Climate Services for Agriculture: Empowering Farmers to Manage Risk and Adapt to a Changing Climate in Rwanda

Quarterly Progress Report to USAID/Rwanda, October - December 2017

Executive Summary

During the October-December 2017 reporting period, the project initiated a process to develop a multi-sector national climate services framework and governance process, in partnership with Meteo Rwanda and the World Meteorological Organization, under the UN Global Framework for Climate Services. Other highlights include: (a) initiating a network of on-farm trials to fill a critical gap in evidence of how the use of climate information impacts farm yields and incomes; (b) leveraging another USAID-funded project to bring new methods into the evaluation of climate services for farmers; and (c) completing laboratory measurements to develop an updated national soil database – needed for climate-driven soil water balance tools under development for agricultural drought early warning, and for analysis of onset and cessation of the rainfed growing season. The following summarizes key progress towards each project outcome.

Outcome 1: Climate Services for Farmers. The project collaborated with the USAID-funded Climate Information Services Research Initiative (CISRI) project on an evaluation of the use of climate information and behavior changes resulting from project activities in the four initial pilot districts. The evaluation is based on a survey of 589 farmers (~50% female) in 4 districts, selected randomly from sectors with and without prior PICSA training. Preliminary results (to be verified through econometric analysis) show higher rates of use for farm decision-making, and higher average yields, in the sectors that had PICSA training. To strengthen evidence of the impact of climate services on farmers' production and incomes, the project developed an on-farm experimental protocol, trained local partners in the protocol, set-up a field trial monitoring system, and launched an initial network of field trials at a field day.

Preparations for PICSA rollout for the 2018B season included selection of 35 target sectors, and experimental sites, in 7 new districts. Communication of climate information was expanded through Radio Huguka programming, daily SMS and WhatsApp.

Outcome 2: Climate Services for Government and Institutions. Plans to develop an agricultural drought risk analysis and early warning system for the Government of Rwanda required the development of a new, calibrated, gridded national soil database. Laboratory measurements and statistical analyses of data from 89 soil sampling locations were completed. This soil database is being developed to support climate-driven soil water balance Maproom tools that will provide a foundation for agricultural drought risk analysis and early warning, rainfed growing season onset and cessation analysis and decision support, and potentially food production monitoring and prediction tools to support government planning. It is an update and improvement over the existing 20-year-old national soil database. It will be a resource for many applications beyond climate services.

Outcome 3: Climate Information Provision. Advances in the provision of climate information during the reporting period included: (a) updating merged gridded rainfall time series data to extend the duration (1981-2016) and improve quality, (b) a fitness-for-purpose evaluation of the merged gridded data for PICSA, (c) progress on tools to manage and use automatic weather station and Doppler radar data, (d) analysis of predictability of additional derived seasonal climate and soil water balance variables, and (e) updates of the Data Library software and prototype Water Balance

1

Maproom at Meteo-Rwanda. Meteo-Rwanda staff and IRI collaborators advanced a joint study of Rwanda's historic climate, to be submitted to an academic journal.

Outcome 4: Climate Services Governance. The process of developing a multi-sector national climate services policy framework, under the UN Global Framework for Climate Services (GFCS), was launched with the "National Consultative Workshop for Setting Up a National Framework for Climate Services (NFCS) in Rwanda," 5-7 December 2017. Hon. Vincent Biruta, Minister of Environment, officiated the meeting and pledged continued political support for the process. The 119 participants; representing national government and non-governmental institutions, local project partners, universities, civil society and several international organizations; began to define a roadmap for meeting climate service needs across sectors, and endorsed a Steering Committee to oversee development of Rwanda's NFCS.

Crosscutting Issues. The project team met in Kigali in December to revise the overall strategy and partner budgets in response to announcement of a $1M reduction to the overall budget, and to refine the project Monitoring and Evaluation strategy. The project supported Meteo-Rwanda on a project concept note, submitted to the DfID-funded Weather and Climate Information Services for Africa (WISER) program, that, if funded, will support further development and automation of downscaled seasonal climate forecasts for agriculture, and development of ICT-based climate service learning materials particularly for local government.

