiteto take the advice of other farmers in order to decide where to graze the livestock.

Figure 10: Source of information for crop decision making, CCAFS baseline survey.



State of climate information access and use in 2014

Less than 50% households in Tanzania acknowledged receiving climate information. The two most common types of climate information received by households interviewed are the forecasts for extreme events and seasonal rainfall onset. Forty-three percent of male household heads in Kiteto and 23% in Longido reported receiving information on forecasts of extreme events while 38% of women in Kiteto and 36% in Longido acknowledged receiving this type of information (Fig. 12). Forecast of the onset of the rain is reported by around 40% of the interviewees in both the districts. Seasonal rain forecast is the third most received type of climate information. Households less frequently receive daily weather forecasts, and forecasts of pests and disease - less than 10% of the respondents reported receiving this information.

Figure 11: Source of information for livestock decision-making, CCAFS baseline survey.

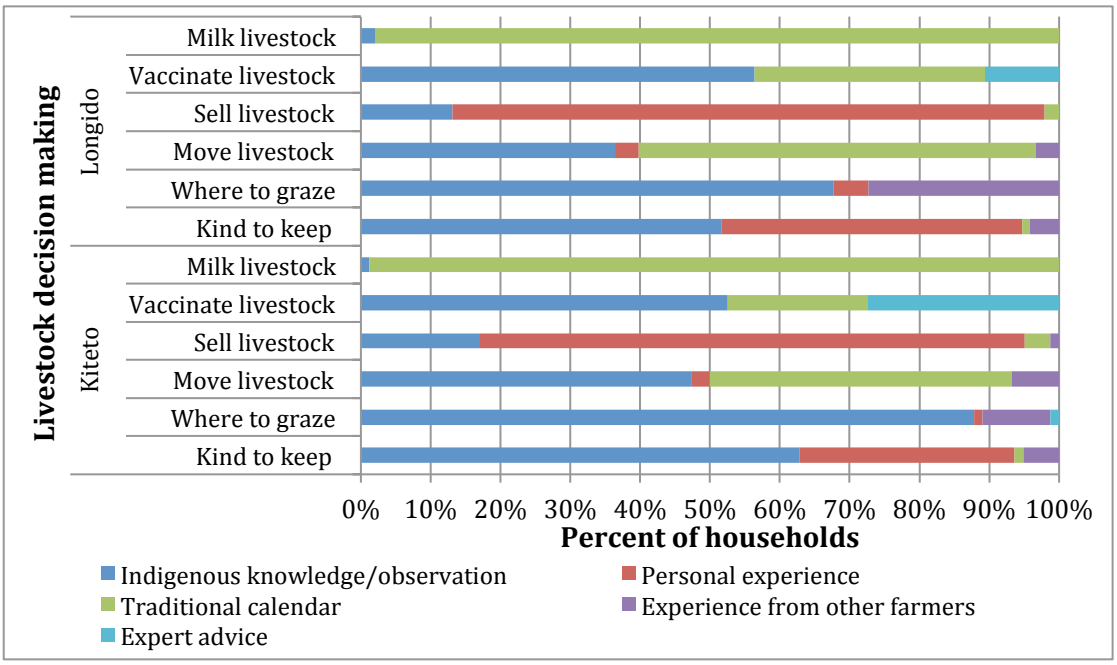
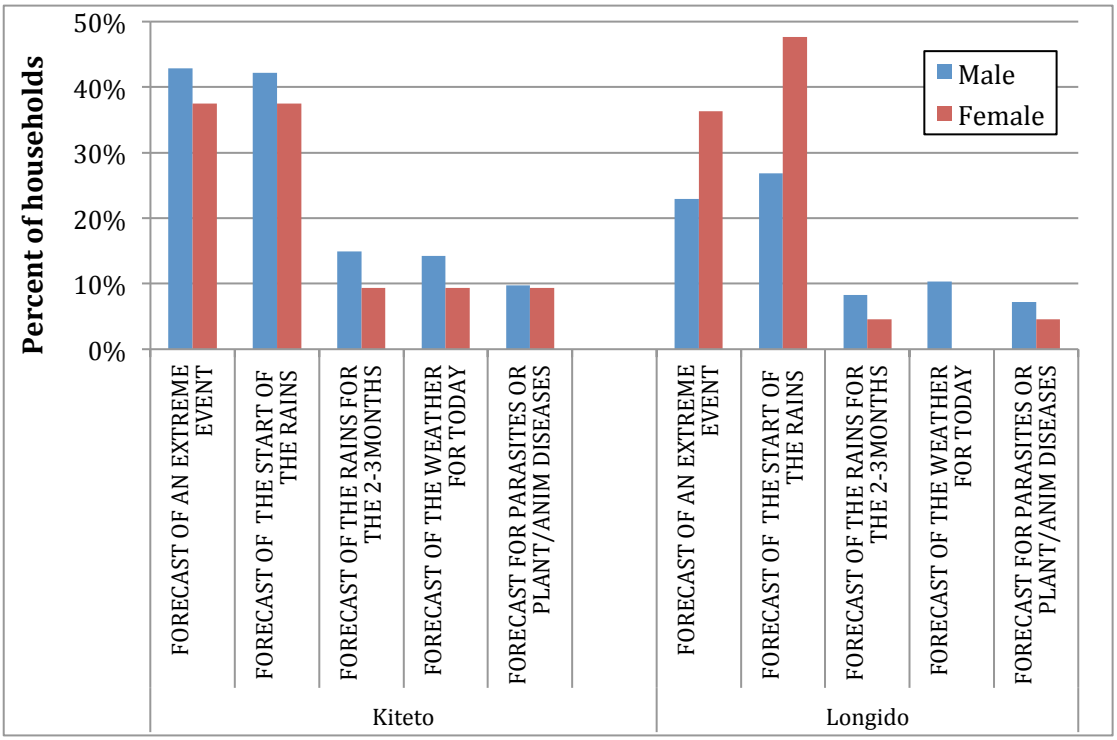


