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MINISTRY OF AGRICULTURE

COLUMBIA CLIMATE SCHOOL
INTERNATIONAL RESEARCH INSTITUTE
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CGIAR

RESEARCH PROGRAM ON
Climate Change,
Agriculture and
Food Security

CCAFS

WORKSHOP REPORT

Climate Risk Management in Agricultural Extension

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WORKSHOP REPORT NO. 001

CGIAR

AICCRA
Accelerating the Impact of CGIAR
Climate Research for Africa

To cite this workshop report
Grossi A, Dinku T, Hansen J, Nsengiyumva G, Trzaska S, List G . 2021. Climate Risk Management in Agricultural Extension. AICCRA Workshop Report. Wageningen, the Netherlands: CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS).

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Abstract

A two-week training of trainers (ToT) workshop was implemented from June 7-18, 2021, in Adama, Ethiopia by the International Research Institute for Climate and Society (IRI) of the Columbia Climate School and the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) in East Africa. The workshop, which was organized as part of the World Bank's Accelerating the Impact of CGIAR Climate Research for Africa (AICCRA) project and in close collaboration with the Adapting Agriculture to Climate Today, for Tomorrow (ACToday) Columbia World Project, brought together various professionals from the Ministry of Agriculture, Agricultural Technical and Vocational Education and Training (ATVET) colleges, the Ethiopian Institute of Agricultural Research (EIAR), and the National Meteorological Agency (NMA) to pilot a four-module curriculum aimed at improving climate risk management in agricultural extension.

Keywords

Ethiopia; agriculture; climate change; climate variability; food security; education; extension approaches; capacity development; climate-smart agriculture; climatology; monitoring systems; forecasting; participatory approaches; Goal 2 Zero Hunger

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Acknowledgements

The Climate Risk Management in Agricultural Extension (CRMAE) curriculum and pilot workshop represents a collaborative effort, made possible by input and iterative feedback from Ethiopia's Ministry of Agriculture and the Agricultural Technical Vocational Education and Training (ATVET) program.

This curriculum and workshop were jointly prepared and organized through the Adapting Agriculture to Climate Today, for Tomorrow (ACToday) Columbia World Project with generous support from the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) in East Africa through the Accelerating Impacts of CGIAR Climate Research for Africa (AICCRA) project.

The contributions from experts across these projects and institutions were invaluable in the preparation of the Climate Risk Management in Agricultural Extension curriculum aiming to equip extension staff to access, understand, and incorporate climate information into their professional work.

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Acronyms

ACToday	Adapting Agriculture to Climate Today, for Tomorrow
CRMAE	Climate Risk Management in Agricultural Extension
DA	Development Agent
EIAR	Ethiopian Institute of Agricultural Research
ENACTS	Enhancing National Climate Services
M&E	Monitoring and Evaluation
MoA	Ministry of Agriculture
NMA	National Meteorological Agency

Ministry of Agriculture pilots new curriculum to help manage climate risk through extension system

Improvements in the weather and climate information available in Ethiopia provide new opportunities for agricultural extension personnel to help farmers better manage climate risks that they face, and to adapt recommended technology packages to local climatic conditions. A new curriculum to equip the country's extension staff to maximize access and use of climate information was co-developed with the Ministry of Agriculture and piloted in June 2021.

Introduction

One of the biggest challenges impeding the exploitation of climate information in different sectors is a lack of foundational capacity around climate risk management. A dearth of knowledge and skills surrounding climate basics, what climate information is available and accessible, how to appropriately communicate complex climate information and develop products that actually support decision-making, and how such services might be integrated within national systems are all stymie a country's ability to take adaptive action in an uncertain climate.

The implications of this challenge are especially pronounced in climate-sensitive sectors such as that of agriculture, and in places like Ethiopia where over 85% of the population (more than 70 million people) are reliant upon the sector for their livelihoods (USAID, 2021). For example, while both Ethiopia's Climate Smart Agriculture Roadmap for 2020-2030 (Eshete et al., 2020) and the National Strategy for Ethiopia's Agricultural Extension System (EIAR, MoA, 2014) identify location-specific agro-ecology based interventions and climate-smart adaptation practices as one of the main systemic bottlenecks for effective adaptation, the country's more than 72,000 agricultural agents serving over 16 million farmers (Abate et al., 2020) are not capacitated on the access and use of historical, monitoring, or forecast climate information products available through the National Meteorological Agency (NMA) that would allow them to tailor their recommendations more appropriately.

Trainees practice leading development agents from Adama through a seasonal participatory planning exercise, as one of the activities during Module 4 of the course. Pictured here, they ask the development agents to classify the last 5 years as wet, medium or dry before comparing their consensus responses to historical data.

Moreover, actors who implement disaster risk reduction and management (DRR/M) projects and programs, such as those in response to drought or floods mandated by the National Policy and Strategy for Disaster Risk Management (NPS-DRM), do not receive adequate and appropriate training to help them carry out these roles effectively (Biru & Dibaba, 2018). As such, they are ill-equipped to plan for, manage, and respond to emergencies, and the mismatch between the national policy framework emphasizing a transition to more proactive, multi-layer disaster management and the reactive reality on the ground persists.

This lack of capacity around climate risk management therefore at once presents problems for humanitarian action and longer-term sustainable development. Because of the multi-sectoral nature of both the food system and DRR/M sector, it is also a challenge that permeates multiple institutions and every level of administration—national, regional, zonal, woreda (district), and kebele (village).

To address these challenges, the International Research Institute for Climate and Society (IRI), as part of Columbia Climate School at Columbia University, has been working closely with the Ethiopian Ministry of Agriculture (MoA), the Ethiopian Institute of Agricultural Research (EIAR), and the National Meteorological Agency (NMA) to co-develop a curriculum aimed at improving climate risk management in agricultural extension. The comptenecy-based curriculum, which consists of a Reference Guide (textbook), an abridged Handbook, and Facilitators' Guide, was developed as part of the Adapting Agriculture to Climate Today, for Tomorrow (ACToday) Columbia World Project. ACToday strives to improve cimate information and services to address Sustaianble Development Goal 2—End hunger, achieve food security and improved nutrition, and promote sustainable agriculture. It was also built on the achievemnets of IRI's Enhancing National Climate Services (ENACTS) initiative, which aims to improve the availability, access, and use of climate information and emphasizes decision-relevant products for clilmate adaptation.

While the IRI had been in the process of developing the curriculum itself for more than a year with in-country partners, the ten-day training of trainers (ToT) workshop conducted from June 7-June 18, 2021 with generous funding by the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) was the first opportunity the curriculum was able to be tested and piloted with agricultural experts and professionals in Ethiopia. Although the curriculum intself ultimately is designed for Ethiopia's subject matter specialists (SMS) and extension staff, including development agents (DAs), the workshop represented an important opportunity to first interface with and garner feedback from national level agricultural, meteorological, and agrometeorological experts who are most familiar with Ethiopia's agricultural extension system before implementing the curriculum with extension staff at lower administrative levels and through formal training at the Agricultural Technical and Vocational Education and Training (ATVET) college system. The pilot was also conducted at an opportune time as the three-year ATVET curriculum is currently under revision by the Government of Ethiopia.

In what follows, we outline the structure and content of the piloted curriculum, the workshop proceedings and participants, the challenges faced during implementation, and the key findings, recommendations, and next steps that arose from the workshop process.

During group work, trainees classify past years as good, medium or poor based on crop yields and rainfall before comparing their responses to historical data.

Curriculum Components

The Climate Risk Management in Agricultural Extension (CRMAE) curriculum, which was piloted over the course of two weeks (10 days) with national level agricultural staff, is a ***competency-based curriculum*** consisting of four modules that build progressively on each other. This means the curriculum emphasizes complex outcomes of a dynamic learning process (i.e. knowledge, skills, and attitudes to be applied by learners) rather than narrowly focusing on what learners are expected to learn about, in terms of traditionally-defined subject content, such as through memorization with the goal of simply passing a test (UNESCO, 2021). The specific competencies, learning objectives, assessment metrics, and course structure for the CRMAE course are outlined in Appendix A. However, an overview of each module and overarching objectives is provided below.