Table of Contents

Acronyms

AWS	Automated Weather Station
CIAT	International Center for Tropical Agriculture
CISRI	Climate Information Services Research Initiative
CPT	Climate Prediction Tool
ENACTS	Enhancing National Climate Services
ENSO	El Niño–Southern Oscillation
FFS	Farmer Field School Facilitators
FPs	Farmer Promoters
ICRAF	World Agroforestry Centre
IOD	Indian Ocean Dipole
IRI	International Research Institute for Climate and Society
MAM	March – April - May
NFCS	National Framework for Climate Services
PASP	Post-Harvest and Agribusiness Support Project
PICSA	Participatory Integrated Climate Services for
RAB	Rwanda Agriculture Board
SOND	September-October-November-December
UOR	University of Reading
WEAI/GIF	Women Empowerment in Agriculture Index and Gender Integration Framework
WMO	World Meteorological Organization

Progress during the Reporting Period

Highlights

During the October-December 2017 reporting period, the project initiated a process to develop a multi-sector national climate services framework and governance process, in partnership with the World Meteorological Organization, under the UN Global Framework for Climate Services. Other highlights include: (a) initiating a large network of on-farm trials to fill a critical gap in evidence of how the use of climate information impacts farm yields and incomes; (b) leveraging another USAID-funded project to bring new methods into the evaluation of climate services for farmers; and (c) completing laboratory measurements to develop an updated national soil database – needed for climate-driven soil water balance tools used for agricultural drought early warning. The following summarizes key progress towards each project outcome.

Outcome 1: Climate Services for Farmers

The main activities contributing to Outcome 1 were on-farm trials, preparations for the PICSA rollout, climate information communication, and evaluation of year-two project activities.

Testing PICSA impacts through farmer-managed field trials

Because survey-based evaluation does not fully address a gap in quantitative evidence of the impact of climate services on farmers' production and incomes, a team of five scientists developed a supplementary on-farm experimental protocol for evaluating PICSA impacts through *Twigire Muhinzi* agriculture extension system Farmer Field Schools (FFS). (This effort does not replace the project's surveys and is a complementary approach to that effort.) The protocol, developed in the local language, includes a notebook for participating farmers to record information about management of the fields and steps used in the trial. The project trained 78 (29% female) local partners and farmer representatives from eight districts on the use of the protocol. A field day was organized to apply the protocol techniques and to allow participants to visualize the practical side of the protocol. After the meeting, field trials were installed in farmers' fields. FFS Facilitators and Farmer Promoters (FPs) followed up on the trials, under the supervision of contracted local partners.

The project set up a monitoring strategy for the PICSA field trials. Working with local partners, a team began regular visits to field trial sites and participating farmers, with the objectives of:
- Verifying crop varieties planted;
- Verifying whether participating farmers are following the protocol and recording data properly;
- Scanning all the pages of the field books;
- Capturing pictures of climate field school trials;
- Recording the geographical coordinates of all plots;
- Designing and putting signposts in each field trial; and
- Monitoring the process of all activities done in the field trials.

Maize field trial with a signpost. A plot for ███████████████, a farmer in ████████████████, ██████████████████. Photo: P. Mvuyibwami (CIAT/CCAFS)

All local partners followed up on PICSA experimental trials that were installed in farmers' fields during 2018 A season. Caritas Butare in the southern province is responsible for monitoring 50 field trials, other partners (Caritas Kibungo in the Eastern province, Caritas Kibuye in the Western province and DERN in the Northern province) are responsible for 30 field trials each. This is the most extensive quantitative evaluation of climate service impacts through farmer-managed field trials that we are aware of in the developing world.

Preparations for PICSA Roll out and field trials in season 2018 B

In collaboration with the project's local partners, seven new districts were selected for PICSA rollout in 2018, season 2018B (March-May), and target sectors were identified and agreed on (Table 1). As a first step in preparing for PICSA trainings, the four local partners made their first contacts with local authorities from the new districts where the trainings will be conducted. Project partners had several meetings and discussions to plan the PICSA rollout, including coordination between ENACTS and PICSA.