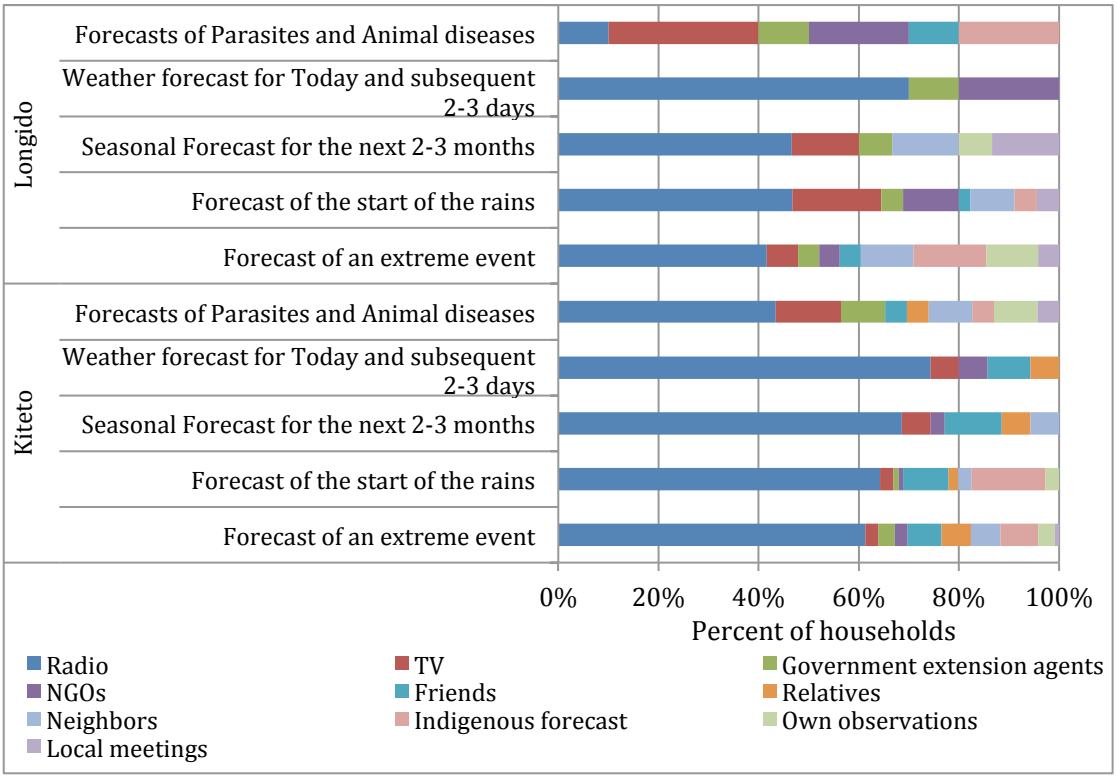
Figure 12: Current climate information received by households, CCAFS baseline survey.



Communication channels currently used to reach farmers

Regardless of the type of information, radio is the most common source of external climate information in Kiteto and Longido. On average, 65% of the respondents in Kiteto and 45% in Longido declared receiving seasonal forecasts for the next 2-3 months, for the start of the rains and for an extreme event on radio. Most respondents (70%) obtained daily weather through radio. Forecast of parasites and animal diseases is the type of climate information least frequently received on the radio. Only 10% of the respondents in Longido and 43% in Kiteto declared receiving this information on the radio. Television is the second most frequently cited source of information on pest and diseases. 13% of the respondents reported getting pest and disease forecasts from this source. Other non-negligible sources of climate information include government extension workers, NGOs, friends and neighbors (Fig. 13).

Figure 13: Current sources of climate information received by respondents, CCAFS baseline survey.



Lead time

The most cited lead-time households and key informants reported for receiving climate information was months ahead of the forecasting event, except for daily weather forecasts, which are received days to hours before the event.

Figure 14: Lead times of climate information currently received by the respondents, CCAFS baseline survey.

