

# **Evaluation of Climate Services Interventions in the GFCS Adaptation Programme for Africa**

## **Beneficiary Assessment Final Evaluation Summary Report**

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Report prepared by Statistics for Sustainable Development and Cramer-Njihia Consultants for the World Food Programme and CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS)

# **Stats4SD**

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## Acronyms

CCAFS	CGIAR Research Program on Climate Change, Agriculture and Food Security
CICERO	Centre for International Climate and Environmental Research
CMI	Chr. Michelsen Institute
DCCMS	Department of Climate Change and Meteorological Services (Malawi)
FCS	Food Consumption Score
FFA	Food for Assets
FRI	Farm Radio International
FRT	Farm Radio Trust
GFCS	Global Framework for Climate Services
GFCS-APA	GFCS Adaptation Programme in Africa
ICC	Intra-cluster correlation
ICRAF	World Agroforestry Center
ICT	Information and communications technology
IFCR	International Federation of Red Cross and Red Crescent Societies
IWCARP	Interactive Weather and Climate Adaptation Radio Programming
M&E	Monitoring & Evaluation
MNREM	Ministry of Natural Resources Energy and Mining (Malawi)
MoAIWD	Ministry of Agriculture, Irrigation and Water Development (Malawi)
NACDC	National Agricultural Content Development Committee (Malawi)
ODK	Open Data Kit
P&R	Planning and Review
PICSA	Participatory Integrated Climate Services for Agriculture
PPI	Progress out of Poverty Index
PPS	Probability proportional to size sampling
PTD	Project Delivery Team
R4	Rural Resilience Initiative
SSD	Statistics for Sustainable Development
TMA	Tanzania Meteorological Agency
ToC	Theory of change
ToT	Training of Trainers
UoR	University of Reading
VSL	Village savings and loans
WFP	World Food Program
WHO	World Health Organization
WMO	World Meteorological Organization

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## Executive Summary

The GFCS Climate Services Adaptation Programme in Africa (GFCS-APA) was implemented at national, sub-national, and local levels in Malawi and Tanzania to improve climate services, food security, nutrition and health, and disaster risk reduction by increasing the resilience of people most vulnerable to the impacts of weather and climate-related events. The food security component was co-led by the World Food Programme (WFP) and the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) working in partnership with National Meteorological Services and agriculture ministries, with support from University of Reading, Farm Radio Trust (Malawi) and Farm Radio International (Tanzania). This report presents the findings from an evaluation commissioned by WFP and CCAFS of the interventions within the food security component. It provides a synthesis of information from a quantitative survey that collected data on the impact of the interventions on the beneficiaries combined with information from qualitative interviews that provided a more in-depth view of the participants' experiences and the processes of change. This evaluation focuses on interventions implemented in one district of Malawi (Balaka) and three districts of Tanzania (Kiteto, Kondoa, and Longido). The interventions were (1) trainings of participants in an approach known as Participatory Integrated Climate Services for Agriculture (PICSA), (2) interactive radio programmes providing short-term weather forecasts and agricultural advisories, and (3) an SMS component offering weather forecasts and agricultural advisories along with on-demand services. In Balaka, Malawi, a portion of participants also were beneficiaries of an ongoing WFP rural resilience (R4) programme. The beneficiaries of the initiative (more than 3,000 individuals in Balaka, Malawi and more than 10,000 across the three Tanzania districts) were mainly crop and livestock farmers with some engaged in other livelihood activities as well. The evaluation included quantitative surveys (n = 804) and in-depth qualitative case studies (n = 32).

The survey asked respondents which elements of PICSA they used in their decision making before and during the season. While each topic was reported as used by typically about 70-80% of the respondents, those topics that were most used in all the districts (by nearly 100% of respondents) were the seasonal calendar and the historical climate information. In Balaka, Malawi and Kondoa, Tanzania, the training on crops and varieties was also used by nearly all respondents. Livestock and livelihood options was also a highly-used topic in Longido.

For the interactive radio component in Malawi, 84 listening groups were established/strengthened and equipped with a radio set each. Fifty-seven percent of all survey respondents in Malawi reported listening to the radio programme, and of these, 99% used the information for decision-making. In Tanzania, the radio programming was only available in Longido district, where 40.8% of survey respondents reported listening to it. Of those who listened, 97.2% used the information presented through the radio programming for decision making.

Slightly more than a quarter of survey respondents in Malawi reported receiving SMS weather services on their mobile phones. All of them used the information for decision making, and 92.3% of them said it lead to better decision making. In Tanzania, the SMS component was used only to remind people to listen to the interactive radio programmes to avoid overlap with an existing SMS effort led by the Tanzania Meteorology Agency.

In Malawi, 97.2% of respondents reported making changes to their crops, livestock or livelihoods from one season to the next, while 52.1% of respondents in Tanzania reported changes. There are, however, substantial differences between the three districts in Tanzania: 70.4% of respondents in Kiteto and 67.6% in Kondoa made changes, but only 8.1% of respondents in Longido reported any

changes. Overall, 97.5% of the changes made were influenced by at least one of the programme components (PICSA, interactive radio or SMS services).

Survey respondents were asked what changes they had made and what contributed to their decisions to make those changes. Of those that reported planting a new crop variety, 94.1% attributed that change to the PICSA training, 44.4% reported that the radio programme had contributed to the change, and 8.9% said the SMS service had contributed.<sup>1</sup> Based on information from the qualitative interviews, the most commonly mentioned outcome in Malawi was increased yields, both from maize and from other crops. This outcome was attributed by the respondents to the adoption of hybrid seed, the use of mulching, and the practice of conservation agriculture. Several respondents also reflected on their improved livestock management practices as a result of messages received through the radio programme and the SMS service. After receiving information via radio and SMS, many of the respondents now vaccinate their livestock regularly and consult with a veterinary officer in the case of sick animals.

Of the Tanzanian survey respondents that reported making a change to a crop variety, 100% agreed that the PICSA training contributed to their decision to make that change. In 97.5% of the cases where respondents planted a new variety in the season following the training, they said it had a positive effect on their household, and 98.3% would plant the variety again. The positive effects of planting a new variety reported by respondents were that the household had more food than before (91.5%), the respondent was better able to cope with bad years caused by weather (38.5%), and the household had more income than before (70.1%). As in Malawi, the most commonly mentioned outcome during the case study interviews from the changes in practices was increased crop yield for maize, sunflower, and pigeon pea. This resulted in having more food for the household and the sale of surpluses, which boosted household income.

Survey respondents in both Malawi and Tanzania were asked whether they shared any of the information received with other community members. In Malawi, 85.3% of respondents said they had shared at least a portion of what they learned in the PICSA training with other people within or outside their household, and this number was 88.2% in Tanzania. On average, a PICSA-trained beneficiary in Tanzania shared PICSA training content with 26 other people, and in Malawi, a PICSA-trained beneficiary shared content with 16 other people.<sup>2</sup> While the evaluation did not elaborate on the content shared, it is safe to assume that some knowledge on PICSA training content has been shared with others by those who attended the trainings.

In regards to gender, there were no significant differences in training levels between men and women as found by the survey. There is evidence that women used the training activities more frequently for their planning and decision making than men. When it comes to perceptions and opinions about PICSA, a higher proportion of men than women feel that their household has benefited from the training. For example, 92% of men compared to 74% of women say that the decisions they made because of the training improved their household's income situation, and 81% of men compared to 64% of women said they have been better able to provide for their household's healthcare as a result of the training.

The quantitative survey responses and the qualitative case studies offer evidence of intangible benefits of the training beyond the visible practice changes made. In the survey, large proportions of respondents reported seeing agriculture as more of a business following the PICSA training (79.9% in

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<sup>1</sup> The total is greater than 100% because more than one response was possible.

<sup>2</sup> These averages included people who were trained and did not share the content with anyone.

Tanzania and 91.9% in Malawi). The case study interviewees reported this perception as well and also stated that the interventions had changed their ways of thinking and made them more curious to seek out information from their extension workers and other sources on how to improve their agricultural practices.

Overall, survey respondents in the targeted districts made tangible changes to their agricultural practices and livelihoods, which resulted in positive impacts on their lives. Respondents reacted positively to the PICSA trainings, with more than 90% reporting that it had made them more confident in planning and making decisions about their farming and livelihoods, and were also appreciative of the interactive radio programmes and SMS component. The initiative's theory of change appears to hold true based on the results of the evaluation. Those respondents who received all of the intervention components in Balaka (including participation in the R4 programme) achieved positive impacts in their household food security and incomes, although it is not possible from the results of this survey to quantify the impacts and evaluate if they are on a greater scale than non-R4 participants. It is not possible to statistically test the hypothesis that all of the components together result in better outcomes, but within the qualitative case studies we can see evidence that access to credit through village saving and loan groups encourages the ability to purchase agricultural inputs without the need to work as a casual labourer on other people's land.

In general, the types of changes made by participants and the magnitude of people implementing such changes are impressive, especially in light of other development interventions that often do not achieve such significant levels of adoption. The benefits of bringing together extension workers, national meteorological services, and other partners to increase the capacity of vulnerable, food insecure community members to use climate information products for improving their livelihoods is clearly evident.



## 1. Introduction

The Global Framework for Climate Services (GFCS) is a UN initiative established in 2009 and coordinated by the World Meteorological Organization (WMO). The purpose is to guide the development and application of science-based climate information and services in support of decision-making for agriculture and food security, health, disaster risk reduction, water and energy. One of the first initiatives funded under the GFCS was the “Climate Services Adaptation Programme in Africa”, supported by the Norwegian government and implemented in Malawi and Tanzania. A broad consortium of partners, including the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS), the World Food Program (WFP), WMO, and others<sup>3</sup>, began implementation in 2014 for a period of 3 years. Following a no-cost extension the programme will finalize all activities in May 2017.<sup>4</sup>

The GFCS Climate Services Adaptation Programme in Africa (GFCS-APA) has been working at national, sub-national, and local levels in the two countries to improve climate services, food security, nutrition and health, and disaster risk reduction by increasing the resilience of people most vulnerable to the impacts of weather and climate-related events. The food security component was led by WFP and CCAFS. During implementation, CCAFS partners and other organizations were contracted to support work under the food security component, based on needs identified by communities in the target districts. Contracted partners included the University of Reading, which trained intermediaries (government extension workers, NGO field staff, and Red Cross volunteers) to work with community members using the Participatory Integrated Climate Services for Agriculture (PICSA) approach<sup>5</sup>; and Farm Radio Trust (Malawi) and Farm Radio International (Tanzania) who were brought on board to help in the delivery of interactive radio programmes and SMS services containing climate information and agricultural advice, and several local partners in each country. The work built on prior CCAFS investment in the development of PICSA (Dorward et al., 2015) and interactive climate services radio programming (Perkins et al., 2015); and WFP investment in the R4 Rural Resilience Initiative. Throughout this report, we will refer to the activities carried out under the food security component of GFCS-APA as the ‘initiative’.

Other components of the programme were carried out by other consortium members in close partnership with CCAFS and WFP. The project represents a real collaboration across many project activities. National level dialogues and capacity building efforts have been used to strengthen the ability of the meteorological services in each country to make historical climate data available for local level work and to produce the needed downscaled forecasts that play an integral role in climate services. The national ministries of agriculture and their extension services have also been engaged so that appropriate advice for community members can be included with the weather forecasts.

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<sup>3</sup> Other partners to the Adaptation Programme in Africa are the Centre for International Climate and Environmental Research (CICERO), Chr. Michelsen Institute (CMI), International Federation of Red Cross and Red Crescent Societies (IFRC), and World Health Organization (WHO).

<sup>4</sup> The programme was initially scheduled to end in December 2016 but was extended several times by the donor as requested by WMO (coordinating) and partners. The activities of the food security component were finalized in March 2017.

<sup>5</sup> PICSA was developed by researchers at the University of Reading and has been used in eleven countries globally.

Under the food security component, CCAFS and WFP supported many innovations that were implemented in the GFCS-APA. In addition, climate services activities were integrated into the WFP Rural Resilience Initiative (R4), already under implementation in Balaka District, Malawi when the GFCS-APA started to maximise impacts of interventions.

As the GFCS-APA was coming to an end, WFP and CCAFS commissioned an evaluation to determine the effects of specific activities implemented under the food security component of the project (strengthening capacities of intermediaries at district level, interactive radio programming and SMS), resulting in this report. The evaluation was conducted by two independent organizations working in conjunction, Statistics for Sustainable Development (SSD) and Cramer-Njihia Consultants. The evaluation consisted of two parts: Part I, understanding the interventions, and Part II, a beneficiary assessment. Part I laid the groundwork for Part II by determining the status of activities involved in the programme and creating a theory of change and impact pathway. This report serves as the final output from Part II and draws on data from a quantitative survey that collected data on the impact of the interventions on the beneficiaries combined with information from qualitative interviews that provided a more in depth view of the participants' experiences and the processes of change. The theory of change for the interventions drafted in Part I is presented in Section 3 of this report and was used to help inform the design of the quantitative survey that was conducted.

### Scope of the evaluation

A comprehensive monitoring and evaluation (M&E) system for climate services programmes should involve four components: (1) *science assessment* to examine how information is produced, its quality, whether it is tailored to user needs, and the extent of any dialogue between beneficiaries and met services; (2) *assessment of information and its flow* for tracking how information was disseminated; (3) *institutional assessment* that investigates how institutions collaborated to produce climate information and whether a project or product is scaled up; and (4) *assessment of use and impact of information on the end user* that focuses on the end of the impact pathway to assess how beneficiaries receive and use the information (Tall and Njinga, 2013).

The current evaluation of the food security component of the GFCS-APA that WFP and CCAFS have requested from SSD and Cramer-Njihia is focused on the fourth component of beneficiary (end user) assessment (see Appendix 1 for evaluation terms of reference). The goal was to assess the extent to which beneficiaries were aware of the intervention, the way they used it and whether they benefited from it. We acknowledge that the other components (science assessment, assessment of information and its flow, and institutional assessment) are equally important and should be assessed by the programme partners in addition to this commissioned evaluation. For the purposes of this report, however, we will focus on how the programme participants received and used the climate services provided, and what impacts this may have had on their lives and livelihoods. Data from the quantitative survey and in depth information from the qualitative interviews are analysed in tandem and presented along with existing baseline data or other available information.

## 2. Description of programme activities

### Baselines conducted

Some of the first activities to take place under the Adaptation Programme for Africa were baseline studies in each country. CCAFS, through its partner the World Agroforestry Center (ICRAF), conducted baseline studies on access to climate services in both Malawi and Tanzania from

September to October 2014. In Malawi, the baselines were conducted in the districts of Lilongwe and Nsanje because that is where the Malawi Red Cross was planning to work, and in Zomba. After conducting the baseline in Zomba, however, WFP and partners decided to postpone implementation in that district to avoid overlap with a similar World Bank project that was being planned. Balaka district was not included in this initial baseline, although it became the focus of activities as described below. The full baseline survey results for Malawi are presented in CCAFS Working Paper 112 (Coulibaly et al., 2015a). In Tanzania, the baselines were conducted in Kiteto and Longido districts, where WFP and the Red Cross were planning interventions. The survey results are presented in CCAFS Working Paper 110 (Coulibaly et al., 2015b). Kondo district was not included in the Tanzanian baseline, although activities have been conducted there subsequently, as described below.

The baselines contained two components: a household questionnaire for collecting quantitative data and a key informant interview guide for qualitative data collection. Within the household questionnaire, there were six main topics: 1) household assets and risk to agricultural productivity, 2) the general sources of information on agriculture, 3) the specific sources of information on climate, 4) the use of climate information and the perceived impacts, 5) gendered access to climate information and finally, and 6) impact of climate services use on crop/livestock production and food security. The key informant interview guide was designed to collect additional information generated from the individual households' interviews but through open-ended questions. Topics included community risks, sources of information on climate and agriculture, communication of climate information, and gender and access to climate information (Coulibaly et al., 2015b).

In addition to the baselines conducted by ICRAF, a radio scoping study was carried out from October to December 2014 by Farm Radio International (FRI) under the direction of CCAFS. The survey included audience research, for which 655 people were interviewed in the same three districts of Malawi as the ICRAF baseline, and 625 people were interviewed in seven districts in Tanzania, including Kiteto and Longido. Focus group discussions, key informant interviews, and workshops with stakeholders were also conducted. The audience research survey asked questions regarding respondents' access to radio, frequency of listening, listening habits, mobile phone ownership and use, trusted radio stations, and preferred programming types. It also collected information on access to weather forecasts via radio and how they are used, the type of weather information needed, people's preferred information sources, and use of climate information for agricultural decision making. The results from both countries are presented in CCAFS Working Paper 111 (Hampson et al., 2015). A baseline for the WFP Rural Resilience Initiative (R4) was conducted by WFP in Balaka in 2015 and that formed the basis for the monitoring of R4 activities in that district, including those related to climate services.

### Original plans and completed activities

The first half of 2014 was planned as an inception phase for the entire programme to get underway and achieve buy-in from national governments and other local partners. The CCAFS baselines and radio scoping study were implemented in the second half of 2014. The interventions began in Kiteto in 2014 and expanded to other districts by 2015 and were designed on the basis of national workshops undertaken under the coordination of CCAFS and WFP. They were each led by a different partner or set of partners under the coordination of WFP and/or CCAFS. First, the component of PICS Training of Trainers (ToT) for intermediaries (mainly extension workers) was introduced by

CCAFS and was led by the University of Reading team that have developed the approach with logistics, coordination and facilitation support for the trainings from WFP, and subsequent trainings were delivered to community members by intermediaries with financial support from WFP. Second, the radio and ICT component was coordinated by WFP and led by Farm Radio Trust (FRT) supported by the Met Service in Malawi and by Farm Radio International (FRI) in Tanzania. Third, an ICT-based activity involving an SMS and Beep4Weather service was also led by Farm Radio Trust in Malawi with assistance from the Malawi Department of Climate Change and Meteorological Services (DCCMS) for the provision of weekly forecasts and other partners such as the Ministry of Agriculture Irrigation and Water Development (MoAIWD) for provision of agricultural advice. In Tanzania, Farm Radio International worked with the Tanzania Meteorological Agency (TMA) to provide a similar Beep4Weather service.