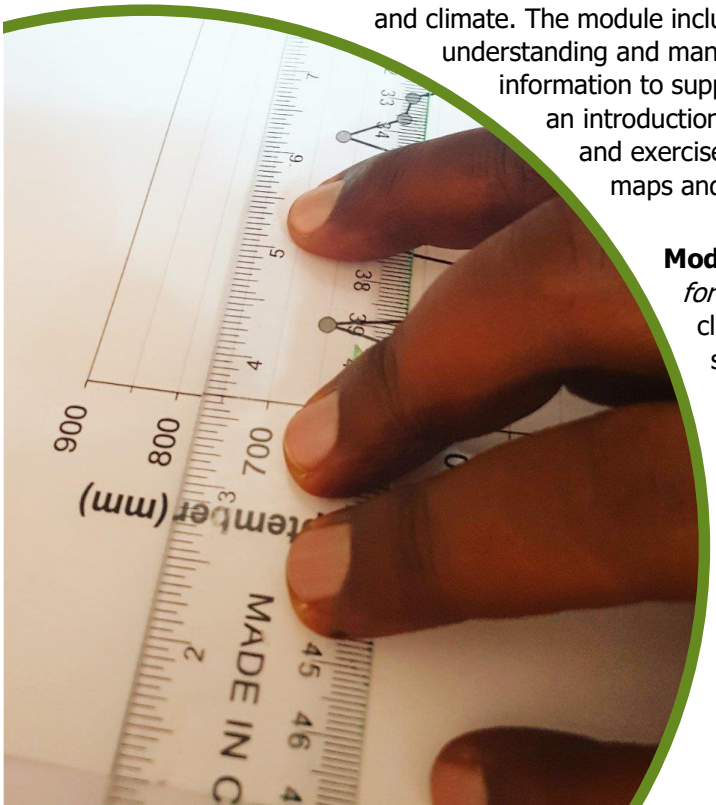
Objectives

The 2-week CRMAE course aims to equip subject matter specialists (SMS) and extension staff, including extension agents and development agents (DAs), to understand and incorporate climate information into their professional work. It is designed to provide foundational knowledge on climate and agricultural decision making and provide practical tools to:

- analyze climate-related risks;
- use appropriate weather and climate information to support agricultural decisions;
- communicate complex climate information effectively with farmers; and
- integrate climate services into agricultural extension activities.

Modules

Module 1: *Climate Basics* provides foundational knowledge about climate concepts, data and common data analyses, and forecasts. A basic understanding of climate from this module provides necessary background and context for subsequent learning about the types and use of climate information to improve agricultural risk management. It also prepares participants to address client farmers' questions and concerns about weather and climate. The module includes probability concepts that are foundational for understanding and managing risk, and for interpreting and using climate information to support risk management. It also includes a unit that provides an introduction to the basics or reading and interpreting a map or graph, and exercises to expose participants to the most common climate maps and charts they are likely to encounter in their work.



Module 2: *Climate Information Products and Tools Available for Agriculture* provides an overview of relevant weather and climate information products and services that are [or will soon be] available through the National Meteorology Agency (NMA). It teaches participants how to navigate and use relevant historical, monitored and forecast information products available through NMA's web page and online climate information products (Maprooms).

Participants use a ruler to easily visualize the probability of exceeding or not exceeding certain thresholds of rainfall. This exercise is important for developing a probability of exceedance curve and understanding the concepts that underlie it.

Module 3: *Climate-Sensitive Agricultural Decisions* strengthens participants' understanding of the interaction between climate and farm decision-making. It enables them to perform basic analyses of climate-sensitive farm management decisions under uncertainty. A number of factors, in addition to crop and livestock productivity, influence farm management decisions, particularly at seasonal and longer time scales. To equip participants to provide appropriate support and guidance to their farmers, the module builds understanding of factors that lead to different management decisions by different farmers and under different climate conditions.

Module 4: *Integrating Climate Services into Agricultural Extension* equips participants to bring climate services into the services that they provide their client farmers. Building on learning from the other three modules, Module 4 equips them to lead farmers in a participatory seasonal planning workshop, informed by historical and seasonal forecast information. The course concludes with development and presentation of plans to integrate climate services into extension activities with participants' client farmers. These plans will address: information and support needed for key climate-sensitive management decisions; differing needs of different types of farmers; communication, training and support strategies; annual calendar of climate service activities; and monitoring and responding to feedback.

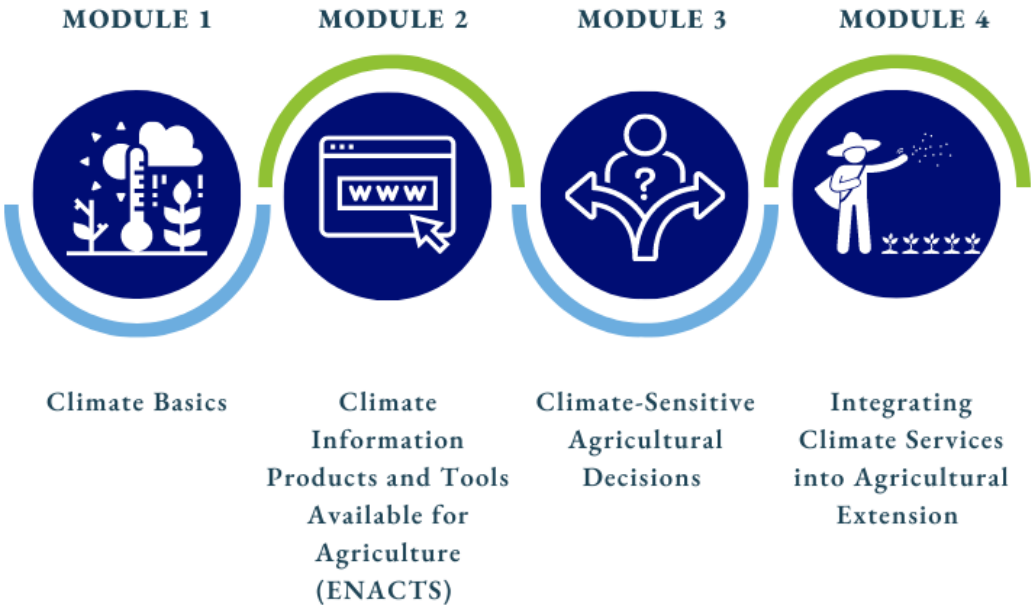


Figure 1: The four component modules of the Climate Risk Management in Agricultural Extension curriculum targeting extension staff. Modules build upon and reinforce each other.

Approaches and Methods

Participants

To pilot the CRMAE curriculum, a total of 14 particpants were invited to partake in a training of trainers workshop in Adama, Ethiopia from June 7-18, 2021. While a full list of the participants and their affiliations can be found in Appendix B, broadly, the experts came from the following institutions:

- the Ministry of Agriculture (MoA);
- the National Meteorological Agency (NMA);
- the Ethiopian Institute of Agricultural Research (EIAR); and
- two federally administered Agricultural Technical Vocational Education and Training (ATVET) colleges (Alage and Agarfa).

Trainers and Format

The trainers included six staff from the IRI, two of whom were physically present in Adama and four of whom joined remotely to conduct their respective sessions. This hybrid format was adopted due to travel restrictions and difficulties surrounding the COVID-19 pandemic, which prohibited some members of IRI team from travelling to Ethiopia. Due to the time zone difference between New York and Ethiopia, remote lectures were given in the afternoons (Ethiopia time), while hands-on, practical exercises and discussions were scheduled during the mornings (Ethiopia time). While this is not the ideal schedule and layout for the course, the team had to make the adjustments to accommodate less-than-ideal circumstances surrounding the pandemic. The IRI trainers were complemented as well by additional trainers and speakers from both the MoA and NMA.

For the two days of Module 4, so that trainees could practice leading and explaining the seasonal forecast participatory planning process and gain confidence in doing so, four development agents were brought in from the surrounding area of Adama.

Resources and Materials

In terms of materials, for this training, a soft copy draft of the Reference Guide (textbook) was made available to participants, though the abridged Handbook and Facilitators' Guides were still underway at the time the training took place. Similarly, a "Resource Hub" with all PowerPoint presentations, Zoom recordings, activity and exercise sheets, handouts, and relevant readings (such as research) was created using Google Drive and shared with participants.

Trainees practice using the SIMAGRI decision support tool for agriculture on their computers.

Monitoring and Evaluation Approach

To monitor and evaluate the training, the team integrated opportunities for both written and oral feedback from participants. For formal written feedback, a series of self-assessment and feedback forms were developed with the ACToday project's Monitoring and Evaluation (M&E) Lead and Education Design Technologist. There was a 1) pre-training assessment and 2) post-training assessment for the overall entire training, as well as pre- and post-training surveys for each of the four individual modules to ensure that specific feedback and input for the course content, management, and logistics could be captured. A more detailed discussion of the course feedback (oral feedback) can be found in the "Key Results and Findings" section, while an analysis of the surveys (written feedback) can be found in Appendix D.

In addition to these feedback mechanisms, quizzes and other exercises were integrated within the course, as well as group project work and presentations, as supplemental checks on learning outcomes.

Schedule of Training

A full, detailed schedule of the 10-day training can be found in Appendix C. However, in terms of general time allocation for each module, the following was adhered to:

Module 1: 2.5 days

Module 2: 2.5 days

Module 3: 3 days

Module 4: 2 days

Participants practice entering inputs into the online SIMAGRI tool. SIMAGRI is an agricultural decision support system that allows users to explore different "what-if" scenarios with various inputs (including weather, soil conditions, fertilizers, and planting dates) to estimate yield and determine optimal management practices. Understanding how to use this tool is part of Module 3 (Climate-Sensitive Agricultural Decisions) of the course.