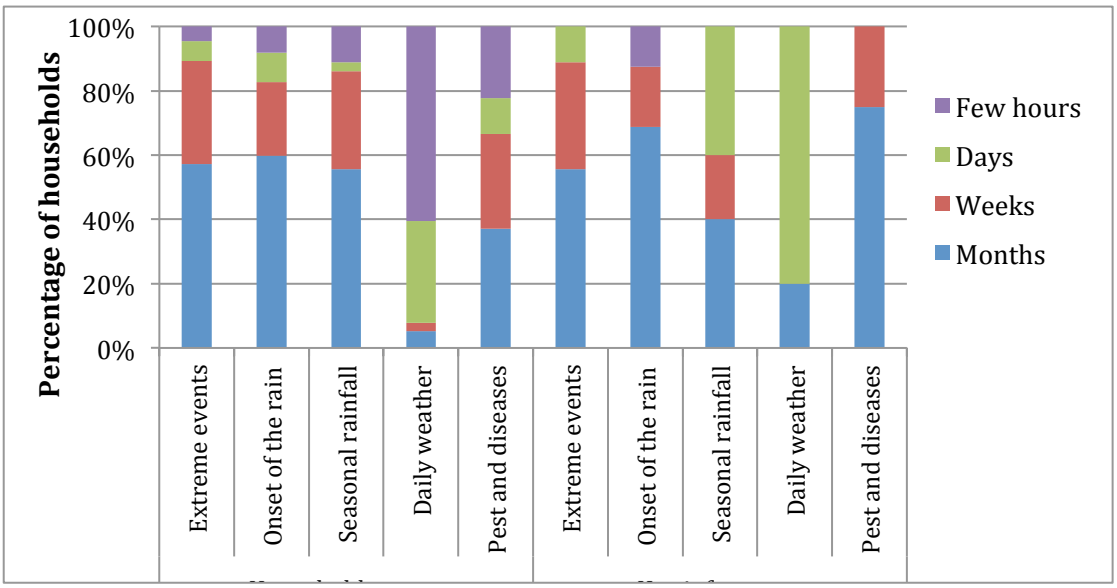
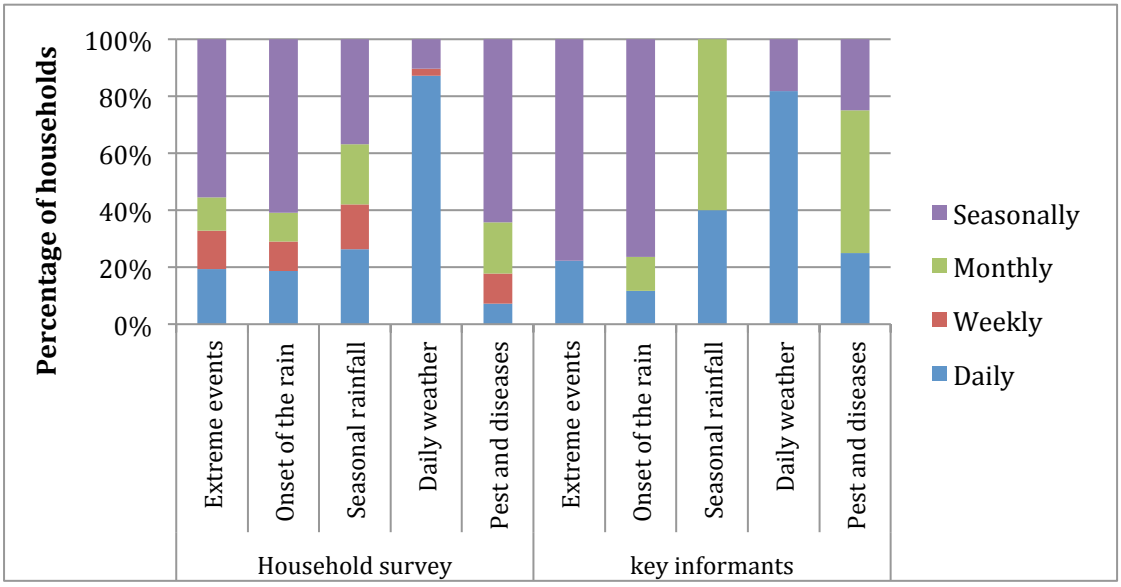


Figure 15: Frequencies of climate information currently received by the respondents, CCAFS baseline survey.



Is climate information received with advice?

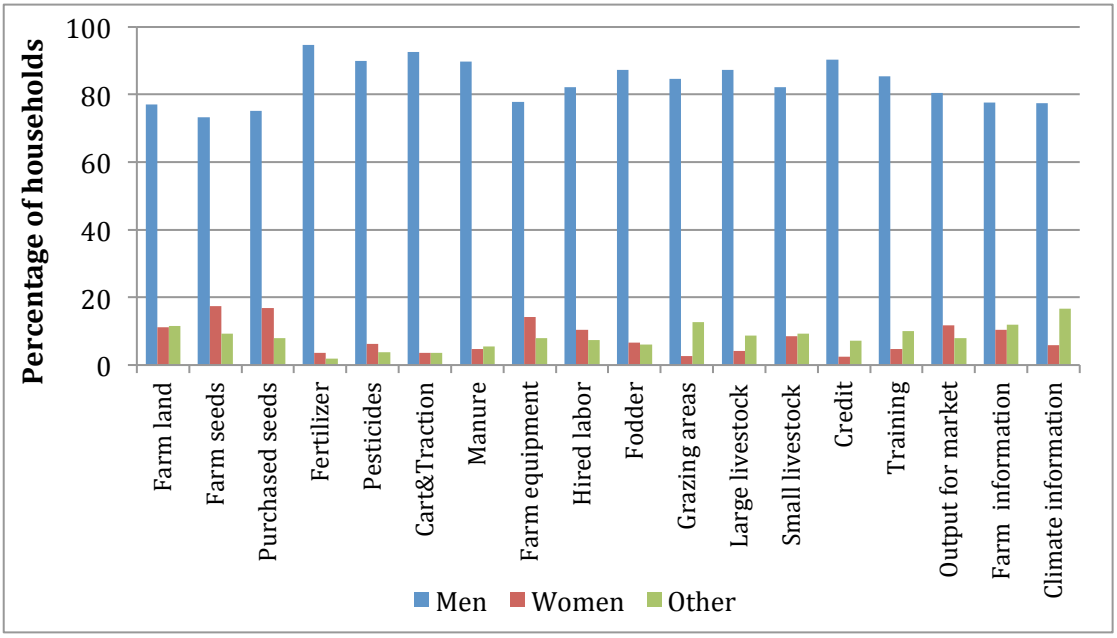
Overall, less than half of the households interviewed in Kiteto and Longido who had access to climate information reported that climate information was received with advice (Table 8 in Tanzania Baseline report). Farmers and pastoralists are not generally advised on how to cope with the forecasted climatic condition. The percentage of women claiming this fact is more