PICSA is an approach designed to “facilitate farmers to make informed decisions based on accurate, location specific, climate and weather information; locally relevant crop, livestock and livelihood options; and with the use of participatory tools to aid their decision making” (Dorward et al., 2015; 4). The PICSA Training of Trainers (ToTs) were conducted by researchers from the University of Reading, key in-country CCAFS and WFP staff and staff from the TMA and DCCMS. People trained included mostly government extension officers from the district who currently serve communities in the target districts, NGO staff and Red Cross volunteers. Capacity building is key to PICSA, with emphasis placed on building the capacity of the national meteorological services, extension workers, and other partners to continue training trainers and providing other supporting services (historical climate data, downscaled forecasts, etc.) with the idea that over the long term the training can eventually be run entirely in country without external support. More about the approach and its theory of change is provided in the next section.

The radio programmes, integrated with ICT activities, were implemented by FRT and FRI, and these organizations worked together with local radio stations to train radio staff, develop, design and broadcast a 30-minute interactive radio programme with information tailored to local agricultural needs. The radio stations were selected as a result of the radio and ICT scoping studies that were carried out in each country. During those studies, respondents were asked which stations they listen to most and where they would prefer to hear such a programme, helping guide the selection of which station to use. In addition, the radio programmes also offered opportunities for listeners to call in and provide feedback. This component has also involved the formation of radio listening groups to increase access to the radio programmes and spur discussions and sharing of information within communities in the target district. In both countries, there is also an SMS and recorded message service, described below.

There are several different target populations for activities under the food security component of the initiative. While the end users of the climate information are vulnerable, food insecure communities whose livelihoods mostly rely on pastoralism and farming, the intermediaries who are trained (mostly extension workers but also some staff of non-governmental organizations working in the areas) are also users of the information in their outreach work, as are other district based non-governmental organisations and government departments such as the health sector and agriculture sector. In addition, within the communities reached, people practice different types of agriculture, benefitting from the weather, climate information and agriculture advice delivered to them through the different platforms. In Tanzania, the intermediaries trained work with pastoralists and mixed

crop-livestock farmers because the target districts have a range of agro-ecological zones. In Malawi, beneficiaries are mostly mixed crop-livestock farmers.

Two major changes were evident from the programme’s original plans and the activities as implemented. First, the districts in which the baselines were conducted do not match exactly with where the interventions were carried out. In Malawi, the intervention districts were not completely agreed upon before the baselines were implemented, and although the districts covered in the ICRAF baseline were Lilongwe, Nsanje, and Zomba, the majority of the activities that were implemented in 2015 took place in another district, Balaka (Figure 1).

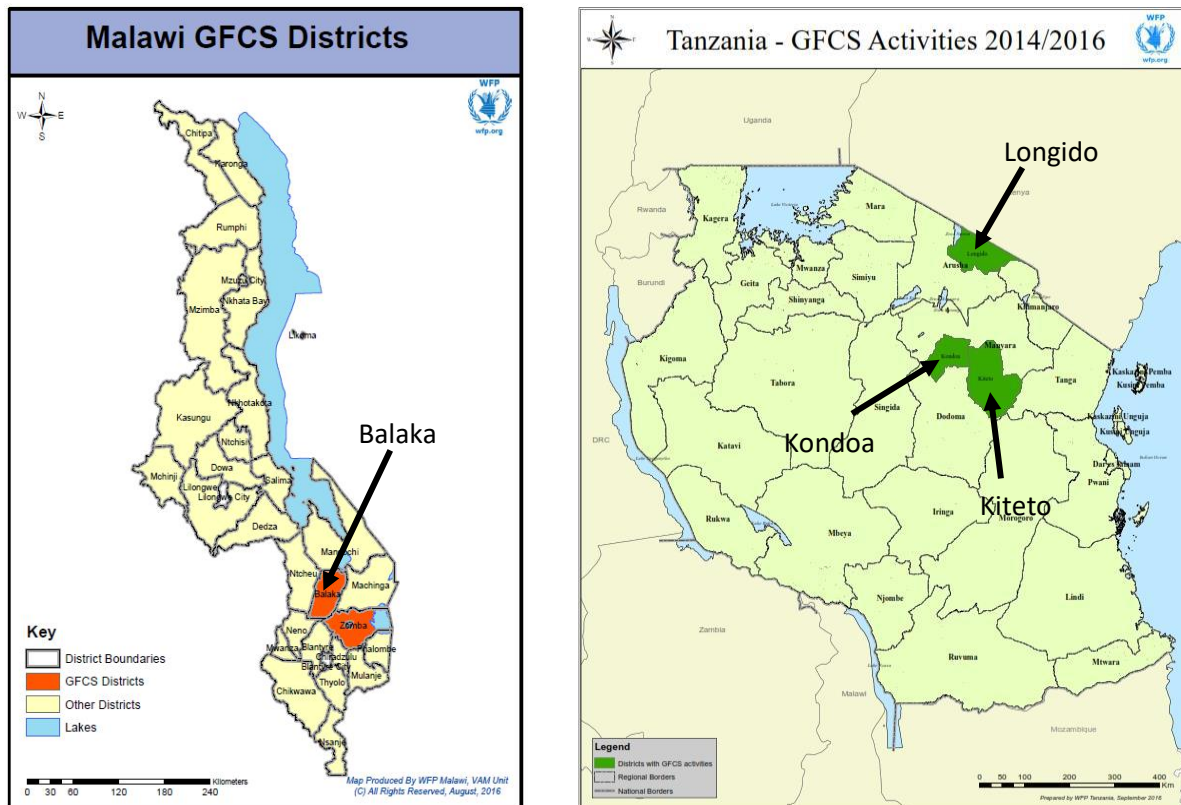


Figure 1. Map of districts included in this evaluation

Activities in 2016 also included trainings of trainers in a second district of Malawi (Zomba), but that district was not included in this evaluation because the community members who have been trained would not have experienced a full growing season since implementing changes and therefore would not be able to fully evaluate the impacts of the initiative on their livelihoods. The shift in intervention districts occurred after discussions within the GFCS-APA Project Delivery Team (PDT) members. WFP shifted its focus intervention area from Zomba to Balaka District to avoid overlaps with a World Bank Shire River Basin programme in Zomba. The food security component of the initiative was implemented in Balaka district for Year 1 and 2. In Year 3 (2016), the extension worker training component was scaled up to Zomba district. Although the radio and ICT scoping study covered Balaka, there was no baseline conducted in Balaka by ICRAF/CAAFS as was done in Lilongwe, Nsanje and Zomba, which would have formed the basis for monitoring activities under the initiative. WFP has since set up an integrated monitoring process – integrating climate services activities into

the R4 monitoring methodology – to aid monitoring of these. WFP carried out an R4 baseline in Balaka district in 2015, in the same area where the initiative was implemented.

In Tanzania, the baseline districts of Kiteto and Longido have been the locations for much of the work, but interventions have also taken place in the district of Kondoa. Kondoa was not covered in the ICRAF baseline but it was included in the radio scoping study. The shift to Kondoa was discussed and agreed at PDT level and took place because WFP's five-year plan includes more of a focus on drier areas, such as Kondoa and integration in ongoing operations is key to ensure longer term sustainability of climate services activities. It should be noted, however, that even though two of the Tanzanian districts are the same for the baselines and the activities, the exact locations in which intermediaries chose to train beneficiaries may overlap very little or not at all with the locations from which households were selected for the baseline. It is possible that none of the respondents in the baseline survey subsequently received the interventions because the plan of interventions was not clearly established prior to the baseline being conducted.

The second change in planned versus actual activities is the addition of a component known as Planning and Review (P&R) days starting with the 2015/16 season. After the first year of implementation of PICSA it was decided by WFP, CCAFS, and UoR that it would be beneficial, after conducting ToTs, to conduct a follow-up session with participants. This would help collect information on how the trainings went with participants and to provide refreshers for any topics that were deemed challenging. In addition to providing refreshers on the PICSA method, the inclusion of P&R meetings meant that ToTs could be held longer before the season and that the P&Rs could introduce the actual seasonal forecast for that season and how to train community members to interpret and use it.

### Activities in Malawi

In terms of PICSA, there were four ToTs in Malawi, two in July 2015 (Balaka district) and two in July 2016 (Zomba district). A total of 148 intermediaries (80 in Zomba and 68 in Balaka) were trained in those four sessions. The intermediaries trained succeeded in training 105 farmer groups across Balaka, Nsanje, and Lilongwe<sup>6</sup>, and 96 groups in Zomba. This has resulted in a total of 3140 community members trained by intermediaries in Balaka, Nsanje and Lilongwe, and 4125 trained in Zomba as of April 2017 (data obtained from WFP monitoring documents). A P&R meeting was held in October 2015 for those who had been trained a few months earlier to go through what went well and what was challenging in their work with communities. The seasonal forecast was also reviewed in that meeting, and extension workers then returned to their communities to share the forecast information with community members and work with them in adjusting any agricultural or livelihood decisions based on the forecast. As a result of the engagement with DCCMS through the food security component of the GFCS-APA programme, the seasonal forecast has been downscaled for all districts in the country (Nyirongo, personal communication).

The radio and SMS component, led by WFP Malawi and supported by FRT, began in October 2015, and the radio programme was broadcast twice weekly through Zodiac Broadcasting Station (ZBS), a national radio station, thereby reaching anyone in the country who chose to listen. The broadcast

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<sup>6</sup> The monitoring figures include eight intermediaries from the Malawi Red Cross that have trained farmers in Lilongwe and Nsanje districts, but the majority of the intermediaries trained have been working with community members in Balaka.



times (Friday afternoon for new programmes and Tuesday morning for repeats from the previous Friday) were chosen by the respondents in Balaka during the radio scoping study as their preferred times to listen. The agro-climatic content is reviewed by the National Agricultural Content Development Committee (NACDC), a newly formed institution that arose as a result of WFP's convening multiple stakeholders for the initiative and involving many national partners. The NACDC formed an Agro-Climatic task force that develops the agro-climatic content, which is then reviewed by NACDC and approved by both MoAIWD and the Ministry of Natural Resources Energy and Mining (MNREM). Fifty programmes were broadcast and repeated during the course of 2016 (FRT, 2016). A total of 84 listening groups were formed in Balaka and were given solar/wind-up radios purchased through the project that are capable of recording and trained on how to use them. The listening groups committed themselves to purchasing the most affordable mobile phones available to enable them to engage with the interactive programming.

The SMS and Beep4Weather services were also implemented by FRT. Community member mobile phone numbers were collected by extension workers during the PICSA trainings and entered into a database, and those registered then received text messages with weekly forecasts from the met service. If they wanted to hear more detailed information, they could leave a missed call ('beep') with the Beep4Weather service and receive a call back at no charge to listen to a recording with a more detailed forecast and related agricultural tips. A total of 8521 people were subscribed to the SMS service as of December 2016, beyond the target of 6250 (FRT, 2016).

The Beep4Weather service became active in February 2016, and there were about 500 people who used it regularly. Demand was higher during the agricultural season. The service was promoted during the radio programme and through the SMS messages sent to registered users. FRT also used social media to spread word about the service, because they are not only targeting community members but also the intermediaries who interact with them.

### Activities in Tanzania

The first PICSA ToT took place in Kiteto district in October 2014 and trained 30 intermediaries. A summary of the training is presented in CCAFS Working Paper 132 (Dorward et al., 2014). By November 2015, there were 107 intermediaries trained in Kiteto, Longido, and Kondoa districts. The trained intermediaries have reached a total of approximately 10,067 beneficiaries as of April 2017: 6377 in Kiteto, 2007 in Kondoa, and 1683 in Longido (WFP monitoring documents). P&R meetings were held in all three districts in November 2015. In 2016, in the lead up to the agricultural season, PICSA ToTs and P&Rs were conducted for the remaining 50% of Kondoa and Kiteto staff (70 staff) who had not been trained in PICSA previously.

Interactive radio activities began in Tanzania in May 2016, implemented by FRI. The broadcasts ran for 16 weeks, with a 30-minute live show, followed by a repeat each week. Unlike Malawi, there were no radio listening groups formed in Tanzania due to the very different context in the district of focus. The radio activities were centred in Longido district, a predominantly pastoralist area inhabited by the Maasai. The pastoralist lifestyle and the Maasai cultural traditions of interacting mainly with others from one's own age group and gender would have made it difficult to form listening groups the way it was done in Malawi. FRI did monitor listener participation in the programme through a series of 13 polls, and there were 421 unique respondents contributing 2168 responses during the 16 weeks. In addition to the radio polls, FRI sent a total of 7800 SMS alerts and voice messages to 261 registered community members over seven months. Monitoring visits

conducted by FRI staff in the field during the course of the initiative found that there were many more listeners to the programme who listened but did not interact by calling in or sending SMSs. A technical advisory team met every other month to discuss the content and ways forward. TMA staff from the headquarters and the region were involved, along with WFP, FRI, radio broadcasters, and others.

For the SMS forecast service through TMA, people's mobile numbers were collected by extension staff in the target districts and fed back to TMA for the SMS service. TMA provided weather forecasts via SMS in Tanzania; this was not a component of the GFCS-APA food security programme.

### Evaluation focus

This evaluation focuses on the activities as they were carried out in Kiteto, Kondoa, and Longido districts in Tanzania (2014 and 2015) and in Balaka district of Malawi (2015). The preparatory work of district and community level meetings had started in Balaka in 2014, but due to a flooding emergency the trainings and other interventions did not start until 2015. The initiative expanded in 2016 and additional PICSA ToTs were held in a second district of Malawi (Zomba), but it would have been too early for participants in that district to report any livelihood or agricultural practice changes so it was not included in this evaluation.

## 3. Theory of change and impact pathway

The overarching theory of change (ToC) for activities related to climate services provision within the food security component of the GFCS-APA is that by improving access to timely, credible, and actionable climate information for decision making, food insecure community members and the institutions that serve them can improve their livelihoods activities, increase resilience to climate shocks and variability, and be more prepared for climatic extremes. There are three key aspects to this ToC: the co-production of climate services information (requiring an enabling environment), information dissemination and capacity building of beneficiaries to make use of it, and the ways in which the people will use the services to make changes to their agricultural practices. The methods underlying this strategy are built on the critical nature of engaging with partners and strengthening capacity of actors along the impact pathway. A well-coordinated network of partners is essential to the functioning of the climate services system that will ultimately enable vulnerable, food insecure communities to better anticipate and manage climate risks and increased climate variability. In addition, two-way communication between recipients and climate service providers is essential so that feedback can be used for improving climate service products and better meeting people's needs.

At the national level, the food security component of the GFCS-APA programme contributes toward creating an enabling environment in which the meteorological agency of each country is linked with the agriculture ministry and the extension service so that climate service products for the agricultural sector are co-produced with the needs of rural communities in mind. National stakeholder workshops to identify capacities and gaps in the food security sector and to validate the integrated approach to communicating climate service information help bring a wide group of stakeholders on board. This enabling environment is critical to the success of the rest of the activities. The improved products include historical information for use in understanding the climate and climate variability in a particular area and calculating the probabilities and risks associated with certain weather events. Downscaled forecasts for the growing season, accompanied by extension



workers assisting farmers within the particular area to assess a range of appropriate options for their individual contexts, are an improvement on the relatively large scale forecasts that have traditionally been released. Weekly forecasts, broadcast via multiple channels, are another means through which people can be empowered to improve their agricultural decision-making. Additionally, it is envisaged that results of the food security component of the GFCS-APA programme demonstrating positive returns on investment will lead to the relevant institutions providing more effective services at a larger scale.

The second aspect of the programme relates to the capacity building of food insecure community members and the dissemination of climate services. These are at the heart of the activities being undertaken by World Food Programme and CCAFS supported by University of Reading, Farm Radio International and Farm Radio Trust. One of the main approaches to build capacity of vulnerable, food insecure communities in using climate information is the Participatory Integrated Climate Services for Agriculture (PICSA) approach. The PICSA approach is used by extension workers and other intermediaries to work with food insecure communities starting months before the rainy season begins to help them assess their current livelihood activities, examine probabilities and risks associated with the climate in their area, and consider different options for crops, livestock, and other livelihood activities. When the seasonal forecast is released just before the beginning of the season, intermediaries then help community members revisit their options based on what is forecasted. During the season, short-term forecasts and warnings accompanied by agriculture advice may be used to adjust practices as needed. As part of the food security component, ToTs are undertaken to train intermediaries who will then use these methods to work with existing farmer groups, thereby reaching as many beneficiaries as possible.

In addition to PICSA, the other key approaches to building the capacity of community members to use climate information are through interactive radio programming and on-demand SMS services. The forecasts are provided through interactive broadcasts on preferred radio stations and accompanied by expert advice on cropping and livestock decisions. Listeners who register their phone numbers in the FRT/FRI database also receive short-term (weekly) forecasts accompanied by the agriculture advice from the meteorological agency via SMS. Community members wishing to hear more information can access a service known as 'Beep4Weather' to hear a recorded message containing more details. These approaches are designed to reach large numbers of people and provide agro-climatic expert advice that can be coupled with the short-term forecasts to help inform decision-making. Radio is used because it is a verified means of promoting messages to rural communities, and the interactive components are added to offer a means of allowing listeners to submit questions, make suggestions on future content, and encourage engagement with the topics covered.

By making available more relevant climate information through radio and mobile phones, and by building the capacity of beneficiaries to understand how such information is useful to them, the programme will improve community level decision making with regard to agricultural practices and livelihoods affected by climate events and increased climate variability while at the same time shifting the dynamic between extension agents and community members from a linear delivery of information to a facilitation of discussions about options. Credible, accessible, and actionable climate information contributes to make better, evidence-based decisions, to adopt improved technologies and practices, and to protect assets in unfavourable seasons. In so doing, vulnerable communities will achieve greater food security and improved livelihoods. By working with

communities in a participatory manner, extension agents shift their role from delivery of static messages to facilitators of dynamic decision making, creating a new relationship with beneficiaries.