Key Results and Findings

Following both written feedback collected through the M&E assessment forms, as wells as in-depth oral feedback gleaned form a half-day meeting at the Ministry of Agriculture with key stakeholders who partook in the CRMAE pilot course, detailed input was gathered on the course content, format, administration, and various other aspects of the pilot.

In terms of oral recommendations, Tufa and Amanda met at the Ministry of Agriculture (MoA) on June 22 with key stakeholders who partook in the CRMAE pilot course to gather in-depth feedback and discuss next steps on refinement of the CRMAE curriculum, as well as to discuss its adaptation for Ethiopia's Agricultural Technical Vocational Education and Training (ATVET) program. Present at the meeting were Esayas Lemma (Director of Crop Directorate, MoA), Nejeha Redy Alemar (Instructor and Department Head for Plant Science at the Alage ATVET College), Yimer Assefa Yimam (Agrometeorology Department Team Leader/Coordinator, NMA), Tolesa Denboba Buli (Senior Agronomist, MoA), Girma Kibret Gashaw (Climate-Smart Agriculture Specialist and focal point of World Bank Resilient Landscapes and Livelihoods Project, MoA), and Fisseha Eskeziaw Yeneneh (ATVET Curriculum Expert, MoA & Agarfa ATVET College). Comments and feedback regarding the CRMAE pilot and associated materials are summarized below:

General Feedback

Visual content

In-country partners felt the material in both the Reference Guide and in the lecture content (PowerPoints, exercises) was very map and graph-heavy. At the development agent (DA) level, they are not necessarily able to easily read and interpret maps and graphs, and this may be a capacity that needs to be reinforced or amended as part of their job description, if the course material is to be used in its current state. Especially with understanding probabilities or reading probability of exceedance graphs, the in-country team felt capacities may not be readily in place at the DA level. For Module 4 as well with the mock participatory planning workshop, partners felt the instructions could be a bit confusing for someone with only a 10^{th} grade (the former requirements for DAs) or 12^{th}-grade education (the new requirements for DAs) would struggle. As such, as of the writing of this report, a unit on the basics of reading maps and graphs, including an introduction to the most common types of maps and graphs extension staff are likely to encounter in their work and accompanying practice exercises, has been added to Module 1.

In addition, some partners felt that the slide decks, particularly those for the Climate Basics lectures, were too static and should be more dynamic; for example, incorporation of moving images or even video links within the slides themselves when describing Earth's system would be helpful.

Appropriateness and usefulness of material

For Module 1 (Climate Basics), while partners believe the topic itself is very important to cover, it was viewed as too theoretical and not focused or tailored enough to Ethiopia's specific conditions (too much content on global systems). The partners therefore requested more of a geographic focus on Ethiopia/East Africa within this module.

For Module 3, the content within the enterprise budget and economic analysis (Module 3.3) was highlighted as being very important, and partners were glad to see its inclusion in the course.

For Module 4.1 (Climate Service Communication Strategies), a request was made to add 3-4 pages to the Reference Guide to elaborate further on structured group communication and training protocols that have been used widely, and especially to outline which approach (or combination of approaches) the MoA in Ethiopia is using. In particular, partners wanted more information and resources on the Participatory Scenario Planning (PSP) process developed by CARE, as well as the Participatory Integrated Climate Services for Agriculture (PICSA) approach currently being piloted by the MoA in conjunction with the IRI and University of Reading (UoR). The ACToday team, therefore, might expand the content of this module to add a bit more description, as well as point training participants in the future to the existing guidebooks for PSP or PICSA, or further resources on these topics.

In addition to this, the partners would like to see the addition of ***"self-check" exercises*** to the Reference Guide. In other words, beyond the group exercises or lectures, the Reference Guide might include self-check exercises with an answer key where participants can ensure they are interpreting graphs or maps correctly or are retaining key points within the content. For Module 2 especially (Climate Information Products and Tools Available for Agriculture i.e. ENACTS), participants noted that the Reference Guide does not include any explanations on how to read or interpret the maps, focusing mostly on navigation. For Module 1 as well, a request to include more exercises to ensure and reinforce understanding, as this topic is especially quite new to many people, was echoed several times by partners.

Length of the Course and Materials

Most participants, even those who are experts in their fields, felt the course was too fast and found it at times hard to keep up; i.e. there was too much content covered in a short period of time. The length of the course therefore might be re-examined and adjusted.

All partners appreciated the comprehensiveness of the Reference Guide, which is currently 135 pages, and pointed to it as a strength in the course materials. However, due to printing costs and resource constraints, Esayas (Director of the Crop Directorate, MoA), reiterated a need for a shorted version such as a Handbook or Manual of the Reference Guide, which would include worksheets and exercises that could be easily printed for each student. After discussing, the MoA staff agreed that this Handbook is extremely important and should not exceed 40 pages in length, to accompany the Reference Guide (which will likely be given digitally) and Facilitators' Guide. The group agreed that the Handbook for lower level (woreda, kebele) staff ("Learner Profile 1") and higher level staff (national, regional, zonal) level ("Learner Profile 2"), would differ; it also agreed that a Handbook for DAs versus SMS's should differ, with exercises for the SMS's being more difficult.

The MoA said it would cover the costs of printing these Handbooks and Facilitators' Guides. It also committed to supporting and supplying other requisite materials, such as computers and projectors, during the first year of implementation.

Differentiation of Content for Different Learner Profiles

One of the main consensus points to come out of the meeting was that the course content developed for this CRMAE pilot should be differentiated and modified for 2 different target groups/learner profiles:

1. Federal, regional, and zonal level staff—"Profile 1"
2. Woreda and kebele level staff (subject matter specialists and DAs)—"Profile 2"

The content as it stands now is more appropriate for Profile 1 staff, but not those in Profile 2, for which the content would need to be simplified and adjusted to match the learning environment and available resources at the most local administrative levels.

For Profile 2 (woreda and kebele level staff), for example, Module 2 was not deemed realistically feasible, as the necessary equipment (computers, internet, etc.) is not readily available to exploit and leverage maprooms, though in the future as the country develops, such resources may be available. The same is true for the and SIMAGRI-focused lectures of Module 3 (Module 3.2) and exercises requiring internet and higher-level analytical skills. However, Module 1, the remainder of Module 3, and Module 4 was still deemed relevant and possible for lower-level staff. In short, while all levels (Profile 1 and Profile 2) generally need capacity building on Climate Risk Management in Agricultural Extension (CRMAE), not all content and resources that are useful and feasible at the upper administrative levels (federal, regional, zonal), are useful or feasible at the lower administrative levels (woreda, kebele).

On the note of the lower administrative levels, in-country partners agreed that the woreda and kebele level staff could be treated mostly the same in terms of learner profile. They also gave additional background on the subject matter specialists (SMSs), sometimes called "extensionists," who coordinate the development agents (DAs) and comprise this lower level of staff (woreda and kebele):

- SMSs possess at least a Bachelor's degree, usually from an agricultural university
- DAs have graduated from a 3-year ATVET college, but do not possess Bachelor's degrees.

- There are what are considered 3 essential categories of DAs (with additional categories present, as needed, depending on location):
  1. Crop Management
  2. Natural Resource Management (NRM)
  3. Livestock and Animal Health
- For each woreda (approximately 800 in Ethiopia), there are 10 SMSs present to coordinate the various DAs. Each of these 10 SMSs, in turn, coordinates a minimum of 3 DAs, in the categories described above, in each woreda. Each woreda, therefore, theoretically has at least 30 staff supporting its extension system.

On the note of whether or not to include the ENACTS Maprooms (Module 2) and SIMAGRI content (Module 3.2) for the lower-level staff (woreda and kebele), however, there seemed to be disagreement amongst the in-country partners. There were some who felt that even though the SMSs and DAs may not have good access to internet or computers, nor students at the ATVET colleges (there are computer labs but too few computers for all the students), they should still be exposed to ENACTS and SIMAGRI and encouraged to access these resources on their own time via mobile phones. Now that a web-version of SIMAGRI-Ethiopia exists, this suggestion to make up for the lack of computer access (previously, SIMAGRI had to be installed on a desktop) through use of mobile phones is a viable one. The ACToday-Ethiopia team has also recently formatted the SIMAGRI-Ethiopia web version for mobile phone. Another suggestion to combat the issue of internet access, which could be pursued in tandem with the use of the web version via mobile phone, is the installation of the prior desktop version of the SIMAGRI tool at offices and on computers at the regional and zonal levels.

Proponents of keeping in Module 2 (Maprooms) and Module 3.2 (SIMAGRI) content for lower level staff felt that the MoA should plan for the country's future situation (for example, for 10 years from now, when access to internet and technology will improve) and not just the current situation.