than that of men, except for the forecast on extreme events and onset of rainfall. When climate information is delivered with advice, the majority of respondents (more than 60%) reported not being able to use the advice, with the exception of forecasts on the onset of rainfall. On average, women are less able to use the advice associated with climate information since they have poor control over agricultural resources.

Control of agricultural resources within households

It is observed that women's control over agricultural resources within households surveyed in Tanzania is negligible. Only 11% of women reported owning the farmland, while around 9% have control over the seeds. About 4% of women participate in agricultural trainings in Tanzania.

Figure 16: Women's control of agricultural resources within households, CCAFS baseline survey.



Climate information use in 2014

Farmers and pastoralists rely mostly on their indigenous knowledge and personal experience to inform their crop and livestock decision-making. Scientific climate information such as rainfall onset and forecasts on extreme events are often perceived as unreliable because the experts' forecasts do not always unfold as predicted. As a result, they hardly trust these forecasts. Another likely reason is that as the demographic results have stressed that most of the respondents in Kiteto and Longido have no, or only primary school, education. Hence, scientific probabilistic forecasts and the uncertainty concept may not be comprehended very clearly for them to rely on this information in their decision-making. Furthermore,

disseminated climate information is barely associated with advice, which constrains the usefulness of the information.

Climate Services Needed

Types of information

In all districts, seasonal rainfall outlook, onset of rains, extreme weather events, end of the rainy season and number of days of rainfall are the five most important types of climate information farmers would like to receive. However, the relative importance of these types of information for men and women diverges slightly. In all districts, forecasts on onset of rainfall is reported as the most important type of climate information for farmers and pastoralists.

In Kiteto, men and women rank of this information of equal importance. Forecasts of the start of the rains and of expected rainfall over the season are their first and second choices as reported by an average 86% and 76% of the respondents, respectively, regardless of the gender.

In Longido, men and women have different priorities. For women, forecast of expected rainfall over the season is their first priority (82%) followed by forecast of the start of the rains (59%). However the reverse is true with men, who ranked forecast of the start of the rains first (63%) and forecast of expected rainfall over the season second (57%).

Figure 17: Types of climate information that farmers and pastoralists wish to receive, CCAFS baseline survey.