In Malawi, the initiative is operating in an integrated manner with the Food for Asset (FFA) creation programme and R4 programme—both programmes are implemented by WFP in Balaka district. FFA is a combined recovery and development programme designed to support communities in reducing their vulnerability to disasters and decreasing chronic food insecurity through the creation and maintenance of productive community assets. The goal is to build resilience over the long term by improving the capacity of food insecure households to increase their own food production and maximize food utilization, as well as reduce risk. The R4 Rural Resilience Initiative applies four risk management strategies—risk reduction, risk transfer, prudent risk taking and risk reserves—that help poor households improve their food and income security and deal with climate shocks, thereby strengthening their resilience. The risk reduction (asset creation) activities involve constructing assets that help mitigate risks, such as soil and water conservation infrastructure. Risk transfer (insurance) refers to index insurance schemes that provide payouts based on weather-related indices. Prudent risk taking (credit) refers to facilitating participant's access to credit which could be used to invest in inputs, and risk reserves (savings) are built up through village savings and loan programmes and other financial interventions.

A hypothesis within this ToC is that, where the climate services are integrated with R4 activities in the same geographic area in Malawi, the benefits of both are increased. R4 may help and enable community members (by generating resources to invest and insurance against failure) to invest in options and practices they have identified through the climate service interventions and want to implement. It may enable the poor and therefore risk averse to have the resources to invest and to have some security from insurance to put into practice options that they have identified that they want to implement to meet their local climate and other contexts.

Decision making is invariably affected by many other aspects at the household and community level, and climate services are one component of a broad network that should be in place to support livelihood development and climate proofing against shocks. A principle of contribution, not attribution, therefore underpins this ToC. The interventions and accompanying downscaled climate information are not a panacea for the many challenges facing food insecure households, but can offer an important contribution to the overall effort of improving climate resilience and adaptive capacity in the face of a variable and changing climate.

There are several assumptions underlying this ToC. One such assumption is that the extension workers and other intermediaries trained in the PICSA approach will be able to implement it effectively with beneficiaries. The extension services in many developing countries are often overstretched, and asking extension agents to implement a method requiring 3-4 sessions with farmer groups may be outside their comfort zone or abilities. Evidence to date suggests that extension workers are indeed able to use the method effectively with community members and the assumption holds true. Another assumption is that food insecure households will have the ability to implement the necessary changes identified and promoted by the intermediaries and via the radio programmes. Availability of agricultural inputs in remote areas may be limited, and although farmers may realize the need to plant a shorter maturing variety, for example, or apply fertilizer at a particular time, accessing these inputs may not prove feasible. In such cases, the interventions may achieve the intended outcomes of providing climate services and building capacity, but the impact of improved food security may remain elusive due to obstacles outside the control of the programme.

Efforts to address this issue have been made by spending time during the ToT helping extension workers consider how they can help households of all levels of wealth and resources make changes. By helping people consider all their options and encouraging them to access markets through facilitating market linkages, access to credit groups, and other services, extension workers can support different types of changes that do not necessarily require capital or other resources beyond farmers' capacities. Another step to address the issue has been to include input suppliers in the PICSA training of trainers sessions. A third assumption is that the necessary coordination between actors is possible and will not be hindered by competing interests or priorities. The time sensitive nature of downscaled forecasts requires the information to be communicated in a timely manner, and the success of the activities is dependent on the various actors working together for timely dissemination.

An impact pathway presenting the interconnected activities, outputs, outcomes, and anticipated impacts of the programme is presented in Figure 2.

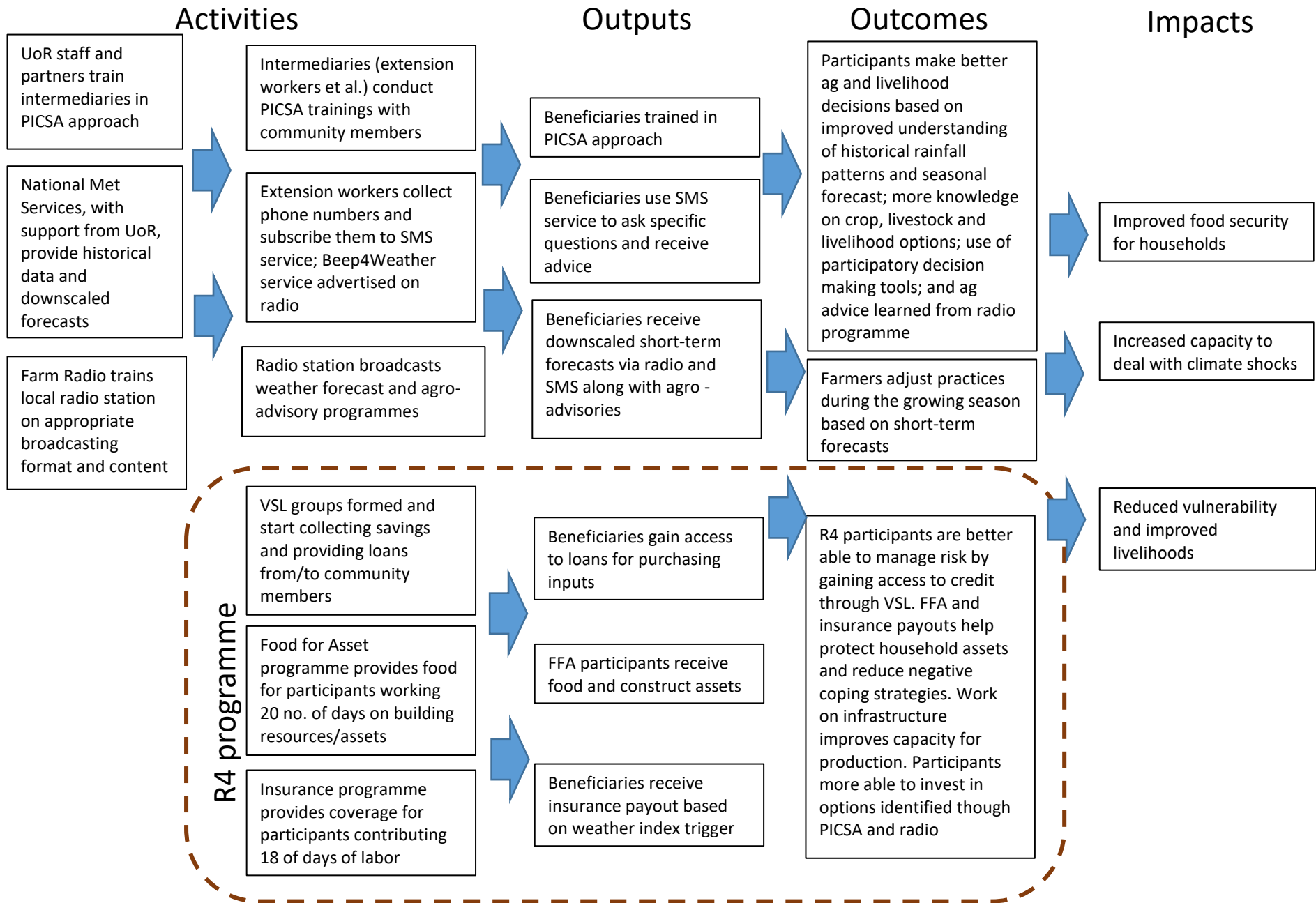


Figure 2. Impact pathway diagram for the food security component of the GFCS-APA programme

## 4. Evaluation design and methods

### Quantitative survey

#### Study design

The quantitative component of the evaluation of activities under the food security component of the GFCS-APA in Malawi and Tanzania followed a cross-sectional design with independent samples in each of the three target districts in Tanzania (Kiteto, Kondoa and Longido) and in Balaka district in Malawi. These four districts served as distinct sampling and analysis domains. The study consisted of a beneficiary survey with a sample size of approximately 200 respondents in each of the sampling domains who had been trained in PICSA by extension workers. The overall aim of the evaluation study was to assess the perceived use and impact of different activities at district level under the food security component of the GFCS-APA [PICSA (all four districts), interactive radio (only Longido and Balaka), SMS weather services (all districts), and Beep4Weather (only Balaka and Longido)] and the related R4 programme (only Balaka) on beneficiary's planning, decision making and livelihoods activities. To this aim, respondents were asked about changes they had made to their livelihood activities, crop and livestock in the season after they received the interventions compared to the season before the interventions. They were then asked if and how they saw these changes and their effects linked to the inputs and training from the initiative's components. Results in each of the sampling domains were disaggregated by gender of the respondent, wealth of the household of the respondent and, in Malawi, by whether the respondent had received assistance from the R4 programme or not.

Respondents were asked directly if and how each of the initiative's components contributed to their decision making and to changes they made in their agricultural and livelihood activities. This led to a focus on questions of perceptions and opinions of beneficiaries rather than on quantifiable farm outputs. Given that there are a multitude of factors that influence agricultural yields and household food security in any given season, it would be premature to attempt to measure any outcomes of the initiative in terms of yields or food security status. Formal hypothesis testing between groups of beneficiaries consequently plays a secondary role. The analysis instead aims to use the beneficiaries' perspective to assess the mechanisms through which the individual activities helped them in their planning and decision making, and in the implementation of these plans.

#### Limitations

The interventions had taken place more than a year before the study date. This ruled out a quasi-experimental design that would have used baseline and endline surveys taking place before the start and at the end of the programme. The lack of a post-ante and control-intervention comparison means that there is no way to formally establish causal treatment effects of activities implemented under this initiative among the target population, but this is extremely difficult to achieve in evaluation of climate services in any case. The evaluation instead takes a contributory approach, assuming that while provision of climate services can significantly contribute to changes in outcome and impact indicators such as climate resilience of vulnerable community members, it is neither a necessary nor a sufficient cause for such changes. The focus of the evaluation was therefore on reports of behavior changes (regarding agricultural and livelihood actions) and the respondents' perception of the effectiveness of the programme components.

The PICSA trainings included in this evaluation took place in September/October 2014 for Kiteto, in early 2015 for Longido, and in September/October 2015 for Balaka and Kondoa. Data collection for the quantitative survey of this evaluation took place in September and October 2016 (see Figure 3). The long period of a year or more between training and survey can lead to substantial recall bias

among respondents, meaning that respondents' memory of the training and its use in the subsequent season can be incomplete or inaccurate. This can be assumed to be even more of a problem in Longido and Kiteto, where respondents were not asked about their agricultural activities in the most recent season, but three seasons ago for Longido and two seasons ago for Kiteto. There was a substantial risk that respondents were not able to properly distinguish farming activities from different seasons, especially in Kiteto and Longido. The survey training workshops were used to make enumerators aware of this issue, to remind respondents of the reference season throughout the interview, and to train them in double-checking relevant questions with respondents to make sure they remembered trainings and farming activities correctly.

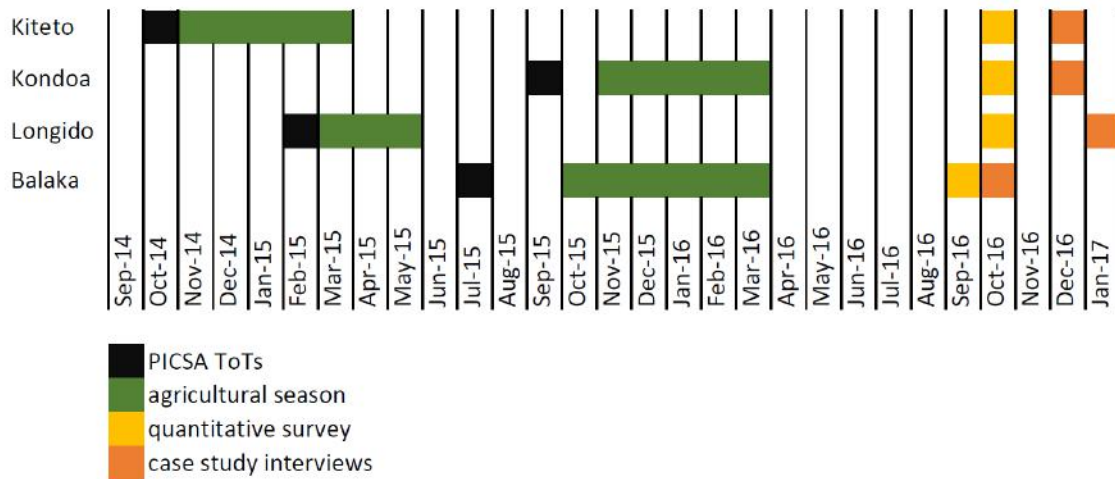


Figure 3. Timeline of PICSA training of trainers and evaluation surveys

### Questionnaire design

Retrospective questions were used to ask respondents about their involvement in and perception of the PICSA trainings and their use of information derived from radio programmes, SMS weather services and Beep4Weather and the complementary R4 programme. The questionnaire furthermore contained a section on changes in beneficiaries' crop, livestock, and other livelihood activities between the season before and season after the trainings, on how these changes were linked to the use of the information gained from the interventions, and on changes respondents would have liked to make, but did not implement. Questions on basic socio-demographic characteristics of the beneficiary and their household as well as a section to capture the Food Consumption Score complemented the questionnaire.

The questionnaire used previous survey tools of PICSA evaluations in Rwanda and Ghana as a starting point. Questions from these survey tools were adjusted to the Malawian and Tanzanian context and sections added to link changes in farming activities as a result of the provision of climate information via radio and SMS as part of activities in the target district.

### Sampling

The survey aimed to be representative of beneficiaries who were trained in PICSA before the 2014 season in Kiteto, before the 2015 *Masika* season in Longido, and before the 2015/16 season in Balaka and Kondoa. The only inclusion criterion for a respondent to be eligible for the survey was to have received the PICSA training from an intermediary before the relevant season. Radio and SMS services were not included as separate sampling domains in the sampling strategy since it is generally not possible to determine which people among the general population listen to the radio

programmes or receive SMS services. It was therefore not possible to obtain user lists of people who listened to the radio programmes or received SMS services. However, by focusing on PICSA beneficiaries for whom sampling frames were easily available, it was ensured that the sample included only people who received climate-related services. It can be assumed that the usage rates of radio and SMS services are considerably higher among PICSA beneficiaries than among the general population, thereby guaranteeing that a reasonably high proportion of interviewees would have used these services. The goal of the quantitative surveys was not to estimate usage rates for radio and SMS services in the general population, but to assess how people used these services for weather and climate-related decision making.

The number of changes each respondent made on average in their farming activities in the season after compared to the season before the training is the main quantitative measure of potential impact of activities undertaken as part of this initiative. It was therefore used as the variable of interest in determining the sample size. The sample was designed to allow for detection of a difference of 0.2 changes in farming activities per respondent when comparing beneficiaries from different sampling domains with a significance level of 0.05. The following sub-sections contain an overview of the assumptions for each of the sampling domains.

#### *Malawi*

The survey sample was designed to be representative of the 2140 people in Balaka district who were trained in PICSA before the 2015/16 season according to monitoring documents that were collected from trained intermediaries. To this aim, a random sample of 20 out of 44 PICSA-trained extension workers who had delivered the PICSA trainings was drawn as the primary sampling unit from lists of extension workers provided by the WFP district office in Balaka. With a design effect of 1.9 derived from the cluster sampling approach and finite sample correction, this led to an intended sample size of 175.

The budget allowed for collection of interviews from 200 respondents. Random sampling of 10 respondents for each of the 20 extension workers took place during fieldwork, using beneficiary lists that were provided by the selected extension workers. Seven interviews were removed during data cleaning, resulting in a final sample size of 193. The actual design effect for the number of changes in the final data was 1.57, meaning that the original estimate of 1.9 was conservative enough and the final sample provides more statistical power than planned.

*Table 1. Planned sample size calculation Balaka, Malawi*

Minimum detectable difference in number of changes respondent made	0.2
Assumed number of changes per respondent	2
Standard deviation of number of changes	0.5
Power (1- $\beta$ )	80%
Required confidence level true value falls within confidence interval (1- $\alpha$ )	95%
Intra-cluster correlation (ICC)	0.1
Cluster size	10
Design effect	1.9
<b>Sample size required (incl. finite population correction)</b>	<b>175</b>

#### *Tanzania*

Target populations for which each of the three district samples aimed to be representative are the PICSA-trained beneficiaries in Kiteto, Kondoa and Longido. In contrast to the sample in Balaka, villages were selected as primary sampling units instead of extension workers. This was done for

purely practical reasons, since there was no readily available list of extension workers, whereas WFP Tanzania was able to provide a list of villages covered by the trainings. Seventeen villages per district were selected from a total of 37 villages in Kondoa, 25 in Kiteto and 39 in Longido. Selection of villages was done with equal probabilities (completely at random) in Longido, and with selection probability proportional to size (PPS sampling, i.e. proportional to the number of people trained in a village) in Kiteto and Kondoa. The reason for these slightly different approaches was that PPS sampling is generally preferable where possible since data collected with PPS does not require weighting of the final data sets to account for different selection probabilities of respondents when the number of respondents per primary sampling unit is constant. The number of trained people per village was only available for Kiteto and Kondoa, hence why the sample in Longido was weighted in the analysis using village level data on the number of trained beneficiaries obtained during enumeration.

The lower number of clusters (villages) and consequently higher number of respondents per cluster led to the higher estimated design effect of 2.6 compared to Malawi. Selecting more villages per district would have been an option to overcome this issue, but was not possible due to logistical reasons (enumerator teams would have had to travel more between villages, increasing fieldwork time). The tables below show the assumptions for sample size calculations per district. The only difference between the districts is the finite population correction, i.e. different target population sizes per district leading to slightly different required sample sizes.