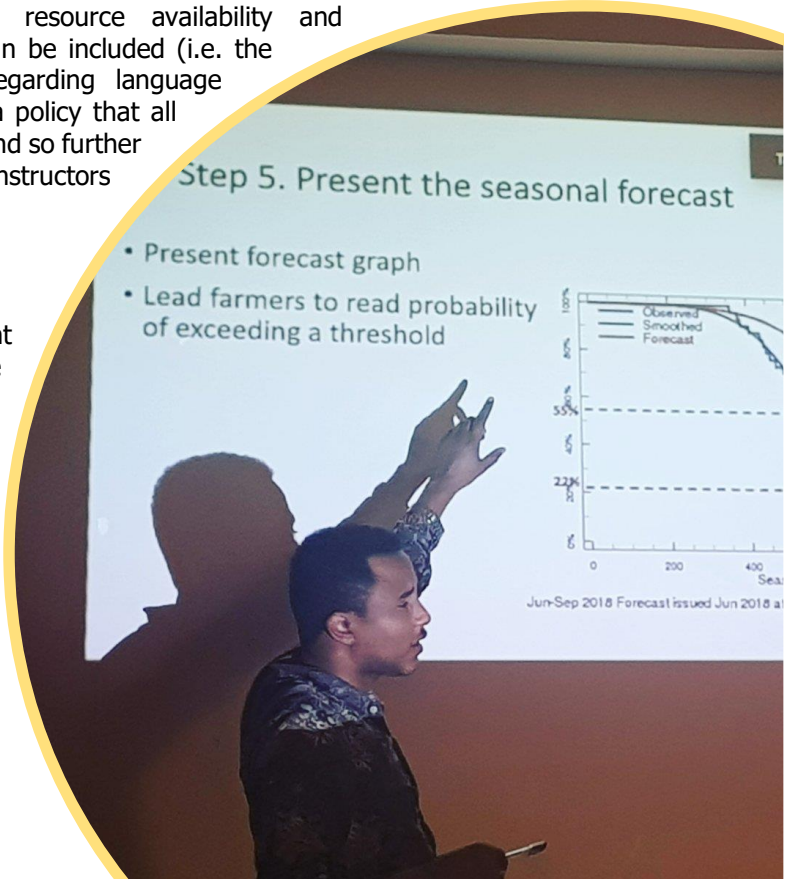
Lastly, there were comments from several partners that the content of CRMAE focused heavily and would be of most interest to the Crop DAs. However, material should also be tailored to the other two main types of DAs (Natural Resource Management and Livestock and Animal Health), as well. In other words, it is not just DAs working with crops that need the knowledge and skills of the CRMAE course, but those working on NRM and with pastoralists or agropastoralists (livestock and animal health) as well. For the DAs focused on livestock and animal health, it was suggested that ACToday might include content and training on tools or maprooms related to 1) water availability, 2) feed availability, 3) incidence of disease due to temperature and precipitation changes.

It was also indicated that the ACToday team should consider different learner profiles for DAs and SMSs in rural versus urban/peri-urban environments as their resource availability and backgrounds may differ and may influence what can be included (i.e. the learning environment) in different localities. Regarding language differentiation, he also indicated that Ethiopia has a policy that all instruction should be in English past the 10th grade, and so further language tailoring of content may not be required; instructors themselves would handle translation.

Need for Facilitators' Guide and Demonstration

The point was stressed that it is not just important *what* is taught but *how* it is taught. As such, the development of a Facilitators' Guide was emphasized as a high priority.

A second training was requested for demonstrating and teaching the teachers how to effectively facilitate the course. Partners commented that the CRMAE training was a good opportunity to test the content (level, usefulness, interest), but the ACToday team needs to take it a step further with regard to promoting best practices in facilitation.



Trainees discuss participatory processes that can help farmers understand and use probabilistic climate information.

SIMAGRI Decision Support System

Regarding feedback on SIMAGRI, in-country partners would like to see additional stations and localities included in the tool, as there are currently only seven. In addition, there was a request to include additional factors than just the nitrogen (NO3) and soil water conditions in the initial conditions of the soil, though what these factors could be were not specified. The ACToday team has been following up on these points since the conclusion of the workshop.

Adaptation of the CRMAE Curriculum for the ATVET Program and Next Steps

The CRMAE course will be adapted and integrated within a semester course as part of the ATVET program. The ATVET program curriculum itself happens to be under review and revision, and so the introduction of the CRMAE content comes at an opportune time. The material will likely be integrated within the 50-hour semester-long ATVET course unit entitled "Observe and Monitor Weather Conditions," which may be renamed to "Observe and Monitor *Climate* and Weather Conditions."

Need for Learning Management System (LMS)

In the context of discussing the adaptation of the CRMAE curriculum for the ATVET program, the MoA expressed a need for a learning management system (LMS). The MoA/ATVET program currently has no LMS or standard system for storing or disseminating course materials like PowerPoints, reference materials, worksheets, etc. to students; this is done on an ad hoc basis. There is a need for some kind of resource hub, such as Courseworks or Canva. The MoA was enthusiastic about having such a system, though it would need funding and expertise to develop it, and then resources to support the training on staff on how to use such a system. This is beyond the scope of ACToday's existing resources, but both teams (MoA and IRI) will be on the lookout for potential funding opportunities.

During group work for Module 4, trainees practice leading development agents through the steps of a participatory seasonal planning workshop. This includes identifying "good" and "bad" years, and the probabilities of exceeding and not exceeding certain thresholds of rainfall.

Conclusions and Recommendations

Revision of the content—including the Reference Guide, lecture materials, and exercises—for the CRMAE course is necessary following specific feedback outlined in the "Key Results and Findings" section. Each of the points will not be reiterated here, but major action items and recommendations for next steps include:

- Adding an Introduction to Maps and Graphs section to Module 1 in the Reference Guide, with exercises, as it cannot be assumed participants have this skill
- Developing an abridged version of the longer Reference Guide called the "Handbook"
- Completing the Facilitators' Guide with best practices on facilitation and promoting positive learning outcomes
- Incorporation of "self-check" exercises throughout the Reference Guide
- Adjusting (simplifying) language throughout all course materials to match the learner profiles of extension staff
- Investigating funding opportunities to address the lack of Learning Management System within the MoA's educational and training architecture

Appendices

APPENDIX A: Competencies, Learning Objectives, and Assessments

Competency	Learning Objective	Assessments	Builds on
Module 1. Climate Basics			
Understand the concept of climate services	Explain the climate services pillars Compare ENACTS and climate services pillars Explain the role of climate services in Ag extension Describe the National and Global Frameworks for Climate Services (NFCS)	Quiz/discussion: Explain the value of climate services, give examples national institutions for each of the four pillars, and the role of the trainee's own institution the role of climate services	Experience with some agricultural practices/activities Layman interest in/awareness of climate change Basic understanding of relevant national institutions and their roles
Understand the concepts of weather, climate and climate change	Identify whether the problem at stake or information provided relates to weather, climate or climate change	• Quiz (e.g. multiple choice) with examples of information or problems pertaining to weather, climate or climate change • Answer mock-up farmers question (about a weather extreme, climate change etc.) (group discussion, report to plenary)	➔ basic experience of everyday weather ➔ layman interest in/awareness of climate change
Characterize the climate of the country	Describe different climates of the country and related limitations on Ag activities	• Compare two climates based on graphs or descriptions (e.g. seasonal cycle); (group discussion, report to plenary) • Interpret a given seasonal cycle, especially in terms of length of growing season and/or other factors limiting Ag activities (group discussion, report to plenary)	➔ basic knowledge of geographical concepts such as latitude, longitude; rotation around the sun and seasons ➔ recalling some basic concepts in physics such as heat absorption, evaporation, friction (can be experiential)
	Interpret climate variability in Ethiopia	• identify whether an anomaly relates to weather, climate variability or change (group work, quizz) • describe variability based on a graph (e.g. time series), identify the mean, the minimum and the maximum (pairs, group work, describe results to others) • contrast two time series or two maps provided (pairs, group work, describe results to others) • answer mock-up farmers question (about a weather extreme, climate change etc.)	➔ weather, climate and climate change concepts ➔ ability to read and understand a 2d graph (axes, units) ➔ potentially the notion of 'mean'