The local partners will continue the follow up for PICSA trials in their respective regions.

Climate information communication for farmers

Communication of climate information through radio was expanded during the reporting period. Twenty-four radio talks (at least 20 min each) related to climate services were produced and broadcasted by Radio Huguka; 24 talk shows led by RCSA project, RAB and Meteo-Rwanda have been broadcasted on Radio Huguka; and 23 news reports have been produced and broadcasted. In addition, a live radio debate involving farmer communities from four districts was held and the debate was about the performance of the SOND seasonal forecast information on crops. This debate was aired live from the NFCS workshop venue in Bugesera District, Nyamata Sector. Radio Huguka has journalists dedicated to producing news reports related to climate services.

Information on Radio Huguka being presented at the NFCS workshop. Photo: T. Muchaba(CCAFS)

In partnership with Meteo-Rwanda, the project expanded dissemination of weather information via short messages (SMS) and WhatsApp. These messages reach at least 5,000 people per day directly, without paying because the bill has been paid by Meteo Rwanda. Meteo-Rwanda also produces 10-daily weather bulletin that incorporate information from the Maprooms, which reach 200 people via email.

Table 1. New districts and sectors selected for PICSA roll out in season 2018 B

Lead partner	District	Sector
Caritas Kibungo	Ngoma	Remera
		Rurenge
		Rukumberi
		Sake
		Mugesera
Caritas Kibuye	Rusizi	Nkanka
		Giheke
		Nyakarenzo
		Gitambi
		Nyakabuye
	Rutsiro	Murunda
		Rusebeya
		Mushubati
		Gihango
		Mukura
DERN	Gicumbi	Byumba
		Nyankenke
		Miyove
		Kageyo1
		Giti
	Rulindo	Base
		Kinihira
		Bushoki
		Buyoga
		Tumba
Caritas Butare	Huye	Kinazi
		Kigoma
		Ruhashya
		Huye
		Gishamvu
	Kamonyi	Kayenzi
		Rukoma
		Gacurabwenge
		Rugarika
		Mugina

Evaluation of Year-2 project activities, with CISRI project

The project collaborated with the USAID-funded Climate Information Services Research Initiative (CISRI) project on an evaluation of the use of climate information and behavior changes resulting from project activities in the four initial pilot districts. A total of 589 individuals (~50% female) were surveyed. Farmers were randomly selected from sectors where the PICSA training had taken place and sectors where there had not been a training. Six types of climate information products

were analyzed: forecast of onset, total amount, distribution and cessation of seasonal rainfall; daily weather forecasts and historical climate information.

Seasonal forecasts of onset of rains, total amount of rainfall and cessation of rains are the most commonly used climate information both for men and women. More than half of the respondents in the trained sectors used this information to adjust their farm decisions. The most common responses to climate information were the decision of whether to farm, intercropping, crop and variety selection, timing of land preparation, timing of planting, and use of organic and inorganic fertilizer. In trained sectors, 60-90% of respondents indicated that the use of climate information improved their crop production, food security and household incomes. The study confirmed the respondents' perceived increased in crop yields, with reported bean yields higher in the trained sectors (1300 kg/ha) compared to the non-trained sectors (800 kg/ha). More in-depth econometric analysis is being conducted to estimate the impact of the uptake of climate information on crop productivity while controlling for potential confounding factors. More details on the yield increase will be provided in a full paper to be published separately.

The goal of the CISRI project is to develop a climate services learning agenda and, where possible, fill gaps in our knowledge and practice related to climate services. One component of the project involves piloting innovative evaluation methods that may be able to fill some of the gaps in evidence of the benefits of climate services. The collaborative study combined survey-based evaluation with an ethnographic method known as the Livelihoods as Intimate Government (LIG) approach. LIG's strength is in drawing out the structures of livelihoods decision-making that produce observed livelihoods decisions and outcomes. Fieldwork for the LGA component of the study was also completed in two project locations in Rwanda, but the resulting data have not yet been analyzed. The joint activity allowed the RCSA project to leverage CISRI resources to assess the impact of climate information communication activities in the second year.