*Table 2. Planned sample size calculation Kiteto, Tanzania*

Minimum detectable difference in number of changes respondent made	0.2
Assumed number of changes per respondent	2
Standard deviation of number of changes	0.5
Power (1- $\beta$ )	80%
Required confidence level true value falls within confidence interval (1- $\alpha$ )	95%
Intra-cluster correlation (ICC)	0.1
Cluster size	10
Design effect	2.6
<b>Sample size required (incl finite population correction)</b>	<b>240</b>

*Table 3. Planned sample size calculation Kondoa, Tanzania*

Minimum detectable difference in number of changes respondent made	0.2
Assumed number of changes per respondent	2
Standard deviation of number of changes	0.5
Power (1- $\beta$ )	80%
Required confidence level true value falls within confidence interval (1- $\alpha$ )	95%
Intra-cluster correlation (ICC)	0.1
Cluster size	10
Design effect	2.6
<b>Sample size required (incl finite population correction)</b>	<b>221</b>



Table 4. Planned sample size calculation Longido, Tanzania

Minimum detectable difference in number of changes respondent made	0.2
Assumed number of changes per respondent	2
Standard deviation of number of changes	0.5
Power (1- $\beta$ )	80%
Required confidence level true value falls within confidence interval (1- $\alpha$ )	95%
Intra-cluster correlation (ICC)	0.1
Cluster size	10
Design effect	2.6
<b>Sample size required (incl finite population correction)</b>	<b>228</b>

Due to budget restrictions, the maximum sample size in each of the 17 villages was determined to be 12 respondents (the maximum a team of three enumerators could manage in one day available per village), leading to slightly lower sampling numbers per district of 204 each. One interview was removed from the final data set after data checking in the sample for Kiteto, leading to final sample sizes of 203 in Kiteto and 204 in the other two districts.

The actual design effects for the number of changes in the final data were 2.02 in Kiteto, 1.49 in Kondoa and 1.36 in Longido. Re-running the above sample size calculations with these design effects and all other parameters equal, the minimum sample sizes required to detect a difference in the number of changes of 0.2 are 190 in Kiteto, 136 in Kondoa, and 127 in Longido. Since these are all well below the 203/204 interviews collected per district, the final samples are sufficiently large to detect the minimum effect originally planned for.

#### Digital data collection

Enumerators used tablets to record survey data, and Open Data Kit (ODK) in combination with the ona.io server platform was used as the digital data collection infrastructure for the quantitative survey.

Advantages of using ODK to record survey data included the following:

- Face-to-face training time was no longer than traditional training with paper-based questionnaires. While the ODK form should not be a substitute for enumerator understanding of the questions and the questionnaire logic, the form automatically implements this logic, requiring less decision-making, and therefore there is less potential for errors on the part of the enumerator during enumeration.
- Supervisory load is reduced with an ODK form developed with all possible data validation logic built into it. This is because the enumerator has no choice but to follow questionnaire logic and capture responses within appropriate ranges, etc.
- Enumerators uploaded the data to the ona.io platform approximately every two to three days. This decreased the risk of data loss compared to paper-based enumeration, and it enabled timely checking and cleaning of data while enumeration was still ongoing.

#### Malawi

The enumerator team consisted of 10 enumerators and one supervisor. A workshop in Balaka town was held from 19 to 23 September 2016 and prepared the team for household selection and enumeration. This included a field test of the survey tool with PICSA-trained beneficiaries located near Balaka town and subsequent revision of the survey tool. Data collection in Balaka district took place from 23 to 28 September 2016. The supervisor was responsible for in-field data quality control

of the collected interviews, for random selection of respondents from the beneficiary lists provided by the extension workers, and for ensuring that all interviews were submitted to the *ona* platform. The supervisor furthermore completed a short ODK form for each extension worker to collect basic information on PICSA beneficiaries trained by the extension worker, such as the number of people trained and the proportion of women trained.

### *Tanzania*

A team of 9 enumerators was trained for respondent selection and interviewing at the WFP country office in Dodoma from 26 to 30 September 2016. This included a field test of the survey tool with PICSA-trained beneficiaries located in Kondoa district and subsequent revision of the survey tool. Data collection in Kiteto, Kondoa and Longido took place from 3 to 18 October 2016. The enumerators were split into three district teams, with designated team leaders responsible for in-field data quality control of the collected interviews, filling in a data quality check form for each village, and making sure all interviews were submitted to the *ona* platform. The team leaders completed a short ODK form for each village to collect basic village level information on PICSA-trained beneficiaries such as the number of people trained and the proportion of women trained. This form also provided the enumerators with straightforward instructions on how to randomly sample 12 respondents from each village list.

### Analysis method

The data set was cleaned, processed and analysed using the statistical software R. The data was weighted per extension worker (Malawi) or village (Longido) to account for the unequal sampling probabilities in these two sampling domains (see “Sampling” section). Standard errors and confidence intervals in the analysis take into account the cluster sampling approach.

### Qualitative interviews

After the quantitative survey was conducted in each country, interviewees for the qualitative case studies were selected from the survey respondents. Eight people were selected in each district based on the recommendation received from WFP for the number of qualitative interviews required. A total of 32 qualitative interviews were collected.

A cross-section of beneficiaries was selected from the pool of randomly selected quantitative survey respondents based on several criteria: a balance of men and women; a mix of livelihood sources (crops, livestock, or a mix); participation or non-involvement in the R4 programme (only in Balaka); at least two interviewees with lower exposure to PICSA (defined as attendance at fewer trainings); and interviewees with a mix of opinions about the value of the trainings and radio/SMS activities. At least one interviewee who was recorded in the quantitative survey as not having made any changes as a result of the interventions was also included in each district.

The qualitative questionnaire was developed based on a previous qualitative survey implemented in Ghana, where PICSA trainings had also been carried out. For Malawi and Tanzania, questions on the radio/SMS components were added, and for Malawi questions on the R4 programme were also included. These qualitative interviews provide case studies that enable the research team to delve into the ‘story’ behind what influence and impact the components are having on beneficiaries, their incomes, and their livelihoods.

Local interviewers were used in each country to enable use of local language with the interviewees. The interviewers were trained by researchers from the University of Reading who have experience conducting qualitative evaluations of PICSA trainings in other African countries. Interviews took place in Balaka from 19 to 24 October 2016, and in all three Tanzanian districts from 28 December

2016 to 4 January 2017. The interview questionnaire can be found in Appendix 2. A shortened version was used in Tanzania due to delays in getting started and the need to complete the interviews more quickly than in Malawi. The participatory budget, comparison, and effect diagram questions were not used in Tanzania to save time.

Notes from the interviews as recorded by the local interviewers were provided for analysis. The notes were coded according to the categories of major interest, i.e. changes made because of the interventions, processes of change, resulting outcomes on livelihoods, and recommendations of what to cover again or how to improve the interventions.

### Synthesis of findings

This report was compiled by comparing the analyses from the quantitative survey and the qualitative interviews and referring to previous programme documentation supplied by WFP and its partners. Because the programme activities were not carried out in the districts where the baselines were conducted at the start of the programme in all cases, it is not possible to have baseline and endline comparisons. Therefore, to make the information more comparable, this report draws mainly from the quantitative survey for data on changes reported by participants. Information from the qualitative interviews are used to supplement the information where appropriate, and a series of vignettes written using the qualitative interview notes are provided in Appendix 3 as case studies of selected programme participants.

## 5. Description of intervention participants

This section uses information from a variety of sources to describe the participants in the initiative. It draws on information from the quantitative survey carried out for this evaluation and also refers back to the baselines conducted by ICRAF, the R4 programme, and the radio scoping study to provide a picture of the beneficiaries and their previous access to agricultural training and climate services. Because there was no R4 baseline information conducted in Tanzania, we have more information on the participants in Balaka and less on those from Kiteto, Kondoa, and Longido.

### R4 baseline information

During the R4 baseline in Balaka, the education level of the household head was recorded. It was found that 13.6% of the sampled heads of household had never been to school, 67.7% attended up to primary and 18.6% went up to secondary level. This suggests that the majority of the sampled household heads can at least read and write. Land ownership in Balaka as measured in the R4 baseline ranged from 0.25 to 20 acres. It was found that 19.9% of households own between zero and one acre of land and 41.2% of the households own between one and two acres. Most of the households could be considered smallholders, as 88.5% of the households own between zero and three acres of land. Eighty-one percent of respondents did not have any irrigated land, and for the households that had land under irrigation it was, on average, 22% of their total land. Irrigated land is mostly along main rivers in the area.

Nearly all households (99%) surveyed in the R4 baseline planted maize, whilst groundnuts were the second most popular crop grown by 41% of the households, and cotton was grown by 37% of the households. Legumes grown were cowpeas, which were grown by 26% of the households and pigeon peas were grown by 24%. Crop diversity per household was also assessed and it was noted that 9% of the households produced one crop and most of the households (70%) of the households produced between two and three crops and 3% of the respondents grew five crops. In terms of livestock, the most commonly kept animals are chickens and goats, with 53% and 23.9% of households keeping these, respectively. All of the household owning goats reported only keeping

one to two, and of those owning chickens 52.5% own between one and five, while 29.8% own six to ten chickens and 17.7% own more than 11. Only 2.7% of households reported owning cattle.

### Radio scoping studies

The audience research portion of the radio scoping study was carried out in four districts of Malawi (Nsanje, Lilongwe, Balaka, and Zomba). The results can be used to understand radio usage generally in Malawi. In Tanzania, the audience research component did include the three districts of interest (Kiteto, Kondoa, and Longido) along with several other districts, so the results are representative of a wider section of Tanzanians than just respondents from the three districts where the initiative's activities have taken place.

In Tanzania, 71% of respondents reported having a functioning radio at home, while an average of 59% claimed to have listened to the radio in the previous seven days. In general, women reported listening to the radio less often than men. Respondents were also asked about mobile phone ownership, and ownership rates were found to be high in Tanzania, up to 95%. Ownership was more common among men than women, but respondents who reported not owning a phone did report borrowing a family member's or friend's phone for use. Phone ownership was lowest among women in Kiteto, with only 50% reporting phone ownership.

The radio survey asked respondents if they had listened to weather forecasts on the radio in the last six months. Sixty-one percent of respondents in Tanzania recalled hearing weather forecasts on the radio, and of these, 25% reported using the information to help decide when to plant. Respondents reported that there was little access, at the time of the scoping study, to weather information by mobile phone, with two-thirds of respondents answering that no information was available.

For Malawi, 63% of respondents to the radio scoping survey reported having a functioning radio at home, which the report concludes was consistent with data from previous findings. On average, approximately half of respondents reported listening to the radio on a daily basis, and men were more likely to listen on a daily basis than women. Phone ownership rates were lower in Malawi than Tanzania. In the district of Lilongwe, rates were higher than in Balaka, Nsanje and Zomba. Three quarters of men in Lilongwe reported owning a mobile phone, compared with 47% in Balaka and 44% of men in both Nsanje and Zomba. The rates were lower for women, at 52% in Lilongwe, 25% in Balaka, and 29% in both Nsanje and Zomba. The R4 baseline in Balaka recorded rates of asset ownership at the household level, and 39% of households in Balaka are reported as owning mobile phones at the time of the R4 baseline.

A majority of Malawi respondents (65%) reported listening to weather forecasts on the radio in recent months although many of these admitting listening "just because it was on". Very little weather information was reported by the respondents in Malawi to be available by mobile phone.

### Quantitative survey for the evaluation

In Malawi, the lists used for selecting the quantitative survey respondents contained substantially more women than men, therefore out of the 193 interviewees in Balaka, 67.5% were women and 32.5% were men. In Tanzania, the situation was reversed and there were more men represented in the lists. Out of 203 respondents in Kiteto, 38.4% were women and 61.6% were men; in Kondoa there were 204 respondents, 36.8% women and 63.2% men; and in Longido there were 204 respondents, 35.3% women and 64.7% men.

The age profiles by gender can be seen in Figure 4. Male respondents in Kondoa tended to be older than their counterparts in Longido. Women aged 30-39 were the highest percentage of respondents in Balaka, and men aged 40-49 were the highest percentage of respondents in Kiteto.

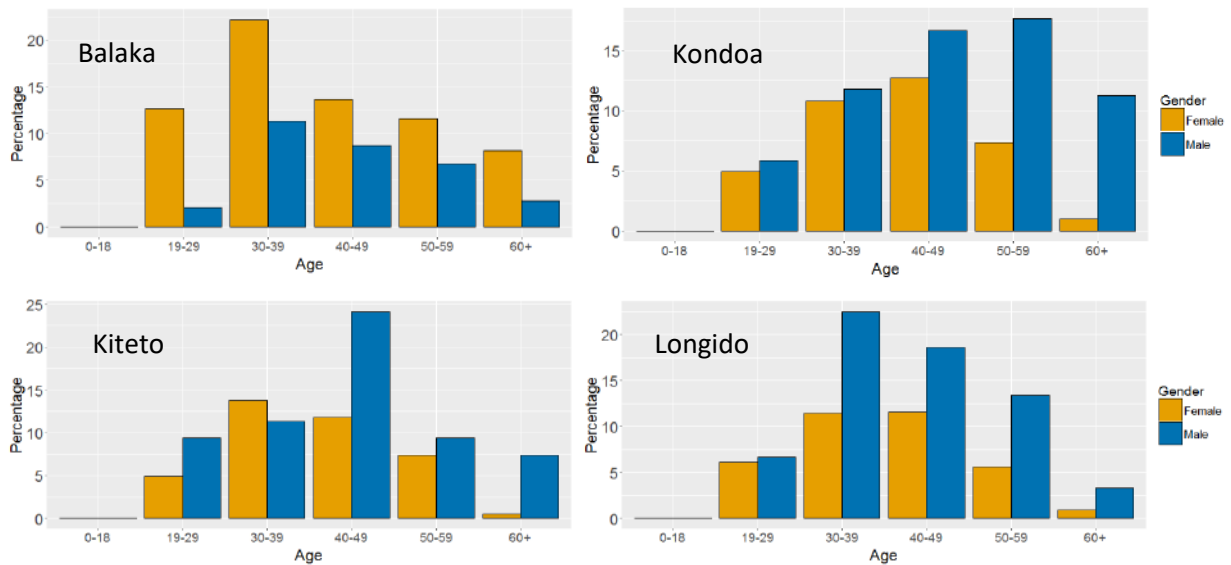


Figure 4. Age profiles of respondents from each district

The respondents to the quantitative survey were asked about their livelihood sources. In Balaka, 90.9% reported cultivating crops and 67.3% relied on livestock as a livelihood source. Around half of respondents also reported having other livelihood activities. In Tanzania, 85.7% of all respondents cultivated crops, with considerably more respondents raising livestock in Longido compared to other districts.

### Progress out of Poverty Index (PPI) and Food Consumption Score (FCS)

The Progress out of Poverty Index (PPI) is a consumption-based poverty line proxy based on ten questions determined through modelling the per capita consumption from national household surveys with household and household member characteristics, such as female literacy rate, building material of the main dwelling and household assets.<sup>7</sup> The higher a household's score on a scale from 0 to 100, the lower the chance that its members are living below the national poverty line. The poverty incidence (percent of people below the 100% national poverty line) estimated through the PPI is 29.4% among respondents in Malawi and 25.7% in Tanzania (Kiteto: 19.5%; Kondo: 17.2%; Longido: 43%).

The household Food Consumption Score (FCS) is used as a proxy for household food security. It is a measure of dietary diversity, food frequency and the relative nutritional importance of the food consumed. A high FCS increases the probability that a household's nutrient intake is adequate. Poor food consumption is defined as when households are not consuming staples and vegetables every day and never or very seldom consume protein-rich food such as meat and dairy. Borderline food consumption covers households that are consuming staples and vegetables every day, accompanied by oil and pulses a few times a week. Acceptable food consumption means households are consuming staples and vegetables every day, frequently accompanied by oil and pulses, and occasionally meat, fish and dairy.

<sup>7</sup> See <http://www.progressoutofpoverty.org/country/tanzania> for construction of the PPI and translation into poverty incidence for Tanzania, <http://www.progressoutofpoverty.org/country/malawi> for Malawi.

The FCSs for Malawi and Tanzania are shown in Figures 5 and 6. In Malawi, 77.9% of respondents are in the acceptable category, and in Tanzania the level is 81.4%. It should be noted that these scores are calculated based on data collected in October 2016 and cannot be compared to the data collected in the R4 baseline because the surveys were not carried out at the same point in the agricultural cycle. The scores from the quantitative survey are presented here just for the purposes of understanding the characteristics of the respondents.

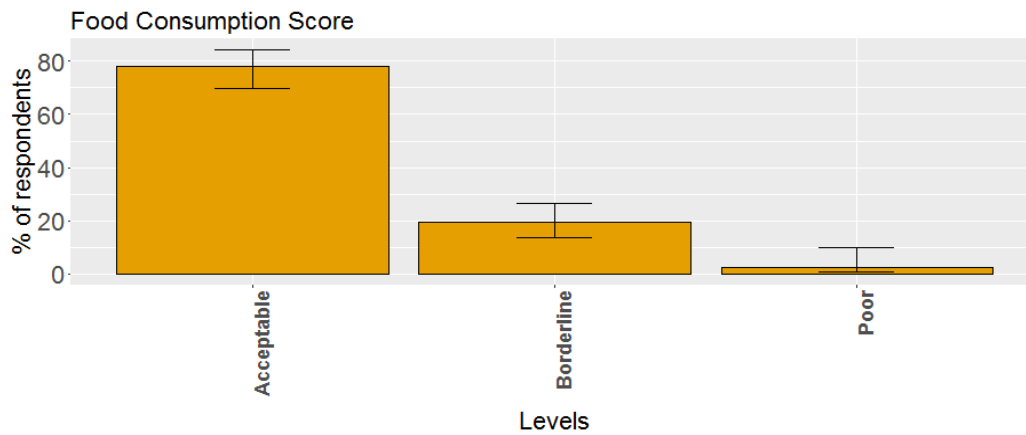


Figure 5. Food Consumption Score from Malawi

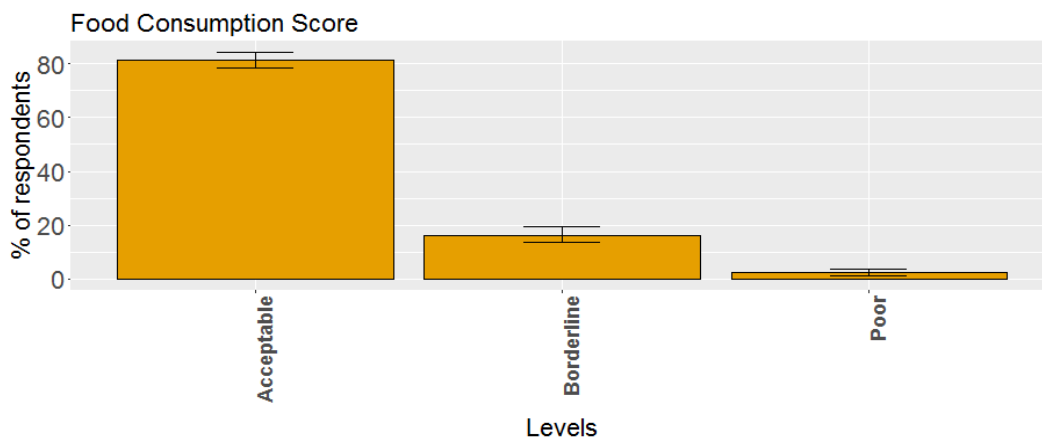


Figure 6. Food Consumption Score from Tanzania (all districts)

## 6. Involvement in and use of services

This section provides details on how the respondents were involved or participated in each of the initiative's components. The changes they made as a result of their involvement are described in section 7, changes made by programme participants.