		(group discussion, report to plenary)	
Understand climate data, climate information and their limitations	Identify different types of meteorological and climate data, their strength and weaknesses	• describe the pros and cons of different types of observation (discussion, quizz) • identify data used in a graph and recall their limitations (discussion, quizz)	→ concepts of point vs continuum (in time and space)
	Describe and interpret climate information provided	• describe climate information provided in a document, including type of data and analysis applied (group work, report to plenary)	→ types of data LO → if possible, concepts of mean and understanding of negative anomaly
	Explain different climate dimensions and scales	• recognize dimensions and scale of information and their limitations (e.g. map vs time series, station vs spatial aggregate, daily vs seasonal) (group discussion, quizz) • explain the limitations of a given climate information to Ag decision maker/farmer (e.g. why is seasonal forecast for two villages similar; why does NMA provide similar weather forecast for two villages or why does it use large regions) (group discussion, report to plenary, could be a quiz)	→ difference between space and time → global vs local scale from country climate LO
Apply statistical concepts in climate	Identify some statistical aspects of climate	• identify statistical analysis in the information provided (group work, discussion, quizz) • compute each statistics (hands on exercises probably in groups)	→ ability to read and understand a 2d graph (axes, units) → if possible, concepts of mean and understanding of negative anomaly → dimensions of climate (spatial vs temporal) LO → basic arithmetics skills (add, subtract, divide, compute a square, rank)
	Interpret some statistical aspects of climate in terms of their relevance to Ag decisions	• discuss Ag decision that a given statistical characteristics can inform (plenary discussion, group discussion with report to plenary) • quizz with different decisions for a given statistical analysis • explain each statistical characteristic to an Ag decision maker/farmer (group discussion)	→ some familiarity with on-farm decisions → Builds on statistical aspects of climate LO
Interpret seasonal (?) climate forecasts	Describe different time horizons	• identify the horizon of the information/ from a figure (quizz, discussion in pairs or plenary) • associate climate information at different horizons with Ag decision processes (quizz, group discussion, report to plenary)	→ distinction between weather, climate, climate change LO → notions of scales LO → some familiarity with on-farm decisions

		• explain ready/steady/go concept in Ag (discussion)	
	Identify different types of forecasts	• identify different types of forecast , related scales and drivers (discussion, quiz)	→ understanding of horizons LO → notions of scales LO
	Explain forecast uncertainty	• quiz on uncertainty sources • explain why forecasts are uncertain and may not verify in a deterministic way (discussion)	→ understanding of horizons LO → notions of scales LO → statistical concepts LO
	Interpret probabilistic seasonal forecasts	• interpret seasonal forecast in terms of shifts of probabilities (quizz) • interpret the shifts in probability of exceedance (quizz)	→ statistical concepts LO
	Explain the impact of El Nino/La Nina on seasonal climate	• be able to anticipate climate anomalies given El Nino/La Nina forecast • be able to describe the anticipated anomalies to an Ag decision maker	→ global climate factors (circulations) LO → basic concepts in physics (rising of hot air) → anomalies (statistical concepts) LO
Module 2. Climate Information Products and Tools Available for Agriculture			
Understand agriculture-relevant products and services available through NMA's web page	Navigate through NMA's web page Locate relevant climate information products Explain the potential use of the products	Practical exercise to locate, download, and explain use of specific climate information product from NMA webpage	Basic computer use Basic internet navigation Module 1
Navigate NMA Maproom products	Ability to identify Maproom structure, components and key features	Practical exercise to locate, extract, download , and present specific climate information product	
	Ability to locate Maproom products of interest and enter required user inputs		
	Ability to extract information for points, boxes, and administrative boundaries		
	Ability to download maps and graphs		
Use NMA Maproom products	Ability to use historical climate analyses to characterize seasonality, variability, extremes, trends	Group activity: Use historical climate analyses to characterize seasonality, variability, extremes, trends.	
	Ability to use historical analyses that are important for agriculture	Group activities: • Analyze risk of a damaging dry spell during a critical stage of crop development (maybe in contrasting years). • Analyze whether and how a warming trend has influenced development time for a crop, based on growing degree-days.	
	Ability to use seasonal monitoring products	Group activity: Use monitoring products to assess the progress of	

		the current or last season relative to the average (climatology) at dekadal, monthly and seasonal scales	
	Ability to interpret probabilistic seasonal and sub-seasonal forecasts and the Flexible Forecast Maproom	Group activity: Analyze the probability of experiencing seasonal rainfall above or below specified thresholds, based on historical climate analysis and a given seasonal forecast	
	Understand use of agricultural modeling tools (e.g., soil water balance) to translate climate information into agricultural impacts and decision support		
Module 3. Climate-Sensitive Agricultural Decisions			
Perform basic analyses of climate-sensitive farm management decisions	Ability to construct a calendar of the main climate-sensitive farmer decisions in your community	Group activity: • Construct a calendar of the main climate-sensitive management decisions for a given farming system. • Identify 3(?) priority climate-sensitive management decisions, and propose relevant climate information and support • Analyze production management options using enterprise budgets. • Analyze production management options using decision trees. • Analyze production management options using risk analysis.	Seasonality of climate (Module 2) Historical and forecast climate Maprooms (Module 2)
	Ability to analyze production management options using enterprise budgets		
	Ability to analyze production management options using decision trees.		
	Ability to analyze production management options using risk analysis		
Understand factors that lead to different management decisions by different farmers and in different years	Understand how differences in farm household goals and resource constraints can lead to different decisions	Exam, covering role of goals, resource constraints, risk aversion and stochastic variability in farmer management decisions.	
	Understand the role of risk and risk aversion in farm management decisions		
	Understand relationship between stochastic variability of climate and prices and agricultural management practices		
	Ability to critically assess current extension recommendations for climate-sensitive decisions	Group activity: Select a current recommendation for a climate-sensitive decision, critique its appropriateness, and propose what is needed to make it more appropriate across farmer types and climate conditions.	
Understand basics of index-based	Ability to summarize main roles of insurance for agriculture	Quiz, covering the role of insurance in agriculture, indemnity-based vs. index-based insurance, basis risk,	Role of risk in agricultural decisions (Module 3)

agricultural insurance	Ability to explain main differences between indemnity-based and index-based insurance	elements of index insurance contract design, and payouts as a function of weather conditions. TENTATIVE Group activity: For a given rainfall index insurance contract, use the historical climate analysis Maproom to identify years and amounts of payouts, and calculate frequency and average amount of payouts. Discuss how well years with payouts match years with low crop yields.	
	Ability to explain a basic index-based agricultural insurance contract		Probability concepts (Module 1) Historical climate Maprooms (Module 2)
SIMAGRI		POSSIBILITY TO DEVELOP AN ACTIVITY PLOTTING WRSI AND CROP YIELD TIME SERIES DATA, CALCULATE CORRELATION. MIGHT APPROACH THIS DIFFERENTLY IF WE USE SIMAGRI.	
Module 4: Integrating Climate Services into Agricultural Extension			
Lead a group of farmers through a basic seasonal forecast communication and planning workshop process.	Understand how group participatory processes can help farmers understand and use probabilistic climate information	• Quiz, covering ways group communication processes help farmers understand and use probabilistic climate information, steps in seasonal forecast communication and planning workshop • Group activity: Demonstrate steps in a participatory seasonal forecast communication and planning workshop with a group of farmers or peers	
	Understand the steps involved in a participatory seasonal forecast communication and planning workshop		Probability (Module 1), forecast Maproom (Module 2)
	Ability to lead farmers in a basic participatory seasonal forecast communication and planning workshop		
	Understand how to adapt the seasonal forecast workshop to sub-seasonal forecasts		
	Identify sources of additional information on participatory climate communication and planning		
Create and implement a plan to integrate climate services into extension activities	Ability to identify types of farmers likely to have differing climate service needs	• Develop a written plan to support farmers in your location with climate services, covering: information and support needed for key climate-sensitive management decisions; differing needs of different types of farmers; communication, training and support strategies; annual calendar of climate service activities; and monitoring and responding to feedback.	
	Understand how gender and social differences within rural communities can lead to differing needs and challenges in accessing and using climate services		
	Understand strategies to reduce disadvantages due		

	to gender and social status for their location	● Present plan to peers. Give, receive and use peer feedback to improve ● Incorporate peer feedback to improve your plan.	
	Ability to prioritize key climate-sensitive farm management decisions		Climate-sensitive decisions (Module 3)
	Ability to assess climate information products, advisories and training needs for farmer types and key decisions		Time horizons of climate-sensitive decisions (Module 3)
	Understand why weather and climate information require different communication strategies		Climate time scales (Module 1)
	Ability to identify and use appropriate communication processes and channels to deliver climate services		
	Ability to schedule climate service activities in an annual calendar		Agricultural decision calendar (Module 3)
	Ability to monitor progress in delivery and use of climate services, and respond to feedback		