Outcome 2: Climate Services for Government and Institutions

The main activity contributing to Outcome 2 was continued development of soil water balance tools.

Develop soil water balance tools to assess drought impacts on food production

Laboratory analysis, using standard analytical methods were used to characterize chemical soil parameters such as total nitrogen, mineral nitrogen, organic carbon, available phosphorus, cations, pH, cation exchange capacity; and physical soil parameters namely soil texture, bulk density, available water content and water holding capacity.

Statistical analysis of soil data included linear regression analysis to assess relationships among soil properties. To identify driving factors influencing property change, a principal component analysis was performed with quantitative variables (altitude and slope) and supplementary qualitative variables such as parent materials and land use changes. The water holding capacity of soils was estimated with a combination of 3D data interpolation and contour plots for combined effects visualization, principal component analysis and regression analysis of relationships between explanatory variables and soil matric potential, and nonlinear least-squares parameter optimization

for determination of retention curve parameters. The sampled soils were classified according to the USDA Soil Taxonomy system based on soil profile description and horizon analytical data. Results will be published in the annual report towards the end of October 2018.

Outcome 3: Climate Information Provision

The main outcome contributing to Outcome 3 included continued work on the maprooms, an evaluation of the merged gridded rainfall data that are used in the PICSA process, and research on Rwanda's climate.

Refining gridded climate data products at Meteo-Rwanda

The project generated new daily and dekadal merged rainfall time series from 1981 to 2016 for ENACTS, validated the ENACTS rainfall product and examined its fitness for purpose for use in the PICSA program. The two main reasons for generating a new version were to improve the quality of the data by selecting more suitable interpolation/merging parameters as well as extending the time series up to 2016 (the previous version was unto 2014).

Work continued on the Agriculture and Food Security Maprooms. The Data Library was updated with new daily and dekad merged rainfall time series. There was also continued work on the water balance forecast maproom based on Climate Predictability Tool (CPT) forecasts generated using historical water balance simulations. The WRSI forecast for bush beans SOND season, based on CPT and the historical water balance simulation was also completed.

Plans to improve the Maproom interface and usability were specified, including: (a) improving formatting of x-y graphs to make them more suitable for PICSA workshops; (b) a Google Maps overlay to aid in selecting locations of interest; (c) developing simplified menus for complex historical analyses while allowing "expert users" access to the full functionality; (d) batch download of printable versions of all PICSA graphs for a selected location; and (e) bilingual functionality. An effort during the reporting period to outsource x-y graph formatting improvements and Google Maps overlay was blocked by inability for CIAT (administering the subcontract), Columbia University (owner of the Data Library platform behind Meteo-Rwanda maprooms), and the software firm that we attempted to contract.

The team continued to work with Meteo Rwanda on organizing, correcting and using its radar and automated weather station (AWS) data, by refining tools (computer code for organization and quality control of AWS and radar data) and remotely teaching Meteo Rwanda how to use those tools. Leveraging the DfID-WISER[1] funded project, the maproom products will be customized targeting farmers, local agricultural personnel, other government, and private institutions, and support their dissemination and use through sector offices and "*Twigire Muhinzi*".

---

[1] CIAT in partnership with IRI, Meteo Rwanda and Met Office is expected to get a grant from DfID-WISER by April 2018 to lead a project that seeks to co-produce climate services information to provide farmers and Disaster Risk Reduction (DRR) decision makers with the best available climate forecast knowledge and agronomic advice based on forecast.

Fitness-for-purpose evaluation of ENACTS merged gridded data for PICSA

An evaluation of the merged gridded rainfall data focused on the derived seasonal variables that are used in the PICSA process. The merging process used all available long-term, quality-controlled rain gauge data, which limits options for validation against independent data. The evaluation attempted to use two independent sources of rainfall data: the Meteo-Rwanda station data that were not used for the merging process (because of short-time series and poor quality), and a farmer rain-gauge dataset from the One-Acre Fund , but concluded that neither data set had sufficient quality to be trusted as validation data.