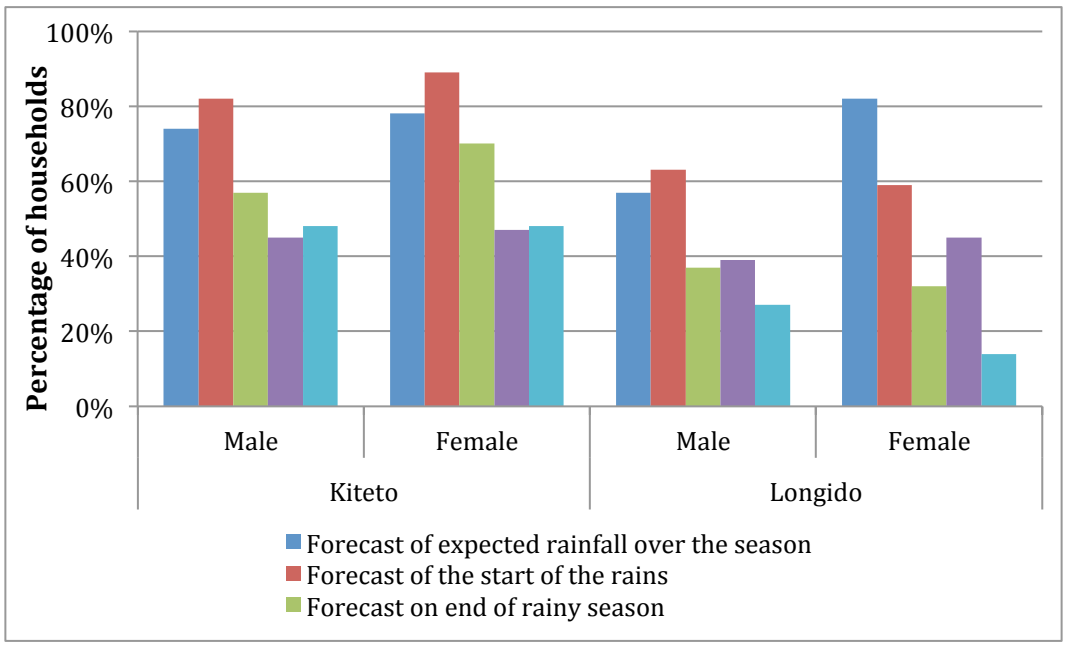
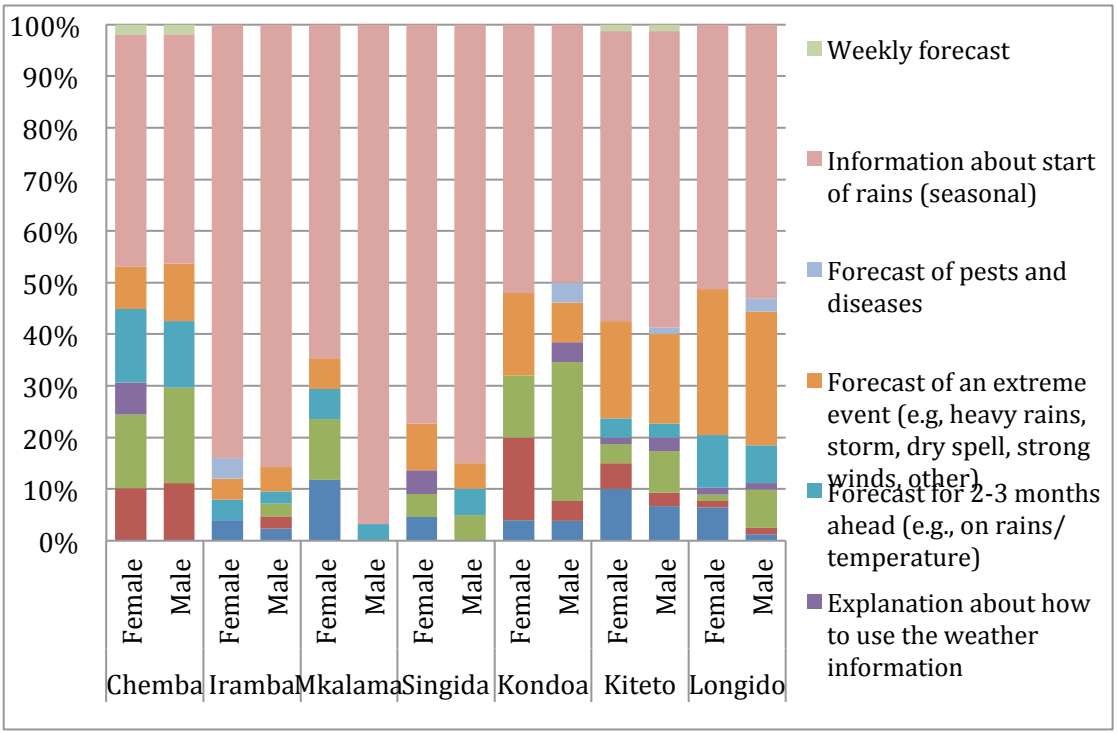


Figure 18: Type of weather information needed in general (n=655). Farm Radio Scoping Study.



Desired lead time

Men and women reported the same preferences for lead-time in Kiteto. An average of 43% of both female and male respondents across districts would like to receive the climate information at the beginning of the agricultural season. The second most preferred lead-time is "a month before forecasting event" and "as soon as forecasters know," as reported by an average 25% of respondents in Kiteto. 8% of the interviewees selected "a week before the forecast event" as their third preferred lead-time to receive the climate information.

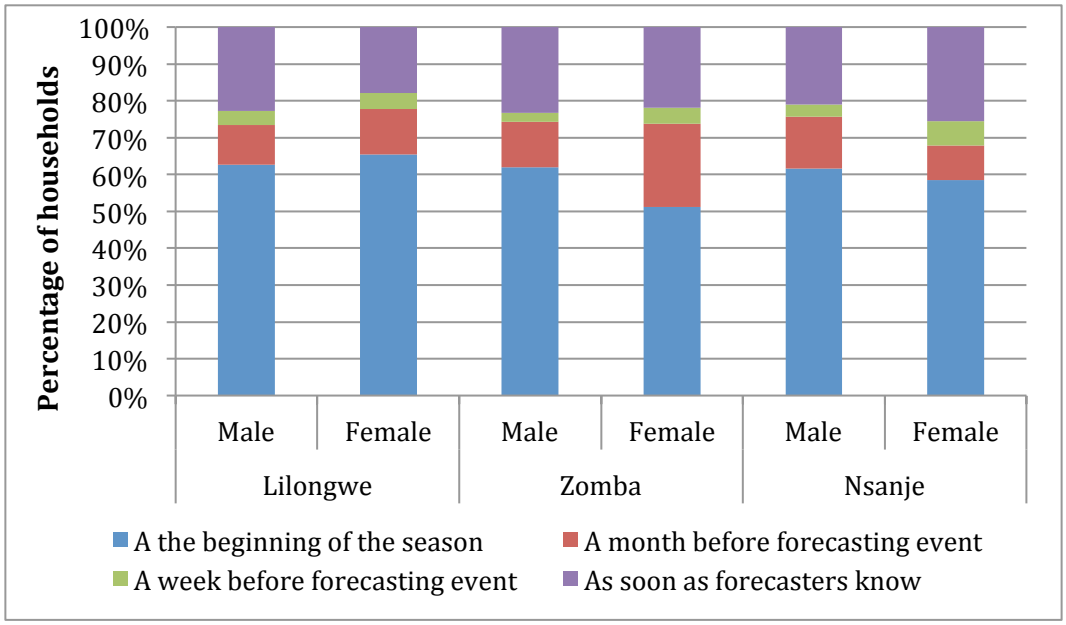
In Longido, men and women prefer having climate information "at the beginning of the season" with an average of 32% respondents. The second most preferred lead time reported by around 30% farmers is " a week before forecasting event". "A month before forecasting event" is the third preferred lead-time by men and women in Longido. (Fig. 19).