APPENDIX B: Participants and Trainers

List of Participants						
No.	Name	Gender	Organization/ Project	Location	Position	Email
1	Endalew Assefa Abera	M	EIAR/DzARC	Bishoftu	Agrometeorology and Natural Risk Management Researcher	endex.012@gmail.com
2	Nejeha Redy Alemar	F	Alage ATVET	Alage	Instructor/ Department Head	negahredy@gmail.com
3	Tolesa Denboba Buli	M	MoA	Addis Ababa	Senior Agronomist	Kenarabi.4@gmail.com
4	Tilahun Dandesa Daba	M	Oromia ANR Bureau	Addis Ababa	Agrometeorologist	tilahun.dandesa@gmal.com
5	Kidus Belay Emiru	M	NMA	Addis Ababa	Agrometeorologist	kibe_302001@yahoo.com
6	Girma Kibret Gashaw	M	MoA	Addis Ababa	Climate Smart Agriculture Specialilst	Girma.kibret@yahoo.com
7	Masresha Kebede Gebrehiwot	M	MoA	Addis Ababa	Agrometeorology Team Leader	kebedemas@gmail.com
8	Mustefa Abu Kuffa	M	MoA	Addis Ababa	CRG M&E Expert	salim1mak@gmail.com
9	Berhanu Assefa Seyoum	M	MoA	Addis Ababa	Director, Environment and Climate Change Coordination Directorate	Berhanuassefa186@gmail.com
10	Dawit Kassa Tadele	M	MoA	Addis Ababa	Food Security M&E Expert	tdkdev2000@gmail.com
11	Yayeh Alehegn Tiruneh	M	Agarfa ATVET	Agarfa	Instructor/Department Head	yayehalehegn55@gmail.com
12	Befekadu Birhane Tsehaye	M	MoA	Addis Ababa	Soil & Water Conservation Expert	befe.birhane@gmail.com
13	Fisseha Eskeziaw Yeneneh	M	MoA	Addis Ababa	Curriculum Expert	Fisseha74@gmail.com
14	Yimer Assefa Yimam	M	NMA	Addis Ababa	Agrometeorology Department Team Leader	Yimera649@gmail.com

List of Trainers						
No.	Name	Gender	Organization/ Project	Location	Position	Email
1	Tufa Dinku *physically present for training	M	IRI	New York	Senior Research Scientist/ACToday Ethiopia Country Lead	tufa@iri.columbia.edu
2	Gloriose Nsengiyumva *remote trainer	F	IRI	New York	Participatory Integrated Climate Services for Agriculture (PICSA) expert and Officer of Research	gloriose@iri.columbia.edu
3	Sylwia Trzaska *remote trainer	F	IRI	New York	Senior Staff Associate/Clilmatol ogist	syl@iri.columbia.edu
4	James Hansen *remote trainer	M	IRI	New York	Senior Research Scientist	jhansen@iri.columbia.edu
5	Eunjin Han *remote trainer	F	IRI	New York	Associate Research Scientist	eunjin@iri.columbia.edu
6	Amanda Grossi *physically present for training	F	IRI	New York	Senior Staff Associate/ ACToday Ethiopia Country Manager	amanda@iri.columbia.edu
7	Asaminew Teshome *physically present for training	M	NMA/IRI	Addis Ababa	Senior Meteorologist/ ACToday-Ethiopia In-Country Coordinator	asmin2met@gmail.com
8	Esayas Lemma *physically present for training	M	MoA	Addis Ababa	Director of Crop Development Directorate	esayas.lemma@moa.gov.net

APPENDIX C: Schedule of Training

Module	Time	Content	Speaker	Time Allocation
Day 1				
	9:00-9:15	Official start time: Welcome people as they arrive.		15 minutes
"Introduction Module"	9:15:10:00	**Opening Remarks and Welcome:** Opening remarks by facilitator and any present dignitaries, introduction of participants	Essays Lemma (MoA), Tufa Dinku (IRI), Dawit Solomon (CCAFS)	45 minutes
	10:00-10:30	Overview of training	Tufa Dinku	30 minutes
	10:30	**Morning tea/coffee break**		30 minutes
Module 1, Section 1	11:00-12:00	**Lecture/Presentation:** - Introduction to Climate Services - The ENACTS Approach - Overview of ACToday	Tufa Dinku	1 hour
	12:00-13:00	**Discussion:** Discussion in groups and as a class of the value of climate services, examples of institutions contributing to the four pillars and examples from the trainees' own organizations	ALL	1 hour
	13:00-14:00	**Lunch**		1 hour
Module 1, Section 2	14:00-14:30	**Lecture/Presentation:** 1. Basics concepts of Weather, Climate and Climate Change 2. How do we measure weather and climate	Sylwia Trzaska	30 minutes
Module 1, Section 3	14:30- 16:00	**Lecture/Presentation:**	Sylwia Trzaska	

		1. Main features of Ethiopian climate 2. Main factors determining climate of Ethiopia		1 hour 30 minutes
	16:00-16:15	**Afternoon tea/coffee break**		15 minutes
Module 1, Section 3 continued	16:15-17:00	**Lecture/Presentation:** Variability of climate in Ethiopia: El Nino and Indian Ocean Dipole	Sylwia Trzaska	45 minutes
	17:00-17:15	**Wrap-up/Summary of Day 1:** Main themes, messages, and concepts from day 1 are summarized. Topic for day 2 is previewed.	All	15 minutes

Day 2				
Module 1, Section 3 continued	9:00:9:15	Review of the previous day.		15 minutes
	9:15-10:00	**Activity:** Exercises related to basic concepts of weather, climate and climate change	Tufa Dinku and Asaminew Teshom	45 minutes
	10:00-10:30	The climate of Ethiopia	Asaminew Teshome	30 minutes
	10:30-10:45	**Morning tea/coffee break**		15 minutes
Module 1, Section 3 continued	10:45-11:45	**Activity:** Exercises related to climate in Ethiopia	Tufa and Asaminew	1 hour
	11:45-12:30	**Activity:** Exercices related to climate variability in Ethiopia	Tufa and Asaminew	45 minutes
	12:30-13:00	**Discussion**	Tufa and Asaminew	30 minutes
	13:00	**Lunch**		1 hour
Module 1, Section 3 continued	14:00- 14:45	**Lecture/Presentation:** Climate Data vs. Climate Information	Sylwia	45 minutes
	14:45-15:30	**Lecture/Presentation:** Statistical concepts in climate (mean, median, variance, correlation, probability of exceedance/non-exceedance)	Sylwia	45 minutes

	15:30-15:45	**Afternoon tea/coffee break**		15 minutes
Module 1, Section 3 continued	15:45- 16:30	**Lecture/Presentation:** Climate forecasting	Sylwia Trzaska	1 hour
	16:30-16:45	**Wrap-up/Summary of Day 2:** Main themes, messages, and concepts from day 2 are summarized. Topic for day 3 is previewed.		15 minutes

Day 3				
	9:00-9:15	Official start time: Welcome people as they arrive.		15 minutes
Module 1, Section 3	9:15-10:15	**Activities:** Exercises related to data and information	Tufa, Asaminew	1 hour
	10:15-10:30	**Morning tea/coffee break**		15 minutes
Module 1, Section 3 continued	10:30-11:30	**Activities:** Exercises related to main statistical analyses	Tufa, Asaminew	1 hour
	11:30-12:30	**Activities:** Exercises related to climate forecast	Tufa, Asaminew	1 hour
	12:30-13:00	**Debrief on Module 1:** Summary of main concepts, themes, and ideas covered in Module 1	Tufa, Asaminew	30 minutes
	13:00	**Lunch**		1 hour
Module 2, Section 1	14:00-14:15	**Lecture/Presentation:** Introduction to Module 2	Tufa	15 minutes
	14:15-15:00	**Demonstration:** Locating, downloading, and explaining use of specific climate information product from the NMA's webpage	Asaminew	45 minutes
	15:00-15:30	An overview of ENACTS maprooms	Tufa	30 minutes
	15:30-16:00	**Activity:** Navigating through ENACTS maprooms	Trainees	30 minutes
	16:00-16:15	**Afternoon tea/coffee break**		15 minutes

Module 2, Section 2	16:15-16:45	**Demonstration:** The Climate Analysis Maproom (Daily Analysis, Dekadal Analysis, Monthly Analysis)	Gloriose Nsengiyumva Tufa Dinku	30 minutes
	16:45-17:00	**Activity:** Exploration of the Climate Analysis Maproom in groups	Trainees	15 minutes
	17:00-17:15	**Wrap-up/Summary of Day 3:** Main themes, messages, and concepts from day 3 are summarized. Topic for Day 4 is previewed.	All	15 minutes