## PICSA

### Malawi

Figure 7 shows the percentage of respondents in Malawi who said they were trained in each of the PICSA activities, and who said they used these activities for their decision making in the 2015/2016 season. All of the interviewed respondents had been trained in at least one of the PICSA activities before the 2015/2016 season (this was an eligibility criterion for participation in the survey), however the figure shows a varying degree of training received for each of the activities. The short-term forecast, the seasonal forecast and the training in probabilities and risks are the activities for which the lowest proportion of respondents received training (or remembered the training for), and these are consequently the activities that were least used in the decision making before and during the season.

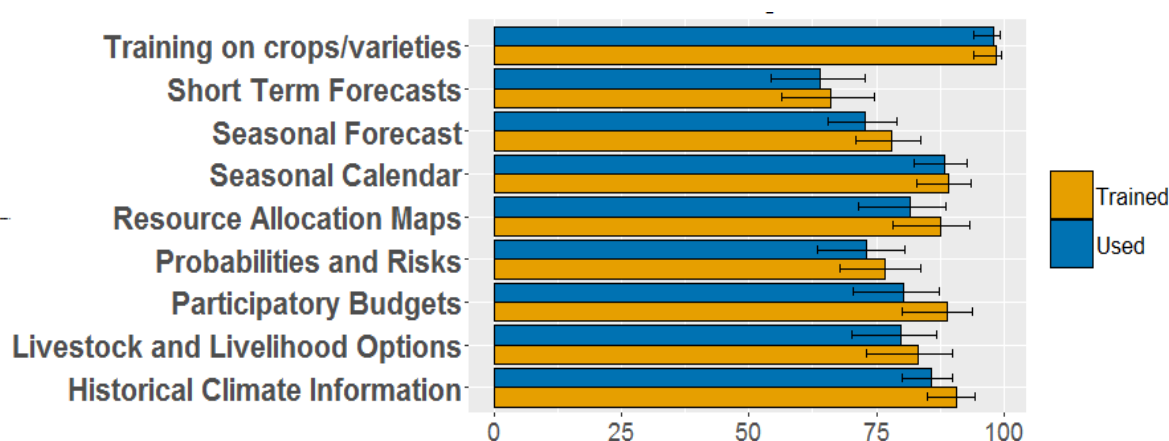


Figure 7. PICSA training and use of the training contents in the season after the training, Balaka (% of respondents who were trained in and used PICSA)

This could be due to a couple of reasons. The short-term forecasts are presented to participants in a different manner than the other training sessions, and so the respondents may not have mentally linked them with the PICSA training, therefore reporting receiving them at a lower rate during the survey. The seasonal forecast is similar, in that the training is for extension workers to better understand and communicate the forecast, so it is presented differently from the 'tools' that make up the other parts of the approach. Also, the training on probabilities and risks has been documented through the P&R sessions to be one of the more difficult aspects for the extension workers to grasp and convey to participants. Given its difficult nature, respondents may recall it at a lower rate. It is useful, however, to look at these results in the broader context of adoption rates in agricultural development. While a usage rate of around 60%, such as for short-term forecasts in Figure 7, may seem low in comparison to the other training topics in the figure, taken on its own it is a notable achievement in the field of international agricultural development, where adoption rates of new technologies and practices can be far lower after even more intensive training and field demonstrations (Fisher et al., 2015; Kassie et al., 2013).

Training rates were similar between men and women, apart from the training on calculating probabilities and risks, which 87% of men reported to have received, compared to 72% of women (difference not significant). This is reflected in the proportion of women and men who used the training on probabilities and risks for their decision making (69% of women compared to 82% of men). When it comes to perceptions and opinions about PICSA, a higher proportion of men than women feel that their household has benefited from the training. For example, 92% of men



compared to 74% of women say that the decisions they made because of the training improved their household's income situation, and 81% of men compared to 64% of women said they have been better able to provide for their household's healthcare as a result of the training. These differences may be due to the differences in crops grown by men and women. Women are more likely to grow crops that are consumed by the household and not sold for cash; men are more likely to grow cash crops that are sold for money which is then used to improve the household's income and pay for healthcare.

During the survey, men were also more likely to say the training has benefited them personally, for example by improving their social standing in the household (88% men versus 82% of women), although the gender difference is generally smaller compared to questions about benefits to the entire household.

Higher proportions of respondents in the upper PPI wealth group (84%) reported having received training on probabilities and risks, compared to people in the lower wealth group (70%, difference not significant). This is also reflected in the proportion of respondents who used this PICSA component for their decision making. Eighty-eight percent of respondents in the lower wealth group compared to 73% in the upper wealth group used the participatory budget for their planning and decision making.

These results align with the responses from the qualitative interviewees who often mentioned the topics of crops and varieties, resource allocation maps, and seasonal calendars as PICSA topics on which they were trained and which were most useful to them.

### Tanzania

The training was received at similar levels between districts, but there were significant differences in whether it was used for decision making. A very high proportion of respondents were trained in all activities, except in Kiteto, where a significantly lower proportion of respondents said they received training on crops and varieties compared to the other two districts (Figure 8). It should be noted that Kiteto was the first district where the PICSA trainings were carried out, and the ToTs that were conducted subsequently in Kondoa and Longido included more information for extension workers on how to present different crop and variety options. In Longido, there was a significantly lower usage rate of most of the training activities than in the other districts, while the proportion of people who were trained in Longido is similar compared to the other two districts (Figure 9).

There were no significant differences in training levels between men and women. There is evidence that women used the training activities more frequently for their planning and decision making than men. Usage rate of the participatory budget is significantly higher for women, which could indicate that women find more value in the training on the participatory budget than men. Impressions and opinions about PICSA are overall similar between women and men.

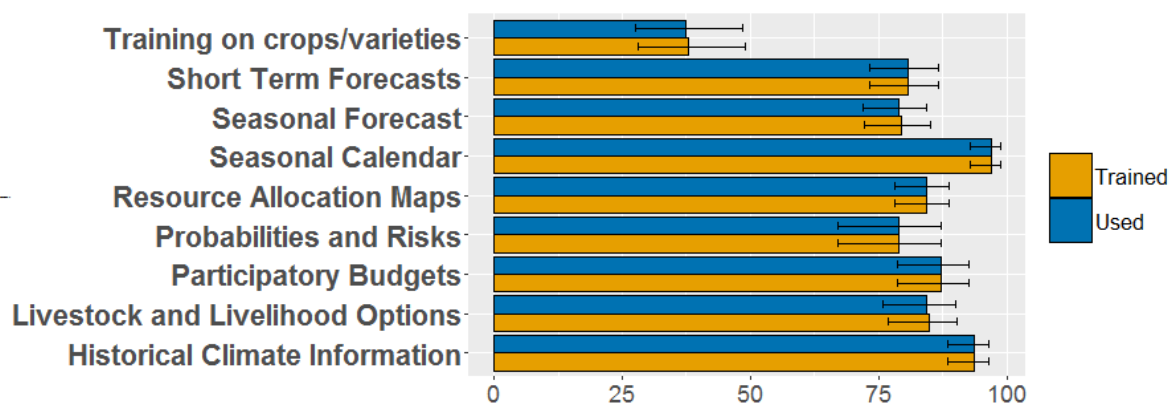


Figure 8. PICSA training and use of the training contents in the season after the training, Kiteto (% of respondents who were trained in and used PICSA)



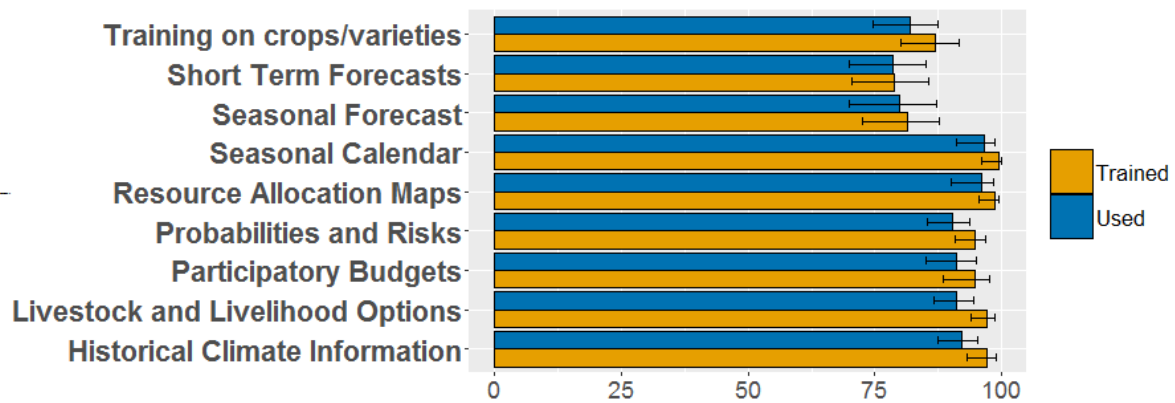


Figure 9. PICSA training and use of the training contents in the season after the training, Kondoa (% of respondents who were trained in and used PICSA)

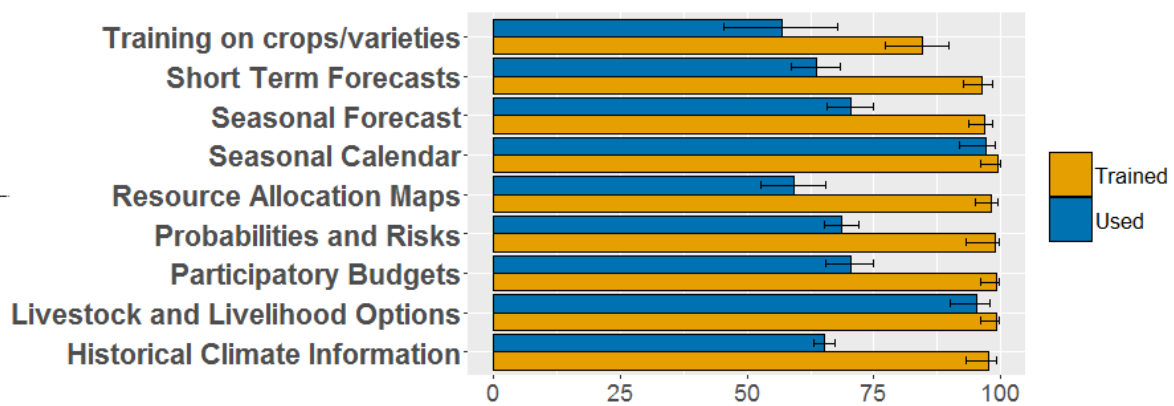


Figure 10. PICSA training and use of the training contents in the season after the training, Longido (% of respondents who were trained in and used PICSA)

### Broadening the reach of PICSA training

The climate information shared and decision-making tools used in PICSA have been designed to be easily shared by farmers. Due to this careful design there is reason to expect that the numbers of people reached with PICSA-related information might be higher or that the benefits might have reached a substantially higher number of community members because of person to person communication and sharing of information.

Survey respondents in both Malawi and Tanzania were asked whether they shared any of the information or tools received during the training with other community members. In Malawi, 85.3% of respondents said they had shared information/tools from the PICSA training with other people within or outside their household, and this percentage was 88.2% in Tanzania. On average, a PICSA-trained beneficiary in Tanzania shared PICSA training content with 26 other people, and in Malawi, a PICSA-trained beneficiary shared content with 16 other people.<sup>8</sup>

<sup>8</sup> These averages included people who were trained and did not share the content with anyone.

It is not feasible to know what information or how much was actually shared, and it is also not possible to know whether there are overlaps in the additional people reached. However, we are able to state that the number of beneficiaries is higher than those farmers directly trained by intermediaries, and therefore the reach and impacts extend further than those directly trained in the approach.

## Interactive Radio

### Malawi

The radio programme was broadcast on Zodiac Broadcasting Station (ZBS) in Malawi, which is a national station and was selected after consultation with the community members identified it as the most listened-to radio station in the target area and because it had good reception. WFP and FRT worked together to form listening groups, also known as Community ICT Hubs, within Balaka for community members to gather and listen to the programme together. Eighty-four listening groups were established/strengthened and equipped with a radio set each. This effort seems to have paid off, as 48% of respondents who do not own a radio in their household still reported listening to the radio programme on weather, climate, and agro-advisories. Fifty-seven percent of all survey respondents in Malawi reported listening to the radio programme, and of these, 99% used the information for decision-making.

Information from a radio user feedback log spreadsheet provided by FRT contains comments from listeners on how the programme is helping them, requests for more information on crop insurance and other agricultural issues, and encouragement to other farmers to adopt practices, further illustrating the usefulness of the radio programme to its listeners.

### Tanzania

The story is different in Tanzania, where the radio programme was only operational in Longido and only started in May 2016. Only half of the qualitative interviewees reported being aware of it, and they all said that the signal was too difficult to pick up and they had stopped tuning in for it. The quantitative survey respondents were similar: 40.8% had listened overall, but only 1.9% of respondents who did not own a radio reported listening. This is in contrast to the 48% of respondents in the same situation in Balaka who were still able to listen despite not owning a radio, presumably due to the radio listening groups that were formed. As noted above, radio listening groups were not formed in Tanzania due to logistical difficulties and cultural differences from the Malawi context. Of those who listened, 97.2% used the information presented through the radio programming for decision making.

These results may not be entirely accurate in regards to the FRI-supported programmes that began airing in May 2016. The enumerators of the quantitative survey were instructed to ask specifically about the 2015 *Masika* season in Longido. If respondents were answering the radio-related questions when thinking back to 2015, the FRI-supported broadcasts had not yet aired and would not have been considered.

A final report of the radio activity in Tanzania provided by FRI provides information on a listener satisfaction survey conducted in Longido, which gives information that can supplement the quantitative survey:

“The listener satisfaction review was conducted four months after the beginning of the programme. ... The review used focus group discussions, quizzes and other participatory tools to assess the level of listener satisfaction, with regard to the usefulness and relevance of IRCIS [the radio component] programs. Generally, all farmers and extension officers who participated in

the review acknowledged that the programs were very useful in helping them to plan and make decisions regarding the selection of crops, time of planting and taking care of livestock.” (FRI, 2016)

### SMS/Beep4Weather

Slightly more than a quarter of survey respondents in Malawi reported receiving SMS weather services on their mobile phones. All of them used the information for decision making, and 92.3% of them said it led to better decision making. In the qualitative interviews, two of the respondents reported contacting the SMS service for advice on specific livestock health issues and were pleased with the information received, so the SMS service in Malawi provided information on demand in addition to weather forecasts. The Beep4Weather service was used by 18.7% of respondents, of whom 100% said they used the information for decision making and it led to better decision making. A monitoring document provided by WFP reported that the SMS component interacted with more than 20,000 people, indicating a wide range of recipients.

The survey did collect information on weather forecasts provided via SMS in Tanzania although this was an activity of TMA, not of the GFCS-APA food security component. Overall, one in ten survey respondents in Tanzania received weather information via SMS, with large differences between the districts. Eighteen percent received the service in Kiteto, while only 4.4% in Kondoa and 1.2% in Longido received SMS weather services. One hundred percent of those who received the service in Kiteto used it for making decisions, and 97.3% of these said it led to better decision making. Many of the qualitative interviewees were not aware of this service, although some of them expressed interest in receiving weather information via SMS.

### R4 (Malawi only)

Survey results were analysed based on participation or non-participation in the R4 programme in Malawi. R4 respondents (n = 48) reported a higher rate of sharing information learned in the PICSA training with other people within or outside their household than non-R4 respondents (97.6% compared to 84%). This may be because R4 participants have more interaction with others through their Food for Asset labour or their membership in village saving and loan (VSL) groups, although the reason is not clear.

There is evidence that higher proportions of R4 beneficiaries used the interactive radio component, SMS services and Beep4Weather compared to non-R4 respondents. Eighty-eight percent of R4 compared to 53% non-R4 respondents listened to the radio programming, while the proportion of households with at least one radio was similar in both groups. Forty-nine percent of R4 and 24% of non-R4 respondents received SMS weather services (proportion of mobile ownership in households almost the same in both groups), and 46% of R4 compared to 16% non-R4 respondents used the Beep4Weather service. The participation of R4 respondents in the R4 interventions is presented in Table 5 (next page).

All (100%) of the respondents who received assistance from the R4/Food for Assets programme said it had a positive effect on their household in the 2015/16 season. When asked why they reported that the R4 programme had a positive effect on their household, half said it improved their food security, 29.8% answered that their living standards had improved, and 17% said it helped with their agricultural activities. Respondents could report more than one reason. Other reasons given were that the R4 programme increased household income (12.8%), helped them cope with weather/climate related events (12.8%), and covered basic needs (4.3%).