Near most station locations, ENACTS and station data generally align closely. A few large differences were noted between seasonal quantities calculated from gridded and station data, particularly for calculated growing season onset date. However inconsistencies between these stations and other nearby stations raise the possibility of quality problems with the records of a few stations. For other derived variables and for most station locations, ENACTS performed acceptably. The evaluation study concluded that:

- ENACTS gridded data provided the best available option for serving the needs of PICSA at locations without long-term station observations;
- Experts and local stakeholders should check the reasonableness of time-series graphs for new locations, before they are disseminated through the PICSA process; and
- The project should critically examine the growing season onset definition used, and explore alternatives.

Research to improve understanding of Rwanda's climate and its predictability

Work continued on a journal manuscript on the climatology of temperature, rainfall, rainy day frequency, and dry spell frequency across Rwanda for the 1981-2016 period. The target journal is the International Journal of Climatology, and the paper is being co-authored by several researchers at IRI, Meteo-Rwanda and CIAT-Rwanda. Research regarding the influence of El Niño–Southern Oscillation (ENSO), Indian Ocean Dipole (IOD) and wind dynamics on rainfall and temperature over Rwanda will continue, with a second scientific publication submission planned for 2019.
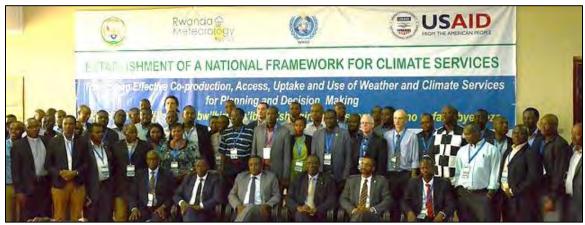
Outcome 4: Climate Services Governance

There was significant activity under Outcome 4 in this period around the development of a National Framework for Climate Services, including a workshop that was held in December 2017 that was sponsored and organized by the project in partnership with the WMO.

Initiate development of a National Framework for Climate Services (NFCS)

The development of a national climate services framework was launched with the "National Consultative Workshop for Setting Up a National Framework for Climate Services (NFCS) in Rwanda," held at La Palisse Hotel, Bugesera District from 5th -7th December 2017. The meeting was sponsored and organized by the project, in partnership with the WMO Global Framework for Climate Services (GFCS). Pascal Yaka facilitated the process on behalf of WMO. The meeting

brought together 119 participants2 from several climate-sensitive sectors. Participants represented national government and non-governmental institutions, local project partners, universities, civil society, and international organizations (WMO, FAO, UNDP; project partners from IRI, University of Reading, CIAT and ICRAF).

National Consultative Workshop for Setting up a National Framework for Climate Services in Rwanda. Photo: T. Muchaba (CCAFS).

Hon. Vincent Biruta, The Minister of Environment, officiated the meeting. His opening remarks emphasized the need to ensure the production of weather and climate information that serves the needs Rwandans in the health, disaster management, transport and agriculture sectors. Other opening presentations focused on the purpose and process of setting up a NFCS. Opening presentations by the Director of Meteo-Rwanda, and by two farmers, highlighted the PICSA approach and its achievements to date in Rwanda.

Most of the meeting was devoted to working group discussions. Six working groups were formed to discuss issues related to types of climate products and services: (1) seasonal climate prediction, (2) weather forecasting, (3) agricultural meteorology, (4) climate and health, (5) hydrological information and flood early warning system, and (6) disaster risk reduction. Participants were then reorganized into eight working groups to start defining the NFCS roadmap for particular sectors: (1) disaster risk reduction, (2) health, (3) energy, (4) communication, (5) hydrology, (6) meteorology, (7) agriculture and food security, and (8) institutional framework and policies.

An exhibition of different products and posters related to climate and weather information was organized and attended by all participants. The exhibition included testimonies and posters by nine farmers, who shared their experience using climate information.

Before closing the meeting, participants voted to establish a Steering Committee to oversee further development of Rwanda's NFCS. The NFCS process is expected to produce a policy framework, multi-ministerial governance structure, and high-level political buy-in for sustained multi-sector climate services.

---

2 42% were under 35 years old, and 17% were female.