Day 4				
	9:00-9:15	Overview of previous day	All	30 minutes
Module 2, Section 2 continued	9:15-10:15	**Demonstration:** The Climate Analysis Maproom continued (Seasonal Analysis, Seasonal Trends, Extremes analyses)	Tufa Dinku	1 hour
	10:15-10:30	**Morning tea/coffee break**		15 minutes
odule 2, Section 2 continued	10:30-11:00	**Activity:** Learners explore the Climate Analysis Maproom (Seasonal Analysis, Seasonal Trends, Extememes analyses)	Trainees	30 minutes
	11:00-11:30	**Demonstration:** The Climate Analysis Maproom continued (ENSO, IOD)	Tufa Dinku	30 minutes
	1:30-12:00	**Activity:** Learners explore ENSO, IOD maprooms	Trainees	30 minutes
	12:00-13:00	**Demonstration:** Climate Monitoring Maproom (Dekadal Analysis, monthly and seasonal analysis, SPI)	Tufa	1 hour
	13:00-14:00	**Lunch**		1 hour
Module 2, Section 3	14:00-15:00	**Activity:** Learners explore the Climate Monitoring Maproom	Trainees	1 hour
	15:00-16:00	**Demonstration:** Climate Forecast Maproom	Gloriose, Tufa	1 hour
	16:00-16:15	**Afternoon tea/coffee break**		15 minutes

Module 2, Section 4	16:15-17:00	**Activity:** Learners explore the Climate Forecast Maproom	Trainees	45 minutes
	17:00-17:15	**Wrap-up/Summary of Day 4:** Main themes, messages, and concepts from day 4 are summarized. .	All	15 minutes

	Day 5			
	9:00-9:30	Overview of previous day	All	30 minutes
Module 2, Section 4 continued	9:30-10:30	**Demonstration:** Climate and Agriculture Maproom (Daily Analysis, Onset/cessation, Length of growing season/seasonal rainfall totals)	Tufa	1 hour
	10:30-10:45	**Morning tea/coffee break**		**15 minutes**
Module 2, Section 4 continued	10:45-11:30	**Activity:** Learners explore Agriculture maproom	Trainees	45 minutes
	11:30-13:00	**Activity:** Learners work on their presentation slides.	Trainees	1 hour, 30 minutes
	13:00-14:00	**Lunch**		**1 hour**
Module 2, Section 4 continued	14:00-15:30	Learners' work on their presentation continues	Trainees	1 hour, 30 minutes
	15:30-15:45	**Afternoon tea/coffee break**		**15 minutes**
Module 3, Section 1	15:45-16:45	*Lecture/Presentation:* Introduction to Module 3 Climate-sensitive farm decisions	Jim Hansen	1 hour
	16:45-17:00	*Wrap-up/Summary of Day 5:* Main themes, messages, and concepts from day 5 are summarized. Topic for Day 6 is previewed.	All	15 minutes

	Day 6			
	9:00-9:15	Official start time: Welcome people as they arrive.	All	15 minutes

Module 3, Section 1 continued	9:15-10:15	*Discussion (plenary):* Select at least one existing extension recommendations, discuss whether it is appropriate across different types of farmers and climate conditions, and what could be done to make it more appropriate	Esayas Tufa	1 hour
	10:15-10:30	**Morning tea/coffee break**		**15 minutes**
Module 3, Section 1 continued	10:30-13:00	*Activity (groups):* Use a decision tree to represent cultivar and N fertilizer options	Esayas Tufa	2 hour, 30 minutes
	12:45-13:00	*Debrief/short presentations:* The class debriefs on the decision tree activity, with brief presentations by select groups	Esayas Tufa	15 minutes
	13:00-14:00	**Lunch**		**1 hour**
Module 3, Section 2	14:00-14:20	*Lecture/Presentation:* Analyzing farmers' options with crop models and decision support tools	Jim Eunjin Han	20 minutes
	14:20-15:00	*Demonstration and group activity (plenary):* Walking through SIMAGRI decision support tool	Eunjin	40 minutes
	15:00-15:15	**Afternoon tea/coffee break**		**15 minutes**
Module 3, Section 3	15:15-16:15	*Lecture/Presentation:* Analyzing farmers' options with enterprise budgets	Jim	1 hour
Module 3, Section 3	16:15-17:00	*Debrief/short presentations:* The class debriefs on the decision tree activity, with brief presentations by select groups	All	45 minutes
	17:00-17:15	*Wrap-up/Summary of Day 6:* Main themes, messages, and concepts from day 6 are summarized. Topic for Day 7 is previewed.	All	15 minutes

Day 7				
	9:00-9:15	Review previous day		15 minutes
Module 3, Section 2	9:15-10:15	***Activity (groups):*** Use SIMAGRI to simulate response to cultivar and N fertilizer application decisions	Esayas Tufa	1 hour
	10:15-10:30	**Morning tea/coffee break**		**15 minutes**
Module 3, Sections 2 and 3	10:30-13:00	*Activity (groups):* - Use SIMAGRI to simulate response to cultivar and N fertilizer application decisions (continued) - Use enterprise budgeting to analyze cultivar and N fertilizer application decisions	All	2.5 hours
	13:00-14:00	**Lunch**		**1 hour**
Module 3, Section 4	14:00-15:00	**Lecture/Presentation:** Analyzing farmers' options with risk analysis	Jim	1 hour
	15:00-15:15	**Afternoon tea/coffee break**		**15 minutes**
Module 3, Section 5	15:15-16:15	***Lecture/Presentation:*** Index-based agricultural insurance	Jim	1 hour
Module 3, Sections 2 and 3	16:15-17:00	**Debrief/short presentations:** The class debriefs on SIMAGRI and enterprise budget activities	All	45 minutes
	17:00-17:15	***Wrap-up/Summary of Day 7:*** Main themes, messages, and concepts from day 7 are summarized. Topic for Day 8 is previewed.	Jim	15 minutes

Day 8				
	9:00-9:15	Review of previous day	All	15 minutes
Module 3, Section 4	9:15-10:15	**Activity (groups):** Use E-S analysis to identify risk-efficient cultivar and fertilizer management options	Esayas, Tufa	1 hour
	10:15-10:30	**Morning tea/coffee break**		**15 minutes**
Module 3, Section 5	10:30-13:00	***Activity (groups):*** Use E-S analysis to identify risk-efficient cultivar and fertilizer management options	All	2.5 hours
Module 3, Sections 5 and 6	10:30-13:00	**Activity (groups):** - Use E-S analysis to identify risk-efficient cultivar and fertilizer management options (continued) - Analyze a weather index insurance contract	All	2.5 hours
	13:00-14:00	**Lunch**		**1 hour**

Module 3, Section 5 and 6	14:00-15:00	***Debrief/short presentations:*** - The class debriefs on SIMAGRI and enterprise budget activities - Review and answer any questions	Jim	1 hour
	15:00-15:15	**Afternoon tea/coffee break**		**15 minutes**
Module 3, Section 1	15:15-16:15	**Lecture/Presentation:** Introduction to Module 4 Climate service communication strategies	Jim	1 hour
	16:15-16:25	***Activity (groups and plenary):*** - Identify communication channels that would support climate services in a given location(group) - Summarize results in plenary.	Jim	30 minutes
Module 3, Section 3	16:25-17:15	**Plenary discussion:** - What to include in a preliminary plan to incorporate climate services into agricultural extension activities - Preview Day 9 activity	Jim	30 minutes

Day 9				
	9:00-9:15	Review of previous day		15 minutes
Module 4, Section 2	9:15-10:15	***Lecture/Presentation:*** A seasonal forecast training, communication and planning process	Jim	1 hour
	10:15-10:30	**Morning tea/coffee break**		**15 minutes**
Module 4, Section 2 continued	10:30-13:00	**Activity:** Practice steps in a participatory seasonal forecast communication and planning workshop.	All	2.5 hours
	13:00-14:00	**Lunch**		**1 hour**
Module 4, Section 2 continued	14:00-15:00	***Activity (continued):*** Practice steps in a participatory seasonal forecast communication and planning workshop.	All	1 hour
	15:00-15:15	**Afternoon tea/coffee break**		**15 minutes**
Module 4, Section 2 continued	15:15-16:45	**Activity (continued):** Practice and demonstrate steps in a participatory seasonal forecast communication and planning workshop.	All	1 hour, 30 minutes
	16:30-17:15	***Debrief/Discussion:*** - The class debriefs about the participatory seasonal forecast	All	30 minutes

		communication and planning workshop exercise. - Preview Day 10		

Day 10				
	9:00-9:15	Review of the previous day	All	15 minutes
Module 4, Section 3	9:15-9:30	**Activity Instructions:** Climate services plan presentations	Esayas Lemma, Tufa Dinku	15 minutes
	9:30-10:15	***Activity:*** Present and discuss climate services plans	All	45 minutes
	10:15-10:30	**Morning tea/coffee break**		**15 minutes**
Module 4, Section 3 continued	10:30-13:00	**Activity (continued):** Present and discuss climate services plans	All	2.5 hours
	13:00-14:00	**Lunch**		**1 hour**
Module 4, Section 3 continued	14:00-15:00	***Activity (continued):*** Present and discuss climate services plans	All	1 hour
	15:00-15:15	**Afternoon tea/coffee break**		**15 minutes**
	15:15-15:45	**Activity:** Course evaluation	All	30 minutes
	15:45-16:15	***Closing:*** Summary and closing remarks, opportunity to present lingering questions	All	30 minutes

Training Self-Assessment Report | CRMAE

Training program: Climate Risk Management in Agricultural Extension (CRMAE)
Region or Country: Ethiopia
Facilitators: Sylwia Trzaska, Jim Hansen, Tufa Dinku, Amanda Grossi, Eunjin Han, Gloriose Nsengiyumva, Asaminew Teshoma, Esayas Lemma
Participant organizations: MoA, EIAR, NMA, ATVET colleges (Agarfa, Alage)

Survey Type: Pre and Post-Training Survey

Date: June 7-18, 2021

Demographic profile of the participants:

Pre-Training Survey

- Number of survey responses: 13
- Total participants in training: 15
- Response rate: 87%
- 8% female and 92% male respondents

Post-Training Survey

- Number of unique responses: 11
- Total participants in training: 15
- Response rate: 73%
- 9% female and 91% male respondents

Job positions: the majority of participants held positions at MOA, some as experts in topics related to natural resources, meteorological sciences and food production and others in administrative roles. Other participants came from research centers and NGOs related to food security.