Table 5. Percentage of people in the R4 programme who received assistance in the 2015/16 season

	Respondents answering yes (%)
Were you part of a village savings group through the R4/Food for Assets programme in the 2015/2016 season?	88.9
Did you receive a loan through the R4/Food for Assets programme in the 2015/2016 season?	56.5
Did you receive any food from the R4/Food for Assets programme in the 2015/2016 season, in exchange to building up assets?	82.6
Did you obtain insurance through the R4/Food for Assets programme in the 2015/2016 season, in exchange for building up assets?	27.7

## 7. Changes made by programme participants

The percentages of respondents in Malawi and Tanzania who reported making changes to their crops, livestock, or other livelihood enterprises in the season following the interventions compared to the season before are quite different. In Malawi, 97.2% of respondents reported making such changes, while 52.1% of respondents in Tanzania reported changes. There are, however, substantial differences between the three districts in Tanzania: 70.4% of respondents in Kiteto and 67.6% in Kondoa made changes, but only 8.1% of respondents in Longido reported any changes.

For each change reported, the respondents were asked if any of the interventions contributed to them making the change. In Malawi, the PICSA training was listed as contributing to 82% of the changes, while the radio programmes contributed to 24.4% of the changes, SMS services to 6.3%, and Beep4Weather to 4.1%. In Tanzania, respondents reported that PICSA was responsible for 96.1% of the changes made. In 8.9% of the changes in Longido district, the radio programme played a role in the respondent making the change. In 3.4% of the changes in Tanzania, the SMS services contributed to the respondent making the change. Overall, 97.5% of the changes were influenced by at least one of the programme components (PICSA, interactive radio or SMS services). These figures correspond to the information presented in the qualitative interview notes for both countries, where most interviewees attribute their practice changes to the PICSA training, followed by the radio programme. The differences between countries can likely be attributed to contextual differences (in cultures, agro-ecosystems, etc.), to the lower exposure to radio and SMS services in Tanzania, and to the manner in which the PICSA training was delivered in Tanzania (training delivered to community members too late in the season for them to make changes in Kiteto and Longido and people not always brought together in group sessions in Longido).

The numbers of changes made by respondents were calculated. In Balaka, respondents made an average of 2.15 changes, while in Tanzania they made an average of 1.01 changes (Kiteto: 1.10; Kondoa: 1.97; Longido: 0.10). There were also some differences along gender and wealth lines in number of changes made. In Balaka, men made approximately 2.5 changes to their activities in the 2015/2016 season, compared to around 2 changes women made on average. Also, respondents in the lower wealth group made 2.4 changes per respondent, and those in the upper wealth class made 1.9 changes. The number of changes made by men and women respondents in Tanzania and their attribution to the programme were similar, although women made significantly more changes to livelihood activities than men (12.1% for women compared to 6.4% for men). Along wealth lines, it is an opposite story in Tanzania. Respondents in the lower wealth group in Tanzania made only half the number of changes compared to those in the upper wealth group. This relates to the findings of the

qualitative interviews from Tanzania, where interviewees often mentioned wanting to make changes but not having enough capital needed to do so.

The quantitative survey responses and the qualitative case studies offer evidence of intangible benefits of the training beyond the visible practice changes made. In the survey, large proportions of respondents reported seeing agriculture as more of a business following the PICSA training (79.9% in Tanzania and 91.9% in Malawi). The case study interviewees reported this perception as well and also stated that the interventions had changed their ways of thinking and made them more curious to seek out information from their extension workers and other sources on how to improve their agricultural practices. One of the interviewees in Malawi also reported satisfaction with the SMS service because he no longer had to go to his extension worker with each and every technical issue. He reported sharing the messages he received with his friends and family; according to him, they were beginning to try the new practices that he was using.

High proportions of respondents in each country also felt that their standing within their household and community had been improved as a result of participation in the training. The percentages of respondents who agreed or strongly agreed with the statement “As a result of the training I have received I feel that my social standing in my household has improved” were 83.6% in Balaka, 98.0% in Kiteto, 96.6% in Kondoa, and 51.7% in Longido. Those who agreed or strongly agreed with the same sentiment regarding their social standing in their local community were 84.4% in Balaka, 96.6% in both Kiteto and Kondoa, and 49.3% in Longido.

A majority of respondents reported feeling more able to cope with bad years caused by weather as a result of the interventions. Respondents who agreed or strongly with the statement “Following the training I feel that I am more able to cope with bad years caused by the weather” were 80.4% in Balaka, 98.0% in Kiteto, 96.6% in Kondoa, and 63.1% in Longido. From the qualitative interviews in Balaka, many interviewees reported being admired by friends and neighbours for achieving even a small yield during a year when many people had completely failed harvests. Several interviewees also mentioned that they had already prepared their land for planting by the time of the interview because they had learned through the radio programme that the rains were expected earlier that year.

This section explores the tangible changes in more detail and looks at any key differences between men and women, R4 and non-R4 participants, and upper and lower wealth groups. It is also divided by changes to cropping practices, livestock keeping, and other livelihood activities.

### Cropping changes

The changes that participants reported making to their cropping practices are listed in Table 6 along with the percentages of respondents making each change by district. The high rate of switching to a new variety can be seen in Balaka; in the qualitative interviews seven out of eight people reported growing a different variety of maize compared

to last season because they decided following the PICSA training that using an early maturing variety would be beneficial given the historical climate data for their area. In Kiteto, most people just grew a different crop variety, and in Kondoa, the changes were more spread between changing how land/crops were managed, amount or type of inputs used, and changes in cropping area size. The low rates of changes in cropping practices is apparent in Longido, where hardly any respondents had

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*“I can say [the initiative] has influenced my yield because if I still planted local maize last season, I would not have been speaking of one bag that I harvested.”*

*--Malawi interviewee*

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made changes to cropping practices. There were two qualitative interviewees in Longido, however, who reported that they started crop farming (maize and horticulture) following the PICSA training, and these seem to not have been picked up as changes by the quantitative survey.

Table 6. Cropping changes reported by survey respondents

	Malawi	Tanzania		
	Balaka (%) N = 193	Kiteto (%) N = 203	Kondoa (%) N = 204	Longido (%) N = 204
I grew a new or different crop	21.1	2.5	5.9	0.0
I grew a different variety of a crop I had grown in the previous season	57.9	40.9	9.3	0.0
I increased the area I grew the crop on	9.5	0	2.9	0.6
I decreased the area I grew a crop on, or I stopped growing it altogether	5.4	0	13.2	0.9
I changed the date that I planted my crops	0.9	0	0.5	0.7
I changed the type or amount of inputs (e.g. fertiliser/seeds) that I used in my crop enterprise	11.6	2.0	25.0	0.0
I changed the way that I manage my land and/or my crops	29.7	3.9	39.7	0.5
Other	2.5	0.0	0.0	0.0
I did not make any changes in my crop enterprises	4.1	50.7	38.7	97.3

Based on information from the qualitative interviews, the radio and SMS services were also influential in changing cropping practices. In Malawi, one interviewee reported that she began keeping a 'winter' farm in which she grows tomatoes and sweet potatoes using irrigation after learning about it through the radio programme. In Longido, one interviewee replied that he used the information gained from the radio to help plan the timing of his farming activities. The interviewees also indicated hearing on the radio programmes about the same practices that were covered in the PICSA trainings and getting the weather forecasts via radio enabled them to plan their activities as had been discussed in the PICSA sessions, so the interventions do seem to have reinforced each other as discussed in the theory of change.

In Malawi, 22.4% of non-R4 respondents grew a new or different crop compared with 11.5% of R4 participants, and 31.7% of non-R4 respondents changed the way they manage land and/or crops compared with 11.6% of R4 respondents. Differences between changes made by men and women in Malawi are also notable. A quarter of women respondents reported growing a new or different crop, whereas only 13.7% of men reported such a change. In Tanzania, the cropping changes reported were similar between men and women.

#### Box 1. Example of cropping changes in Kiteto

Interviewee TZ 04 raised her crop yields and income as a result of the changes she made following the interventions. She now better understands the importance of **proper timing for planting and weeding**, her crops are now **planted in rows**, and she **uses fertilizer**. She also keeps track of weather variations so as to make proper farming plans and carry out activities in accordance with the forecast. She expects to continue applying these practices to her farming activities in the future. Her yields used to be 7-8 bags per acre of maize and 6-7 bags per acre of sunflower. Following the training, she harvested 20-25 bags per acre of maize and 10-12 bags per acre of sunflower. Her income has increased from selling the surplus produce.



## Livestock changes

Table 7 presents the livestock changes reported by respondents in each district. Longido, despite being a pastoral area, has the lowest number of changes to livestock practices. Responses from the qualitative interviews may help shed light on the reasons behind this. First, one of the interviewees remarked that the Masai (the pastoral group in Longido) are very conservative and do not change easily. He believed the training would have to be repeated frequently for people to begin to change. Second, several interviewees in Longido reported being trained individually at their homes by the extension agent instead of through the recommended group sessions that PICSA is meant to entail. One woman said this is due to the difficulty in bringing people together in her area if there is no incentive to attend a gathering. This failure to adhere to the recommended format for PICSA group training sessions may have contributed to the low rates of changes seen in Longido along with cultural values and norms.

*Table 7. Livestock changes reported by respondents*

	Malawi	Tanzania		
	Balaka (%) N = 193	Kiteto (%) N = 203	Kondoa (%) N = 204	Longido (%) N = 204
I tried a new livestock enterprise	12.7	4.9	6.4	0.7
I have increased the scale of a livestock enterprise	13.2	14.3	9.3	2.9
I have decreased the scale of a livestock enterprise or stopped a livestock enterprise	11.8	3.0	4.4	2.0
I changed the way that I manage my livestock	9.6	6.4	27.5	0.0
Other	1.5	1.0	0.0	0.0
I did not make any changes in my livestock enterprises	53.0	70.9	56.4	95.1

Several examples of the changes made can be gleaned from the qualitative interviewees. Many of the interviewees attributed the changes made to their livestock management practices mostly to the information heard during the radio programmes. The qualitative interviewees also provided several examples of using the SMS service to obtain livestock-specific advice, such as the correct medicine to use on an ailing goat or how to improve the health of ill chickens.

Some of the interviewees reported trying a new livestock enterprise either through purchasing goats as a result of crop sales or re-entering poultry farming after not practicing it for several years. The ones who started poultry farming had given it up due to the high mortality rates, but they now vaccinate their chickens regularly and are able to maintain their flocks. Others who had been keeping chickens also reported vaccinating regularly (i.e., changing the way they manage their livestock) and achieving decreases in mortality rates. Interviewees also reported vaccinating cows and goats, providing better feed, and improving

### **Box 2. Livestock changes in Kondoa**

One interviewee in Kondoa used to normally only have two chickens since most of them would die while they were still chicks. From what she learned during the interventions, she began regularly vaccinating the chickens every three months and feeding them properly. This has reduced their mortality rate, and she now keeps an average of 15 hens. She has sold approximately 20 chickens, and some have been used for household consumption. Her household food security has improved, and the money she receives from selling chickens is used for household items such as salt, sugar, and soap.

animal housing. Qualitative interviewees in all districts also reported consulting a veterinarian more regularly than in the past.

### Livelihood changes

Respondents made fewer livelihood changes than cropping and livestock changes. The highest rate of livelihood changes was in Balaka, and Kiteto had the highest rate of people trying a new livelihood enterprise (Table 8). One of these people was interviewed during the qualitative survey. This interviewee reported the PICSA training helped her learn how to budget her expenses and plan other livelihood activities. With her increased income from crop sales, she was able to start a small doughnut baking business (see Box 3 and Appendix 3 (case TZ 04) for more information on her achievements). In the quantitative survey, respondents in both countries reported entering into petty trading as a new livelihood, and other responses were brewing, food crop selling, and charcoal selling, among others.

A difference can be seen in the rates of trying a new livelihood enterprise between R4 and non-R4 participants in Malawi. Of R4 respondents, 29.5% reported trying a new livelihood compared to just 9.5% of non-R4 respondents. Given the small sample size of R4 beneficiaries (n = 48), the difference is not statistically significant but it is still meaningful. This result can be linked back to the theory of change by postulating that the R4 beneficiaries were more able to take a prudent risk of trying a new livelihood because they had access to credit and/or had built up savings through the VSLs although this was not observed for crop and livestock changes as reported in the sections above.

#### Box 3. Livelihood changes in Kiteto

A woman in Kiteto used the money she earned from selling surplus produce to start a small business making and selling *mandazi* (local doughnuts). She was also able to purchase a new mattress and she reports that her family is now able to eat different food varieties at least twice a day.

Table 8. Livelihood changes made by respondents

	Malawi	Tanzania		
	Balaka (%) N = 193	Kiteto (%) N = 203	Kondoa (%) N = 204	Longido (%) N = 204
I tried a new livelihood enterprise	11.5	14.3	5.9	0.9
I have increased the scale of a livelihood enterprise	4.5	4.4	5.4	0.0
I have decreased the scale of a livelihood enterprise or stopped a livestock enterprise	4.6	0.0	0.0	0.0
I changed the way that I manage my livelihood enterprise	2.4	0.0	3.9	0.0
Other	0.0	0.0	0.0	0.0
I did not make any changes in my livelihood enterprises	77.7	81.3	85.8	99.1

### Changes participants wanted to make

The qualitative interviews in Balaka did not reveal much information on interviewees wanting to make more changes, but the quantitative survey showed that 77% of those who reported crops as one of their livelihood sources would have liked to make more changes to their crop activities. The



reasons provided for not making more changes were primarily lack of money, high risk of unfavourable season, and limited access to inputs and resources.

The lack of capital to invest in making changes was the main reason the qualitative interviewees in Tanzania gave for not making more changes. In the quantitative survey, 66.5% of respondents with crops as a livelihood source reported they would have liked to make more changes, while similar percentages of respondents with livestock and other livelihood sources would have liked to make more changes to those livelihoods. The main reason for not making more changes cited in each category was lack of money, with the second highest being lack of access to inputs and resources.

In Tanzania, there was a large difference between men and women in the reasons they were not able to make the livelihood changes they wanted. Among men who said they would have liked to make more changes to their livelihood activities, 49.8% cited a lack of money as a reason for not making more changes, while 65.6% of women cited money as the limiting factor in making changes to livelihoods. This points to women having more difficulty accessing money to invest in their agricultural practices.

Differences were also found in Malawi, but in changes the respondents wanted to make to crops: 38% of men who said they would have liked to make more changes to crops reported lack of money as the reason they were unable to do so, whereas 45.7% of women reported lack of money as an obstacle. Also in Malawi, 28.9% of women who wanted to make more changes to their crops cited a high risk of unfavourable season as a barrier, while 51% of men reported this as a reason. For changes to livelihoods in Malawi, 20% of men who would have liked to make more livelihood changes reported that lack of access to inputs and resources was a barrier while only 11.7% of women cited this as a barrier. This may be partly due to the types of livelihood changes that men would like to make in comparison to women, but the data do not allow for further insights. More in-depth research would be needed with community members to help determine the details of what inputs and resources would be needed by men to help them realize their desired livelihood changes.

## 8. Outcomes and impacts experienced by participants

This section highlights the outcomes and impacts experienced by participants as a result of changes implemented following the initiative's interventions.

### Malawi

Within the quantitative survey, respondents were asked what changes they had made and what contributed to their decisions to make those changes. Of those that reported planting a new crop variety, 94.1% attributed that change to the PICSA training, 44.4% reported that the radio programme had contributed to the change, and 8.9% said the SMS service had contributed (the total is greater than 100% because more than one response was possible). In 70.4% of the cases where respondents planted a new variety in the 2015/16 season, they said it had a positive effect on their household, and 97% would plant the variety again. The positive effects from planting a new variety that were reported were that the household had more food than before (86.3%), the respondent was better able to cope with bad years caused by weather (32.6%), and the household had more income than before (28.4%). Similar results for changes in livestock enterprises were also found. Respondents who answered that they had increased the scale of the livestock activities reported that they had more income from sales and more food for household consumption. All of the respondents reporting such a change attributed it to discussions in the PICSA trainings.

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*"I know I sustained [through the hunger months] because of the combination of different crops that I made."*

*--Malawi interviewee*

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Based on information from the qualitative interviews, the most commonly mentioned outcome in Malawi was increased yields, both from maize and from other crops. This outcome was attributed by the respondents to the adoption of hybrid seed, the use of mulching, and the

practice of conservation agriculture. Several respondents also reflected on their improved livestock management practices as a result of messages received through the radio programme and the SMS service. After receiving information via radio and SMS, many of the respondents now vaccinate their livestock regularly and consult with a veterinary officer in the case of sick animals. There were several respondents who reported improving the housing of their livestock to have better health outcomes. One respondent mentioned taking livestock rearing more seriously than in the past because he had a better understanding of the value that animals have. This is possibly due to the use of participatory budgeting tools presented in the PICSA training and the information heard through the interactive radio programme reinforcing this message. Other respondents reported taking better care of their chickens as a result of vaccination through group contributions for the needed drug. The VSL groups within the R4 programme may have contributed to the group actions on collectively purchasing chicken vaccines.

The participants also reported receiving income from crop sales, especially those who had diversified into crops other than maize. Some of those who started growing pigeon peas, groundnuts, sweet potatoes and green grams sold some of their harvest in the market and used the income earned to purchase household goods and pay for school fees. They had decided to diversify their crops after listening to the discussions in the PICSA trainings on the benefits of growing different crops. A couple of the respondents spoke of the irrigation farming they began after learning about the techniques in the PICSA training and over the interactive radio programme. One woman reported using the money from her tomato sales to help purchase household materials like salt and soap. A man who had an increase of 31 bags of maize reported being food secure and not experiencing any issues of malnutrition in his family. He was able to purchase shares in the village bank and began renovating his house. He also used the extra maize to pay for labour in his fields (see the effects diagram in Figure 11 for his view on how the extra yield has impacted his life).