Communication channels

The format under which farmers and pastoralists would like to receive climate information varies significantly across gender surveyed in the same district. In Kiteto, radio message is the preferred format selected by 37% of male household heads. Visits from government extension agents are their next choice (22%). Word of mouth is the third most preferred format (12%) for men. Female household heads, on the other hand, selected voice message in cell phones as

their first choice (21%). Then following closely were village communicators (19%). Government extension agents' visits ranked third (13%). Other relatively important formats preferred by about 11% of females include radio message, SMS and word of mouth.

Figure 19: Lead times farmers and pastoralists wish to receive climate information, CCAFS baseline survey.



In Longido, radio message (28%) is also the preferred format for men. Word of mouth (24%) and extension agents' visits (17%) are their second and third preferences. The most preferred formats for female household heads interviewed in Longido are, by order of importance, village communicator (24%), radio message (18%) and extension agents visits (15%). As seen in the results above, although the formats preferred varied substantially across gender in a same district, gender preferences are almost identical across districts.

Ownership of cell phones is higher than radio in Kiteto and Longido. 79% of men and 58% of women reported owning a cell phone in Kiteto, while 86% of men and 82% of women have cell phones in Longido. These high figures suggest phenomenal cell phone penetration in Tanzania.

Figure 20: Format preferred to communicate climate information, CCAFS baseline survey.

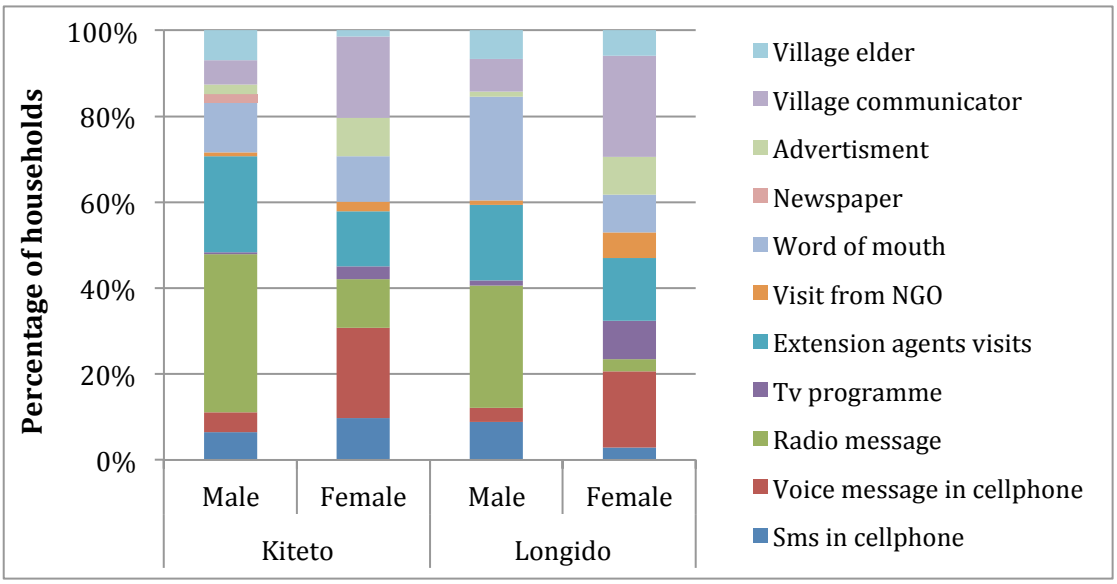


Figure 21: Most important sources of weather and climate information (n=625). Farm Radio Scoping Study.