Discussions among national stakeholders at the NFCS meeting. Photo: T. Muchaba (CCAFS).

Meteo-Rwanda staff demonstrating new Doppler radar capabilities. Photo: T. Muchaba (CCAFS).

One of the farmers who participated in the project, sharing her experiences with Hon. Dr. Vincent Biruta, Minister of Environment. Photo: T. Muchaba (CCAFS).

Building capacity of Meteo-Rwanda and RAB through staff education

Ten students sponsored by the project continue their M.Sc. studies at the University of Nairobi, University of Dar es Salaam and University of Rwanda. The Annex summarizes the progress of each of the sponsored students. Three have completed the course work, and the rest are expected to finish their courses in April 2018. Depending on when the course work ends, students will have between four and six months of project-related thesis research and writing. All ten enrolled September 2016, and are expected to graduate in August 2018. The progress for all students is good, and the planned budget is expected to be sufficient.

Project Outputs

There were several key project outputs during the reporting period, including communication products used during and around the NFCS workshop and several Maproom products, listed below.

Communication and engagement

- A blog was published on the Consultative Workshop for Setting Up the National Framework for Climate Services that took place in December 2017: "Rwanda establishes a national framework for climate services." https://ccafs.cgiar.org/news/rwanda-establishes-national-framework-climate-services#.Wl4lBDexVPY. Photos from the event are available at: https://www.flickr.com/photos/cgiarclimate/24296984127/

- The project produced nine posters from farmers' testimonies on how climate information acquired through PICSA trainings has affected their decision making for their farming activities and changes they have made by using PICSA strategies. The farmers presented their posters

and stories at the Consultative Workshop for Setting Up the National Framework for Climate Services.

Climate information, tool and capacity development

- Tercile forecast derived from Climate Prediction Tool (CPT) is now available: maproom.meteorwanda.gov.rw/maproom/Climatology/Climate_Forecast/DomTerProb.html

- Dominant Tercile and Full Distribution forecast were updated with new CPT forecast using ENACTSv3: http://maproom.meteorwanda.gov.rw/maproom/Climatology/#tabs-3

- WRSI forecast for bush beans SOND season: http://maproom.meteorwanda.gov.rw/maproom/Agriculture/Forecast/BushBeansWRSI.html

Project Management and Administration

There was a project meeting for team members (IRI, University of Reading, ICRAF and CIAT) in Kigali in December 2017 where the project team discussed different project's activities, including PICSA trainings preparation (graphs production, capacity building of Meteo-Rwanda, etc.). The team discussed on strategies/Approaches to be used in the next project' M&E survey (Mid-Term review) and discussed on the budget cut and its implications on different project activities strategies

The project offered two professional internships to recent graduates with B.A. degrees in agriculture and environmental studies. They are supporting the project in the follow up on PICSA field trials and other project's activities.

Coordination with Other USAID Programs and Partner Initiatives

The National Consultative Workshop for Setting up a National Framework for Climate Services in Rwanda is the initial step of developing a NFCS in Rwanda, under the World Meteorological Organization (WMO) Global Framework for Climate Services. Participants represented a range of national and international institutions, including Meteo-Rwanda, the Rwanda Agricultural Board, local NGOs, ministries, and representatives from USAID, FAO and UNDP, among others.

The project collaborates with the USAID CISRI project, which selected the RCSA project as a site to test and pilot evaluation approaches for climate services. The CISRI project aims to develop a climate services learning agenda and, where possible, fill gaps in knowledge and practice related to climate services.

The process of partnership between RCSA and IFAD's Post-Harvest and Agribusiness Support Project (PASP) is at the end and both parties are signing the agreements.

The project was represented in the Women Empowerment in Agriculture Index and Gender Integration Framework (WEAI/GIF) training in October 2017, which was organized by USAID. The training focused on providing knowledge on gender equality and women's empowerment in agriculture. Tools to measure gender integration in different project's activities were displayed

Desire Kagabo attended a Joint Project preparation mission workshop organized by World Bank, November 2017 in Arusha, Tanzania. Based on his experience in climate smart agriculture, Dr. Kagabo was asked to provide inputs on the East and Central Africa Agriculture Transformation Project Mission for Rwanda.