The diversification of crops and increased yields of maize resulted in improved food security and diversified diets. One interviewee remarked, "I know I sustained because of the

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*"Above all, [the interventions] opened my mind such that I now know what is happening in terms of weather and I am able to plan accordingly."*

*--Malawi interviewee*

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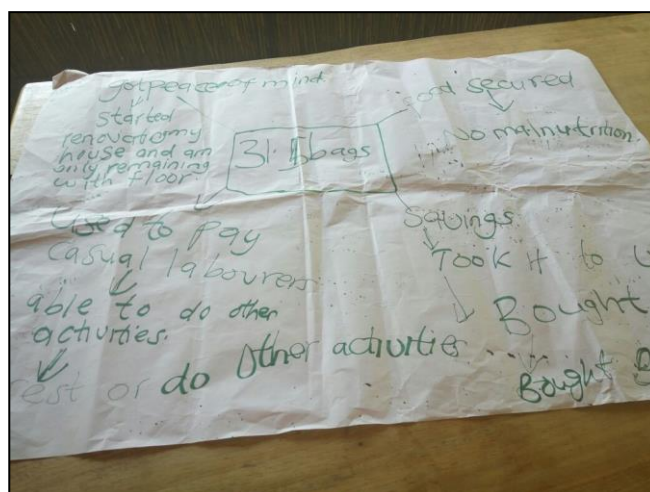


Figure 11. Effects diagram from a case study in Balaka

combination of different crops that I made.” Others appreciated having a variety of foods in their households.

Those respondents who reported participating in the R4 activities verified the predicted interactions between the interventions within the theory of change. They reported using the loan money from participating in VSLs to purchase seed and fertilizer after learning of the importance of agricultural inputs in the PICSA trainings and through the interactive radio programmes. Some of the labour that they contributed toward participation in the Food for Assets and crop insurance programmes was on constructing marker ridges and ridge realignment, which were practice changes discussed in the PICSA training and radio programme. Without the incentive of receiving food or insurance, it is possible that some of these participants may have had to seek out casual labour on other people’s farms instead of investing their time and labour in their own fields. Learning about local weather patterns and variability in the PICSA trainings may also have affected the decision of some respondents to work toward insuring their crops through R4 in this coming season, although that was not explicitly stated by the respondents.

There were several respondents who, reflecting on the various interventions, concluded that what they learned changed their thinking on agriculture and opened their minds to new ways of farming. One woman reported that she now takes farming more seriously as a business as a result of the participatory budgeting and other skills she learned. Three of the respondents specifically mentioned gaining ‘peace of mind’ as a result of getting better harvests. Four of the eight respondents reported that they were admired by friends and neighbours because they harvested some maize last season whereas many people did not harvest anything at all.

The qualitative information helps provide a more in-depth perspective of people’s experiences with the interventions, and the responses from the quantitative survey provide responses to specific statements from a representative sample (see Table 9).

*Table 9. Respondents’ perceptions of the PICSA training in Malawi*

	Respondents who agreed/strongly agreed (%) N = 193
The training that I have received has made me more confident in planning and making decisions about my farming and livelihood	97.5
The training that I have received has influenced my planning and decision making over the past season	97.6
The decisions that I have taken because of this training have improved my household food security	76.5
The decisions that I have taken because of this training have improved the amount of income that my household receives	79.8
From the benefits of this training I have been able to better provide for my household’s healthcare	69.4
From the benefits of the training I have been able to easier pay for my children’s school fees	52.4
As a result of the training that I have received I now see farming as more of a business than I did previously	91.9
As a result of the training I am now better at making decisions and planning for my farming and household	95.0

	Respondents who agreed/strongly agreed (%) N = 193
As a result of the training I have received I feel that my social standing in my household has improved	83.6
As a result of the training I have received I feel that my standing in the local community has improved	84.4
As a result of the training I am now more confident to talk about livelihood or farming with my fellow farmers	93.1
Following the training I feel that I am more able to cope with bad years (caused by the weather)	80.4
I feel that this training is more useful than other training that I have received from this training provider	93.5
From the benefits of the training I believe that there will be less need for my family to work on other people's land next season	89.7
Thinking about the training I felt that it took too much of my time	11.2
I felt that the training needed to be conducted earlier in the year so that there was more time before the season for me to plan and make changes	72.5
The training was too difficult to understand	9.1

## Tanzania

Of the Tanzanian survey respondents that reported making a change to a crop variety, 100% agreed that the PICSA training contributed to their decision to make that change. In 97.5% of the cases where respondents planted a new variety in the season following the training, they said it had a positive effect on their household, and 98.3% would plant the variety again. The positive effects reported were that the household had more food than before (91.5%), the respondent was better able to cope with bad years caused by weather (38.5%), and the household had more income than before (70.1%). For changes in livestock management practices, most of the respondents reported that they changed practices related to cattle and goats. Ninety-four percent of the respondents that made a change to livestock management reported feeding the animals better than before, and 95% answered that they were consulting a vet, getting them vaccinated, or in general paying more attention to their health. Almost all of the respondents reported that the PICSA training contributed to making those changes in the livestock management practices.

As in Malawi, the most commonly mentioned outcome during the case study interviews from the changes in practices was increased crop yield for maize, sunflower, and pigeon pea. These yield increases were mostly seen in Kiteto and Kondoa. Some respondents reported increases of double or triple what they used to obtain. This resulted in having more food for the household and the sale of surpluses, which boosted household income. Correspondingly, the impacts of improved food security and increased income were mainly reported in Kiteto and Kondoa. Other respondents in both Kiteto and Kondoa mentioned being able to cover medical expenses with the increased income from crop sales and using the money for other household necessities like sugar and salt.

Not everyone achieved increased yields, however. One of the respondents in Kondoa reported that the training had no significant impact on his yield and income. He reported that before the training his maize yield was one to two bags per acre and after applying the practice changes of better timing, planting using a rope, adopting a new seed variety and applying fertilizer, his yield was only

three bags per acre. This yield was below his expectations, although he did report that the immediate season after the training was very bad and there was severe rainfall shortage which he did consider to be a mitigating factor.

Respondents in Kiteto and Kondoa experienced improvements in their livestock rearing outcomes. In Kiteto the mortality rate of animals was reported as decreasing, which allowed for an increase in the number of animals kept and the number consumed by the household. In Kondoa several respondents mentioned increases in milk yield and the number of poultry.

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*“After selling some of my cattle that were of the local breed, I used the money to buy a new breed (Boran), which has started producing more milk. I also used some of the money to build a house and toilet.”*

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*--Longido interviewee*

The increased milk yield was used for household consumption, and several interviewees reported consuming some of their chickens on special occasions. The outcomes in Longido were improved milk yield for three of the qualitative interviewees, and out of those three were two men who had started growing some vegetables that they were using for household consumption. One man was also selling some of the vegetables and using the income to purchase salt and sugar. The Longido interviewees who reported making changes also said their cattle were now healthier and had fewer diseases. The milk yield for those interviewees had increased. One woman was able to build improved cattle housing with extra income she earned from milk sales, and a man who sold some of his local cattle used the profits to build a household and toilet for his family. Overall, the outcomes and impacts in Longido were far fewer than those reported by respondents in Kiteto and Kondoa, which is to be expected given the lower rates of changes made by respondents in Longido.

The overall perceptions of respondents in Tanzania regarding the PICS training are presented in Table 10.

*Table 10. Respondents’ perceptions of the PICS training in Tanzania*

	Respondents who agreed or strongly agreed (%) N = 611
The training that I have received has made me more confident in planning and making decisions about my farming and livelihood	93.9
The training that I have received has influenced my planning and decision making over the past season	89.3
The decisions that I have taken because of this training have improved my household food security	82.9
The decisions that I have taken because of this training have improved the amount of income that my household receives	84.5
From the benefits of this training I have been able to better provide for my household’s healthcare	81.3
From the benefits of the training I have been able to easier pay for my children’s school fees	83.6
As a result of the training that I have received I now see farming as more of a business than I did previously	79.9

	Respondents who agreed or strongly agreed (%) N = 611
As a result of the training I am now better at making decisions and planning for my farming and household	87.5
As a result of the training I have received I feel that my social standing in my household has improved	84.5
As a result of the training I have received I feel that my standing in the local community has improved	83.1
As a result of the training I am now more confident to talk about livelihood or farming with my fellow farmers	84.5
Following the training I feel that I am more able to cope with bad years (caused by the weather)	87.8
I feel that this training is more useful than other training that I have received from this training provider	89.5
From the benefits of the training I believe that there will be less need for my family to work on other people's land next season	84.5
Thinking about the training I felt that it took too much of my time	12.9
I felt that the training needed to be conducted earlier in the year so that there was more time before the season for me to plan and make changes	88.9
The training was too difficult to understand	12.9
I would like to get similar trainings in the future	97.6

## 9. Conclusions and recommendations

The overall results from the desk review of programme documents, the quantitative survey results and qualitative interviews combine to provide a favourable evaluation of the GFCS-APA programme's food security interventions. In general, respondents in the targeted districts of this evaluation made tangible changes to their agricultural practices and livelihoods, which resulted in positive impacts on their lives. They were very receptive to and pleased with the PICSA training and also appreciative of the interactive radio programmes and SMS component. The radio and SMS interventions were not as effective in Tanzania as in Malawi, but survey respondents in all districts reported very high levels of using topics covered in the PICSA trainings to help with their planning and decision making before and during the season. Exploring various possibilities for forming radio listening groups in Tanzania that fit within the environmental and cultural context could be one way of continuing to improve the delivery and effectiveness of the radio programming.

The theory of change appears to hold true based on the results of the evaluation. Those respondents who received all of the intervention components in Balaka (including participation in the R4 programme) achieved positive impacts in their household food security and incomes, although it is not possible from the results of this survey to quantify the impacts and evaluate if they are on a greater scale than non-R4 participants. It is not possible to statistically test the hypothesis that all of the components together result in better outcomes, but within the qualitative case studies we can see evidence that access to credit through VSL groups encourages the ability to purchase agricultural inputs without the need to work as a casual labourer on other people's land. Further exploration of the role and influence of the interactive radio and SMS services in Balaka and their relatively low

existence or complete absence in Tanzania can help further understand how the interventions interact to help participants plan and make decisions.

In general, the types of changes made by participants and the magnitude of people implementing such changes are impressive, especially in light of other development interventions that often do not achieve such significant levels of adoption. The benefits of bringing together extension workers, national meteorological services, and other partners to increase the capacity of vulnerable, food insecure community members to use climate information products for improving their livelihoods is clearly evident.

Moving forward, the current suite of indicators used to monitor progress within the R4 programme could be used to also evaluate the PICSA, radio and SMS interventions. A few additional indicators could be added to assess the use of local weather forecasts by participants in planning their agricultural activities, the levels of radio listenership, and the number of people utilizing the SMS service. For example, an indicator on the number of households making agricultural decisions based on downscaled weather forecasts can be included in the R4 monitoring framework. More rigorous evaluation to assess the extent of information sharing from directly trained individuals to others in the community should also be explored.



## References

- Coulibaly JY, Kundhlande G, Tall A, Kaur H, Hansen J. 2015a. What climate services do farmers and pastoralists need in Malawi? Baseline study for the GFCS Adaptation Program in Africa. CCAFS Working Paper no. 112. Copenhagen, Denmark: CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). <http://hdl.handle.net/10568/65727>
- Coulibaly JY, Mango J, Swamila M, Tall A, Kaur H, Hansen J. 2015b. What climate services do farmers and pastoralists need in Tanzania? Baseline study for the GFCS Adaptation Programme in Africa. CCAFS Working Paper no. 110. Copenhagen, Denmark: CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). <http://hdl.handle.net/10568/67192>
- Dorward P, Tall A, Kaur H, Hansen J. 2014. Training agricultural research & extension staff to produce and communicate agro-climatic information, to enhance the resilience and food security of farmers and pastoralists in Kiteto, Tanzania. CCAFS Working Paper no. 132. Copenhagen, Denmark: CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). <http://hdl.handle.net/10568/68140>
- Dorward P, Clarkson G, Stern R. 2015. Participatory Integrated Climate Services for Agriculture (PICSA): Field Manual. Walker Institute, University of Reading. <http://hdl.handle.net/10568/68687>
- Fisher M, Abate T, Lunduka RW, Asnake W, Alemayehu Y, Madulu RB. 2015. Drought tolerant maize for farmer adaptation to drought in sub-Saharan Africa: Determinants of adoption in eastern and southern Africa. *Climatic Change* 133: 283-299.
- [FRI] Farm Radio International. 2016. Interactive radio climate information services: Final report, Tanzania. Unpublished.
- [FRT] Farm Radio Trust. 2016. Annual Report 2016: Interactive radio and climate adaptation radio programming project. Unpublished.
- Hampson KJ, Chapota R, Emmanuel J, Tall A, Huggins-Rao S, Leclair M, Perkins K, Kaur H, Hansen J. 2015. Delivering climate services for farmers and pastoralists through interactive radio: scoping report for the GFCS Adaptation Programme in Africa. CCAFS Working Paper no. 111. Copenhagen, Denmark: CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). <http://hdl.handle.net/10568/65728>
- Kassie M, Jaleta M, Shiferaw B, Mmbando F, Mekuria M. 2013. Adoption of interrelated sustainable agricultural practices in smallholder systems: Evidence from rural Tanzania. *Technological Forecasting & Social Change* 80: 525-540.
- Perkins K, Huggins-Rao S, Hansen J, van Mossel J, Weighton L, Lynagh S. 2015. Interactive radio's promising role in climate information services: Farm Radio International concept paper. CCAFS Working Paper no. 156. Copenhagen, Denmark: CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). <http://hdl.handle.net/10568/70260>
- Tall A, Njinga JL. 2013. Developing a methodology to evaluate climate services for farmers in Africa and South Asia: Workshop report, May 19-25, 2013, Kaffrine (Senegal). Copenhagen, Denmark: CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). <http://hdl.handle.net/10568/33442>

## Appendix 1: Evaluation Outline for WFP contribution to the GFCS Climate Services Adaptation Programme in Tanzania and Malawi

- University of Reading (UoR), UK: Peter Dorward & Graham Clarkson
- Statistics for Sustainable Development (SSD), Reading, UK: Sebastian Steinmüller & Carlos Barahona
- Consultant: Laura Cramer
- Consultant for qualitative fieldwork: tbc

SSD proposes an evaluation approach composed of three parts:

1. Understanding the interventions: strategy, pathway and progress of the R4, Farm Radio Trust (FRT) and PICSA intervention towards achieving its goals. This will also include review of the methodology used in the baseline study carried out by ICRAF in Longido and Kiteto. This will be done through interviews with key persons of WFP, CCFAS, ICRAF, FarmRadio Africa and a desk review of project documents.
2. PICSA beneficiary assessment: Assess the progress of PICSA and the other initiatives (radio programmes and delivery of information through SMS) through the beneficiaries' perspective. This will take place through a household survey of 200 interviews in each of the 4 districts which will be designed based on the information obtained in the first part. Qualitative case studies will be collected to obtain further in-depth insights, with 8 in-depth case studies planned for each district.
3. Summary report: Drafting a final report summarising the outputs and results from parts 1 and 2. The report will be developed working closely with WFP to ensure that length/content are user friendly and can be utilised in the wider project evaluation.

### Part 1: Understanding the interventions

This will be an assessment of the intended scope, development, progress, and current status of the intervention and comparison with the initial project goals.

This will provide us with an understanding of what happened between the start of the intervention and today (mid 2016). Furthermore, review of the baseline reports and findings will be carried out to see how they can be used as sources of information for the initial situation at the start of the intervention.

This part of the evaluation will be conducted on the institutional level by means of interviews with key contacts in WFP for each country, with CCFAS and FarmRadio Africa relevant stakeholders as needed. It will be complemented by a desk review of key project documents, reports, and other material. Primary data analysis will not be part of this stage of the evaluation.

Goals of part 1:

- Assess the situation at the start of the intervention by reviewing baseline documents and reports.
- Gain an overview of the intended coverage and population reached by radio, SMS and PICSA to clearly identify and distinguish potentially different target populations per intervention.
- Establish what were the intervention activities and the involvement of local partner organisations in each of the target districts in both countries.

- Identify, explain and document the pathway of each intervention (R4, FRT and PICSA) from rollout until today: Clarify initially intended outcomes, identify activities not carried out and new (emergent) activities added to the project and compare them to the original plan.
- Identify plans of WFP for the future development of the intervention.
- Identify, learn from and decide the extent to which it would be desirable to use evaluation approaches and instruments that each intervention has used to gather baseline data or assess the effects of their operations in Malawi and Tanzania.
- Draft a Theory of Change (ToC) for each of the components – this will also be used to inform the development of an M&E system for the food security component of the GFCS Adaptation Programme for Africa Phase II.

Outputs from part 1:

- ToC for each of the intervention components
- Report detailing the intended scope, development, progress, and current status of the intervention components

Timeline for part 1: Mid-August 2016 – beginning of September 2016

#### Part 2: Radio/sms and PICSA beneficiary assessment

The goal of this part is to assess the extent to which beneficiaries are aware of the radio programmes/sms and PICSA, the way they used the information provided and whether they benefited from it. The evaluation questions addressed in the survey will have been identified in the PICSA ToC drafted in part 1, taking also into account questions used in the initial baseline exercise carried out by ICRAF in Kiteto and Longido

Interviews at the household or individual level through a survey of 200 respondents per district representative of the PICSA beneficiaries will be collected to assess the beneficiaries' awareness, use, opinion and potential benefits of PICSA and the extent to which it affected them. Further questions on the use of radio and SMS from the Farm Radio component can be included in the survey tools without aiming for a representative sample of FRT beneficiaries. The interviews will be collected in Balaka district for Malawi and in Kondoa, Kiteto and Longido districts for Tanzania in a clustered random sampling design. The cross-sectional survey design will be devised in detail using information obtained in part 1. Open Data Kit (ODK) on tablets will be used as tool for the interviewing process.

Additionally, 8 qualitative case studies per district will be conducted with selected respondents from the household interviews. The goal of the case studies is to provide us with a more in-depth understanding of the mechanisms through which PICSA and other information that were provided affects decision-making of farmers with regards to livelihoods, agricultural practices and resilience. It will also aim at identifying what could be done better/improved in terms of content or delivery of information in the coming years to inform Phase II of the GFCS Adaptation Programme for Africa.