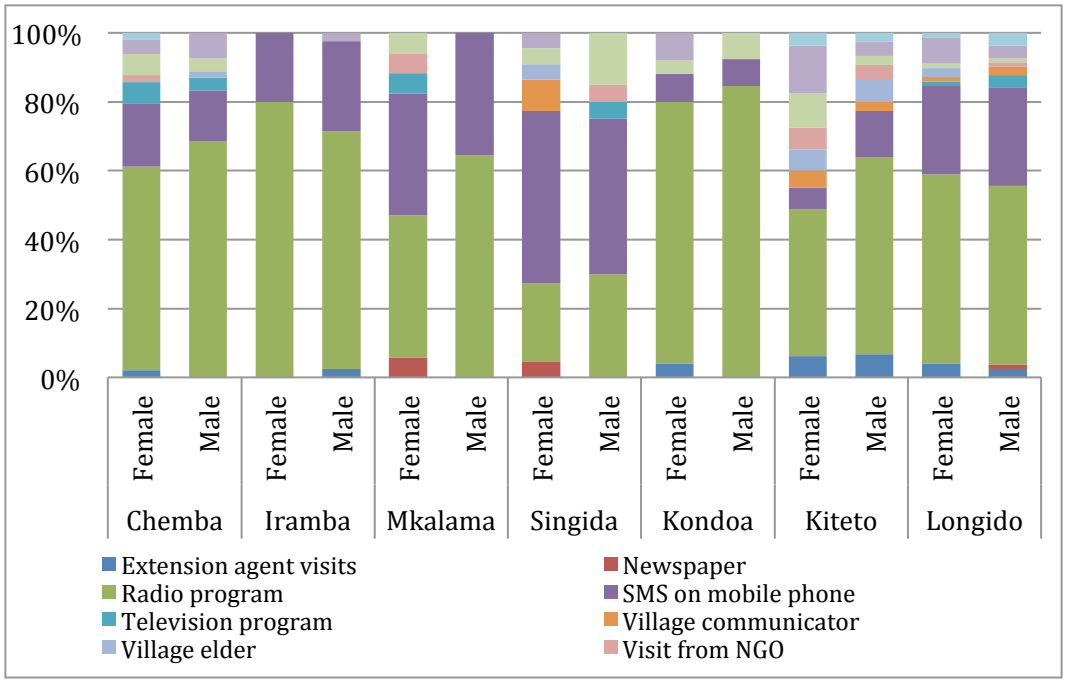


Figure 22: Households' communication asset ownership by district, CCAFS baseline survey.

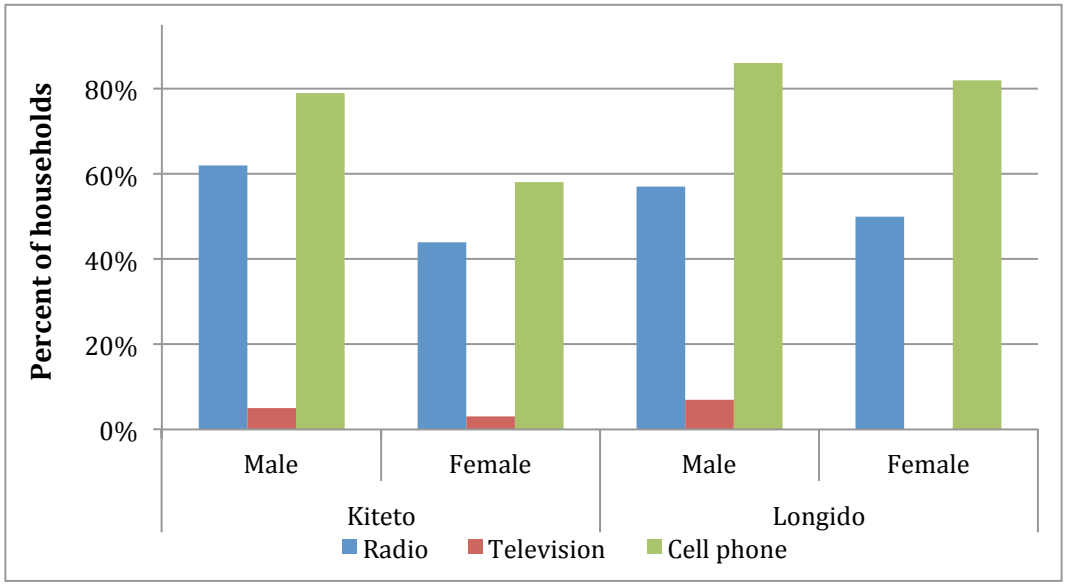
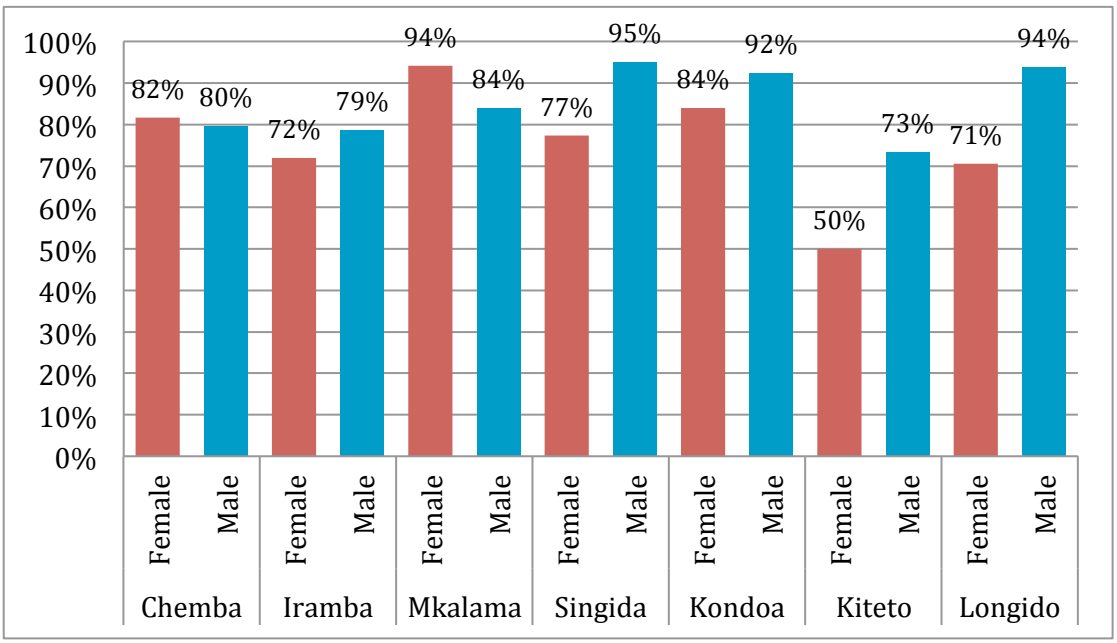


Figure 23: Ownership of mobile phone. Farm Radio Scoping Study 2014.