The project team supported Meteo-Rwanda developed a concept note, "Enhance Accuracy and Reliability of Weather and Climate Services and Products for Improved Socio-economic development of Rwanda," submitted to the DfID-funded Weather and Climate Information Services for Africa (WISER) program. If funded, the project will support further development and automation of downscaled seasonal climate forecasts for agriculture, and development of ICT-based climate service learning materials particularly for local government. CIAT (Dr. Desire Kagabo) is listed as the project lead.

Challenges

A planned public launch of the new suite of Meteo-Rwanda Maprooms continues to be deferred, pending completion of the Water Balance Maproom, and enhancements to the Maproom graphics.

Corrective Actions

Discussions with partners highlighted the need for improved formatting and resolution of x-y graphs used for PICSA and any other workshop-based communication or planning process. (Related plans to complete and improve integration of Google Maps into the maproom would further improve usefulness, but are less crucial to the successful direct use of Meteo-Rwanda Maprooms by *Twigire Muhinzi* extension system for the PICSA process.) From discussions with IRI programming staff, the team concluded that the internal Data Library graphics would not meet this need, and need to be replaced with a public-domain graphics library. Preparations to outsource the development of enhanced graphics functionality were stalled by problems with the contracting process. The work is now being done at Columbia University, and the improved graphics must be fully implemented by May 2018 in order to avoid missing full integration of PICSA and the Meteo-Rwanda Maprooms for another agricultural season. Work on the Google Maps integration will be completed by a later date.

Planned Activities for the Next Reporting Period:

The following provides the key activities for the next reporting period, by outcome. Some key activities include the PICSA rollout in the new districts, a planned report on the PICSA evaluation, trainings for Meteo-Rwanda, continued work on the Maprooms, forecasts for the MAM 2018, continued research on Rwanda's climate, and follow up on the NFCS workshop.

Outcome 1: Climate Services for Farmers

- Talk shows, debates, live shows about climate services will be conducted through our partner communication companies.

- PICSA materials such as climate services graphs will be developed to be used starting from January 2018.

- PICSA roll out in new districts by our local partners.

- Continued work on the econometric analysis of the data from the CISRI review as well as work on the midterm review tools.

- Finalizing the qualitative report from the PICSA evaluation.

Outcome 2: Climate Services for Government and Institutions

- A report from the institutional climate services study will be finalized.

- Pending tests will be finalized and final results on Rwanda soil status to be included in the water balance.

Outcome 3: Climate Information Provision

- Two trainings on satellite and radar meteorology will be done for Meteo-Rwanda capacity building.

- Training for Meteo-Rwanda on Data Library.

- Complete tests on the new rainfall data (version 4) and integrate them to Meteo-Rwanda Data Library and maprooms.

- Continue Helping Meteo-Rwanda with organizing, correcting and using its Radar and AWS data will continue by refining tools and remotely teaching Meteo-Rwanda how to use those tools.

- For seasonal forecast totals, the last two forecasts will be re-examined in the framework of ENACTS V4 during the next quarter. The forecasts for SOND 2017 rainy day frequency will also be verified using station data.

- Forecasts for the MAM 2018 total rainfall, onset date, number of rainy days and (potentially dry spells) is intended for the next quarter.

- Work will continue on the Agriculture and Forecast Maprooms, including refinement via further collaboration with the Rwanda Agriculture Board.

- Ongoing research to define onset and cessation dates of the rainfall and growing season to be based on simulated soil moisture rather than observed precipitation.

- Research regarding the influence of ENSO, IOD and wind dynamics on rainfall and temperature over Rwanda will start.

- The manuscript developed on the climatology or Rwanda's temperature, rainfall, rainy day frequency, and dry spell frequency (all now based on V4 ENACTS) will be submitted for publication in Q2 of 2018.

Outcome 4: Climate Services Governance

- Publish climate services governance paper as a CCAFS Working Paper.
- Follow up on the NFCS steering committee' plans and activities regarding the NFCS roadmap.