Outputs from part 2:

- Cleaned and documented raw data from the household surveys
- Technical report with tables, figures and brief interpretations of summary results from analysing the survey raw data
- Survey report detailing progress, challenges and lessons learnt from the household surveys
- Transcriptions from the qualitative case studies

Timeline for part 2:

- Training of enumerators and fieldwork for surveys: Between early September 2016 and early November 2016
- Data analysis of survey data: Early/mid-November 2016 (to be aligned with development of tools and fieldwork for qualitative case studies)
- Training of enumerators and fieldwork for case studies: mid-September to mid-October

### Part 3: Summary Report

A final summary report will be drafted bringing together the evaluation results obtained from the desk review for R4 and FRT as well as the quantitative and qualitative information collected for PICSA to outline the current status, past development and intended pathway of the food security component of the GFCS Adaptation Programme for Africa Initiative.

Outputs from part 3:

- Final summary report by early December
- Summary of the case studies collected in part 2 by end November

## Appendix 2: Qualitative interview questionnaire

1. Place:
2. Reference:
3. Date:
4. Gender of respondent:
5. Age of respondent:
6. Please write in the details of the training that the respondent attended - i.e. when? How many sessions did they attend? Why did they attend the training?
7. How did you find the PICSA training? Probing questions: *Did you feel that the training was useful to your farming and livelihood? Which of the parts of the training did you find most useful? Why did you find this/these parts useful? Have you discussed the training with your family and peers since you attended? If yes, who and what aspects and why? Did you learn new things from the training that you haven't thought about before? What were they?*
8. Did you listen to the farm radio programme [*Ulimi ndi nyengo*] (how often)? Do you use it to adapt your farming practices during the season? (Same for SMS and Beep4Weather)
9. How has the PICSA training influenced your farming or non-farming practices?
10. What impact has the PICSA training had on your yield, your income and your household more widely?
11. Thinking more closely about the R4 programme, what has been your experience of this?
12. Are you able to suggest any improvements that could be made to the training? Also, what areas do you think need to be covered again?
13. What was the season immediately after the training like? Was it fairly normal? If not, what was unusual about it? Please describe it.
14. Changes. Please use this space to outline the changes discussed with the respondent. We will have information on the changes that the respondents have made based on the quantitative results.
15. Participatory budget: Complete the table with activities by month and labour and cash inputs required
16. Comparison: Compare the practice with the similar activity from the previous season
17. Notes on comparison - please use this space to give detail / explain the comparison that has been made and why it was used.
18. If the change is/was an addition - what practices have had resources reduced
19. Difference to take into Effects diagram
20. Use this space to explain the effects diagram - i.e. give a written summary of the effects described by the farmer.

## Appendix 3: Case studies

Eight quantitative survey respondents from each district were selected for in-depth qualitative interviews. A technical report analysing and synthesizing results from all the interviews was prepared and submitted to WFP as part of the full evaluation. Notes from all 32 interviews have also been provided to WFP. This appendix contains a sample of the interviews presented as long form case studies. The names of the interviewees have been removed to ensure anonymity.

### Interviewee M01, Balaka district, Malawi

Interviewee M01 is a 48-year-old woman living in the Mkomba village of Balaka District. She participated in the PICSA trainings offered by the extension agent for her area in August 2015. She attended three sessions, which were held at the chief's compound. She was chosen by the extension agent to attend and then train others. During the trainings, she learned about planting improved varieties that can mature earlier than traditional varieties, planting early, rotating her crops, and the importance of growing trees in their plots so as to improve the fertility of the soils.

In addition to the agricultural advice given by the extension agent during the PICSA trainings, she also listened to the *Ulimi ndi Nyengo* radio programme in a listening group. She stated that this was a very useful programme where they learned how the weather will be and also how to take care of their livestock. The programme provided information on the weather forecasts for the area so they could know the expected time of the coming rains, which helped them in preparing and planning accordingly. It was because of the radio programme that she had already prepared her land at the time of the interview and laid residues on a quarter of an acre where she was planning to do conservation agriculture in the upcoming season.

She was not subscribed to the SMS weather service because she was not interested in that offering of the initiative. She reported that her friends had been telling her about it, but she was not interested in using that technology.

The interventions of the initiative have influenced her practices in several ways. First, she now prepares her land early in anticipation of the rains instead of waiting for the rain to arrive as she used to do in the past. She has also diversified her crops as a result of the training. Previously, she only grew maize and pigeon peas, but now she has added ground nuts, sweet potatoes, and green grams to her range of crops. Another major change has been in her poultry keeping practices. As a result of the training, she reports, her fellow community members now contribute money to buy drugs for their chickens, which is difficult for an individual to do on his/her own. In 2014, she lost 10 chickens to Newcastle disease, but she believes that her remaining three will survive since she now knows how to take care of them. She also lost six goats prior to the PICSA training, but had she known she now knows about livestock management, she thinks they would still be alive.

Despite her diversification into more crops, the changes to her the timing of her land preparation, and her improved livestock management practices, this interviewee reported that one change she will not make is switching to an early maturing maize variety. She was taught through the interventions about the superior qualities of improved varieties, but she has not adopted such varieties because she insists that she has seen with her own eyes that the local maize varieties are resistant to weevils and other pests. She believes that the improved varieties are easily attacked by pests so she will continue growing her preferred local variety (known as *kagolo*).

#### Interviewee M04, Balaka district, Malawi

Interviewee M04 is a 47-year-old woman living in Mpamasi village of Balaka District, and she was told about the PICSA training by the chairman of their WFP club. She found the training very useful, especially since the facilitator used the local language and clearly communicated the messages to her and her fellow participants. She shared the lessons with her relatives and friends following the trainings. One of the topics that left a big impression on her was the village mapping exercise. After completing this activity, she realized that some resources are very far away from their village, such as water. She says that as women, they spend a lot of time collecting water and therefore have less time to concentrate on farming. She had never made this connection before, and she really enjoyed the lesson.

In addition to attending the PICSA training, she also listened to the *Ulimi ndi Nyengo* radio programme every week, both with her WFP listening group and at home when she was busy. Through the radio programme, she heard weather forecasts for the local area and was able to prepare for activities. For example, she says, if she learned that it would rain next week, she would plant in the current week so that when the rains came the seeds would already be in the field. The SMS service also benefited her. She received messages on her phone with agricultural advice, and even used the service to request help concerning a sick goat. She was advised on the best medication to use and also consulted the livestock officer for help. She shared the information from the radio and SMS service with her friends and relatives so they could benefit as well.

She is also a beneficiary of the R4 initiative. She is a member of the village savings and loans (VSL) group to which she contributes shares and can access loans. They usually distribute money in November, and she uses that money to buy fertilizer for the next season. She's been purchasing fertilizer using the VSL money for two seasons. She also benefits from the Food for Asset programme and receives 1 bag of maize, 2 litres of cooking oil and 10 kg of legumes as a result of contributing 20 days of labour in building productive assets. She reported that at the time of interview they were working on digging a shallow well for the village. She was also contributing the required days of labour to be included in the crop insurance programme for the coming season. She saw others insuring their crops last year, and that is what spurred her to do the same for the upcoming growing season.

Interviewee M04 enumerated the changes she made due to the PICSA training and other interventions and the resulting outcomes the changes had on her life. As a result of the PICSA training, she has switched from growing a local maize variety to growing an early maturing hybrid. She adopted some conservation farming techniques (mulching, marker ridge construction and ridge realignment), which she attributes to enabling her to have some harvest last season while many people she knows did not have any harvest due to bad weather. She also has diversified her crops: in the past, she only grew maize and pigeon peas but she has since added ground nuts and sweet potatoes to her fields. She previously did not know the importance of cleaning her livestock kraal but now undertakes this task. She has planted 30 agroforestry trees in her gardens, and her village has also planted two acres of tree communally.

The interventions and resulting practice changes made by the interviewee have had remarkable impacts on her yield and income. She achieved a harvest of 8 bags of maize from a quarter acre plot (one bag is 50 kg) and 20 bags of sweet potato and 15 bags of ground nuts from her remaining land in the 2015/16 season, despite reporting that the season was not good in terms of rainfall. She sold 15 bags of sweet potato and 10 bags of ground nuts for a total of 155,000 Malawian Kwacha (approx. USD 214 at the current exchange rate). She used this money to pay for her daughter's



school fees and to buy household necessities. She used the 8 bags of maize that she harvested as food for her household and also shared it with her elderly mother, her daughter and her son who had helped her with the money to purchase the seed. The maize lasted her for three months. Due to the learning that she has shared with her friends and relatives, she has observed others also using the mulching technique and realigning their ridges to be 75 cm apart instead of the previous 90 cm. She reports that, above all, PICSA has enlightened her to be aware of the local weather and plan her activities accordingly.

#### Interviewee M07, Balaka District, Malawi

Interviewee M07 is a 22-year-old man in Chisoni village of Balaka District. He attended three sessions of PICSA training between October 2015 and March 2016. He recalls learning about community mapping, historical rainfall data, the importance of trees, and improved agricultural practices, among other topics. He understood the topics and appreciated the delivery method whereby the participants were allowed to ask questions of the extension worker. He learned things he did not expect, such as the correlation between hot northern winds and the coming of early rains. He now has a better appreciation of the local weather patterns and a deeper understanding of how climate change affects his farming as a result of the PICSA training.

He did not listen to the *Ulimi ndi Nyengo* radio programme because he does not own a radio and does not belong to a listening group. He also was not aware of the SMS service because the extension worker did not inform them about this. He wishes that those services would reach him soon. He is a participant in the Food for Asset programme and receives maize, cooking oil, and legumes which he says helps him a great deal in terms of food for his family. He is not involved in any crop insurance scheme, however, and he does not participate in the village saving and loan group because he does not see the importance of belonging to such a group.

Although the interviewee is not participating in the full range of interventions offered by the initiative, he is making positive changes in farming practices. Following the PICSA training, he saw the importance of planting hybrid maize, and although he already had local maize ready for planting that season, he sought out casual labour opportunities to earn money for purchasing hybrid seed of an early maturing variety. He planted this on 1.5 acres, and even though the weather that season was poor, he managed to harvest 1.5 bags of maize. He thinks he would have achieved a higher yield if the rainfall had been higher. "Many people had barely even a cob of maize last season, especially those with local varieties," he reports.

He also learned about intercropping and changed the way he plants his various crops. He used to mix crops all together without considering their maturity days or height but after the training he understood which crops to mix and at what stage. He no longer plants his maize, cotton, and green grams all in one field but instead plants his maize separately and allocates a special section of half an acre for green grams and cotton. For the 2016/2017 season, he prepared his land using marker ridges, did casual work to purchase hybrid seed, and is only awaiting subsidized fertilizer because he cannot afford it on his own. He is continuing with implementing the things he learned in the PICSA training because the 1.5 bags of maize he harvested last season earned him admiration from his friends and gave him peace of mind, encouraging him to carry on with the new practices.

#### Interviewee TZ 04, Kiteto District, Tanzania

Interviewee TZ 04 is a 43-year-old woman in Bwagamoyo, Kiteto District. She attended two PICSA training sessions in 2014 and found it to be very interesting and understandable. She feels that the training was very useful to her farming and other livelihood activities because of the knowledge it provided her. One of the new things she learned as part of the PICSA training was about the seasonal calendar and how to use it for identifying the timing of different activities in farming, livestock and poultry keeping. She shared her new knowledge from the training with family, relatives, friends, and neighbours, and she reports that those who applied lessons from the training in their farming practices have raised their crop yield and income.

She has also raised her own crop yields and income as a result of the changes she made following the training. She now better understands the importance of proper timing for planting and weeding, her crops are now planted in rows, and she uses fertilizer. She also keeps track of weather variations so as to make proper farming plans and carry out activities in accordance with the forecast. She expects to continue applying these practices to her farming activities in the future. Her yields used to be 7-8 bags/acre of maize and 6-7 bags/acre of sunflower. Following the training, she managed to get 20-25 bags/acre of maize and 10-12 bags/acre of sunflower. Her income has increased from selling the surplus produce.

Outside of agriculture, she says the PICSA training also helped her to budget her expenses and plan other livelihood activities. With her increased income from crop sales, she was able to start a small doughnut baking business, purchase a new mattress, and provide her family with different food varieties at least twice a day.

She attributes her improved yields to the implementation of what she learned in the PICSA training. "Due to the application of the PICSA training in my farming activities I managed to get more yields that sustained me for a good period of time compared to others who did not apply and were not aware of the training," she reports.

#### Interviewee TZ 13, Kondoa District, Tanzania

Interviewee TZ 13 is a 55-year-old man who resides in Sakami in Kondoa district. He attended the PICSA training in December 2015, which he reports was too late for him to implement any of the discussed changes in the 2015/16 season. He went to the training because he was told that he would learn the reasons behind weather and climate changes and how those changes have affected his farming activities. He attended all three sessions. He reported that he found the training to be understandable and useful. He felt that the seasonal calendar and seasonal forecasts were the most useful topics because they help farmers to be more cautious and strategic on farming practices and decisions. He has not shared what he learned in the training with his family or friends because they had already planted their crops by the time he attended the training. He is planning to involve them in the coming season, however. He also did not have a chance to make any practice changes in the last farming season because the training came too late. It has made a difference in how he is planning his activities for the current season, however. At the time of the case study interview, he had started to use information from the training to prepare his land early. Since he has not yet implemented the changes for a full farming season, he could not report any impacts on yield or income thus far. He stated that the timing of the training was poorly managed and it should be done earlier before the farming season starts so farmers have ample time to implement the necessary changes.

#### Interviewee TZ 11, Kondoa District, Tanzania

Interviewee TZ 11 is a 41-year-old woman from Mnenia, Kondoa District who attended the PICSA training in June 2015 for three days. She had been told by extension officer was it would be about, and she was impressed and decided to go. She found the training to be very interesting and useful, although she admits she missed parts of it. Some of the highlights of the training for her were learning about the seasonal calendar and the seasonal weather forecast. She also learned that there are different seed varieties that take different lengths of time to mature and have the ability to withstand particular weather conditions.

Her cropping and poultry keeping practices have been influenced in several ways as a result of what she learned at the training. Within her sunflower field, she planted with proper spacing (by using a rope) and planted and weeded on time according to the weather forecast. She also used a quick maturing seed variety that tolerates dry conditions. As a result, her sunflower yield increased from a previous 5-7 bags/acre to 14-15 bags/acre. She sold 13 bags of sunflower at TZS 50,000 each (~USD 22, or USD 286 for all 13 bags) and used the proceeds to pay her children's school fees and on household expenditures. She saved a portion of the money to invest in farming in the coming season.

In her poultry keeping enterprise, she used to normally only have two chickens since most of them would die while they were still chicks. After the PICSA training, she began regularly vaccinating the chickens every three months and feeding them properly. This has reduced their mortality rate, and she now keeps an average of 15 hens. She has sold approximately 20 chickens, and some have been used for household consumption. Her household food security has improved, and the money she receives from selling chickens is used for household items such as salt, sugar, and soap.

She has shared the information she learned in the PICSA training with her friends, relatives, and neighbours. Some of these farmers who applied the information she shared have also achieved improved crop yields.

#### Interviewee TZ 18, Longido District, Tanzania

Interviewee TZ 18 is 55 years old and resides in Kimokouwa, Longido District. He attended the PICSA training in 2015 and was present for all of the sessions. He decided to go for the training since he was told he would have the opportunity to learn about the trend of climate change and how it affects livestock. He understood the training and found it to be useful. The topics he appreciated the most were (i) the information on alternative cattle breeds that tolerate dry weather and mature quickly and (ii) land conservation techniques such as protecting trees and reducing deforestation. He found the conservation information helpful because it helped him understand that climate change is affected by human behaviour and failure to conserve the natural environment.

After learning about the new cattle breed (Boran) that fares better in dry environments, he shared this information with some family and friends. He also spoke with them about reducing the size of herds as another coping mechanism, which was also discussed in the training. He says that following these discussions, some of the people he talked to have started selling cattle of the local breed and buying Boran cattle to replace them. He has also done the same. After selling some of his local cattle, he used the money to buy Boran cattle but reduced his herd size to a more manageable number. He also started to vaccinate his cattle and apply a disinfectant, and he consults a vet when needed. The new animals have started to produce more milk compared to the local breed, and the mortality rate of his livestock has decreased.

Some of the money he received from selling his local cattle he used to start building a house and toilet. He has also started engaging in farming following the PICSA training. He planted a quarter acre of maize for the first time and also planted trees around his homestead. He started horticulture farming, which now provides him with vegetables to feed his household. He believes the PICSA training should focus more on farming practices so that the Masai can have more livelihood options beyond livestock. He also believes the training should emphasize the importance of having a manageable herd size of the better breed due to weather and climate changes.

#### Interviewee TZ 20, Longido District, Tanzania

Interviewee TZ 20 is a 48-year-old woman in Longido district. She recalled attending the PICSA training sometime in 2015 but could not remember exactly when. She only attended one session because she only found out about it on the final day of the training. When asked about her impressions of the training, she said that it was useful, although she did not clearly understand some of the topics that were discussed. This could have been because she missed the previous sessions, she reports. She did, however, learn some useful aspects of livestock management and practices, such as the existence of a better cattle breed. She also learned about a new short season maize variety. When asked if she discussed any aspects of the training with her family or friends, she reported that she had not.

As to whether she has implemented anything she learned from the training, she has not made any changes to her farming practices yet because she is still scared to do so because the weather is very unpredictable. In livestock management, though, she has started to consult a vet for vaccination and other health issues concerning her cattle. This is something she never did before the training. She has not yet changed her breed of cattle or reduced the number, however. She does report that she is considering changing her cattle breed after seeing some of her neighbours and friends have changed. She is still reluctant to reduce the number of cattle she owns even though they are starving to death. As a Masai, she says, having a large number of cattle is a sign of prestige and wealth, therefore selling some to reduce their numbers is a very difficult decision to make.

She cannot yet report an impact on her yield or income from the changes made a result of the PICSA training because she has made very few changes. She would like the training to be conducted again so she has an opportunity to attend all the sessions. She would like a second chance to attend so that she can learn more things that might be important for her livestock management practices.