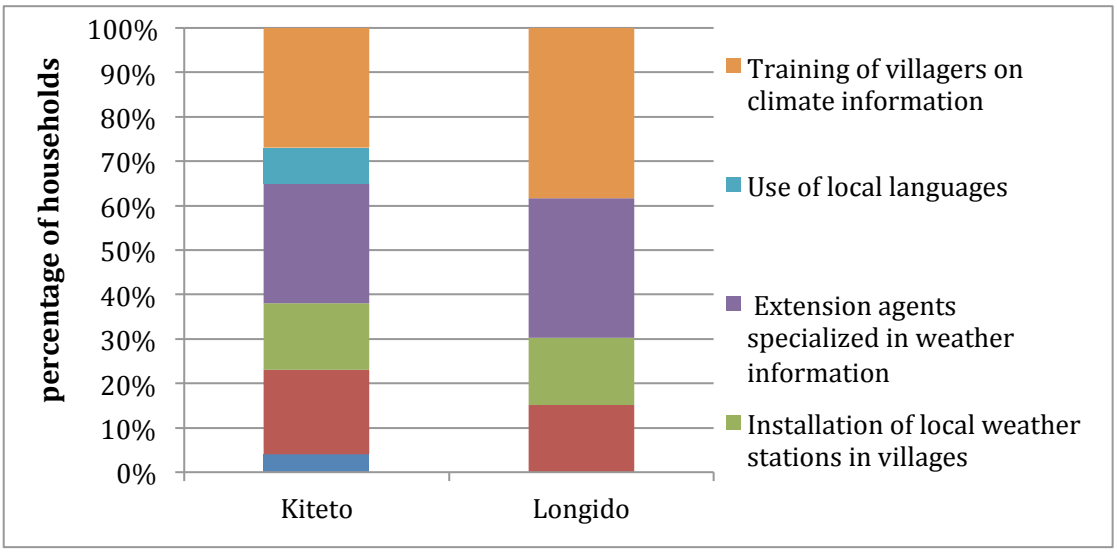
Ways farmers want climate communication improved

In both districts key informants suggest training extension agents (30%). As a result, local extension workers with expertise in climate information will understand the context of decision making and will be able to communicate climate information with agricultural advice relevant to their farming activities. The second most important method of communicating

climate information is identified as capacity building of farmers on climate information (27% in Kiteto, 38% in Longido), which will enhance understanding of the probabilistic nature of climate information and enable farmers to rely on this information in their decision-making.

Further, establishing a reliable communication network and downscaling climate information through the installation of local weather stations are suggested as important strategies to communicate climate information (according to 20% of the respondents in each district). Farmers acknowledged that downscaling climate information would ensure delivery of information useful for their local agricultural activities. Other ways include use local languages, brochures and posters (<10% in Kiteto).

Figure 24: Ways key informants suggested communicating climate information, CCAFS baseline survey 2014.



Conclusion and Recommendations

Several key insights can be derived from this analysis and inform the design of climate services activities in the districts targeted. First, it is essential to integrate indigenous knowledge with scientific climate forecasts to enhance the relevance of climate information for local communities. Second, investments in good radio channel coverage is critical to underpin the effective delivery of climate information at large scale, as most rural households in Tanzania currently have access to climate information through radio. Third, using cell phone messages and relying on village leaders are important ways to reach women with climate information. Fourth, good training of government extension agents in understanding climate forecasts and relying on these agents to deliver the information will be critical to communicate climate information to farmers, and especially to women. Fifth, getting timely

and accurate climate services is essential for these services to be useful to farmers and pastoralists for agricultural decision-making. Finally, downscaling climate information to be location-specific will make the service more relevant and credible for farmers.

The analysis also supports several recommendations for improving the supply, delivery, and iterative feedback and improvement of climate services in Tanzania.

To improve the supply of useful services, first, co-produce climate services with farmers, and integrate indigenous knowledge with scientific climate forecasts to enhance relevance of climate information for local communities. Second, ensure timely delivery of accurate climate services, which is essential for these services to be useful to farmers and pastoralists for agricultural decision-making. Finally, downscale climate information to render it location specific, and make the service more relevant and credible for farmers.

To improve the delivery of climate information and advisories, first, invest in good radio coverage. This is critical for the delivery of climate information as most households have access to climate information through radio. Second, diversify communication channels. This includes leveraging the power of ICTs (cell phones voice messages and reliance on village leaders) to reach all farmers with climate information, including women. Third, train government extension agents in understanding climate forecasts, and rely on these agents to deliver the information.

Rigorous evaluation of climate services is a requirement for improving the usefulness of the services. Conduct post-season reviews to capture farmer feedback on received services. Lastly, continue to track climate information access and use at the local level, and note changes against the baseline.

It is our hope that these findings will offer valuable insights to the GFCS Adaptation Program in Africa, and future projects working to scale up relevant climate services for farmers and pastoralists in Tanzania.

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