Competencies

The seven competencies measured in the CRMAE training program were:

1. Understanding weather, climate and climate change
2. Understanding climate services
3. Using climate information and data
4. Analyzing climate-sensitive farm management decisions
5. Understanding basics of index-based agricultural insurance
6. Leading a seasonal forecast communication and planning workshop
7. Creating and implementing a plan to integrate climate services into extension activities

Learning Expectations [*participant perception*]

Participants **hoped to gain understanding** in a range of topics concerning conceptual differences of climate variability, weather and climate change as well as mitigation and adaptation strategies through risk management. Climate information management, interpretation and access were also mentioned along with more particular knowledge about tools like forecasting and ENACTS use.

Participants hoped to gain **decision-making competencies** in risk management tools and be able to better communicate information to end users through bulletins, tailored advisories or adapting educational curricula for agricultural extension workers.

The participants' **institutional objectives** concern capacity building in climate change adaptation and mitigation, as well as risk mitigation on agriculture and food security. Others noted the creation of extension services to improve

agricultural production and productivity that contribute to food security. Academic objectives include research to better understand weather and climate conditions in Ethiopia to increase economic and social benefits.

Current Engagement and Knowledge Level [*self-assessment*]

This section of the survey aimed to assess current engagement and training participant perceptions of their knowledge of the training competencies prior to the training. To measure level of engagement, participants were asked to rate, on a scale from 1 to 5, the extent to which they have worked on the seven competencies, with 1 meaning "not at all" and 5 meaning "to a significant extent".

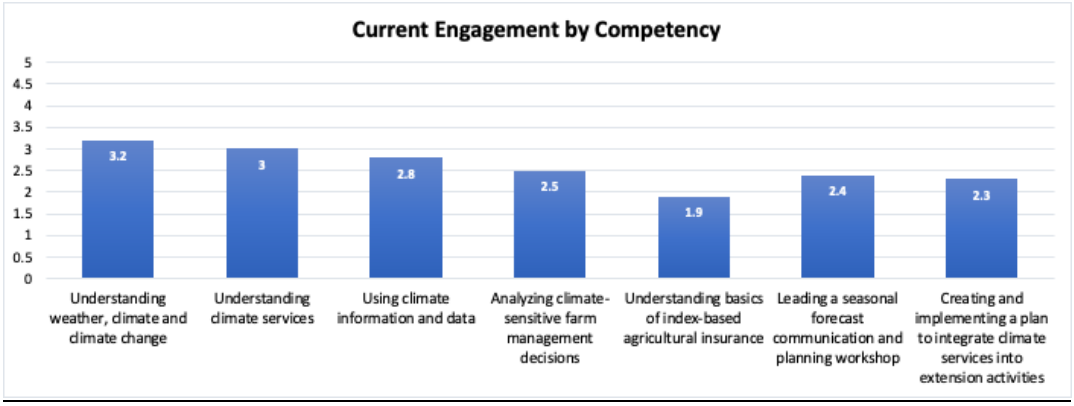
Current Engagement Summary

- **Mean:** across all competencies, the mean engagement level was 2.6 on a 1 to 5 scale.
- **Mode:** the most common individual answer was 1 (no current engagement).

Current Engagement

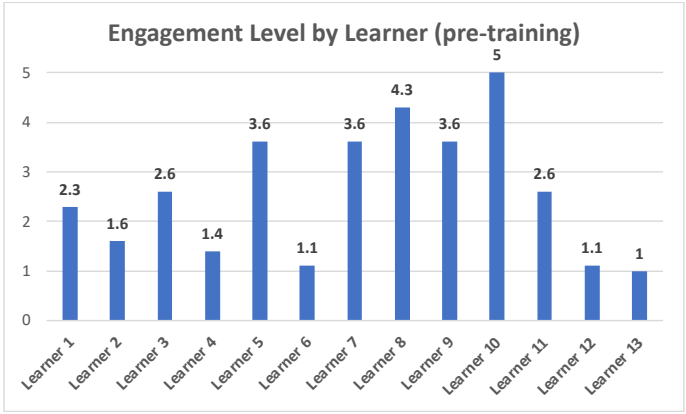
Participants reported the highest current engagement with *Understanding weather, climate and climate change* while being less familiar with *Understanding basics of index-based agricultural insurance* (Figure 1). Participant's engagement across the competencies was reported at very different levels. Average responses were registered in the range of 1 to 5. See Annex A.1 and for full self-assessment data.

Figure 1. Mean self-assessment of current engagement across competencies (pre-training)



The self-assessment is reported as ordinal data on a scale of 1-5. An additional category was considered to capture "Unsure" as an answer but with no ordinal value assigned. Continuous variables are used to illustrate the average response. Where: 1 = Not at all, 2 = To some extent, 3 = To a moderate extent, 4 = To a great extent, 5 = To a significant extent.

Figure 2. Mean self-assessment of current engagement across competencies, by learner (pre-training)



The self-assessment is reported as ordinal data on a scale of 1-5. An additional category was considered to capture "Unsure" as an answer but with no ordinal value assigned. Continuous variables are used to illustrate the average response. Where: 1 = Novice, 2 = Beginner, 3 = Competent, 4 = Proficient, 5 = Expert.

Knowledge Gain [*self-assessment*]

Participants were asked to rate, on a scale from 1 to 5, the knowledge and experience level they consider to have about each competency during the survey collected before the first training session (pre) and after the last training session (post).

Pre-Training Summary

- **Mean:** Across all competencies the mean reported knowledge level was 2.7 on a scale from 1 (novice) to 5 (expert).
- **Mode**: The most common individual answer was 2 (beginner).

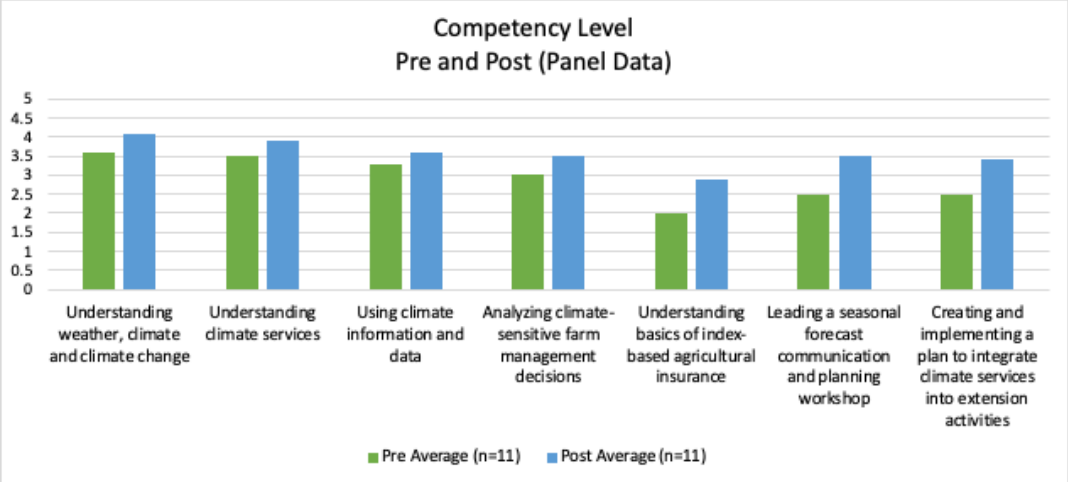
Post-Training Summary

- **Mean:** Across all competencies the average reported knowledge level was 3.6 on a scale from 1 (novice) to 5 (expert).
- **Mode** The most common individual answer was 4 (proficient).

Knowledge Gain by Competencies

Understanding weather, climate and climate change received the highest reported knowledge level in the post survey, reaching an average of 4.1 (proficient). *Understanding basics of index-based agricultural insurance* received the lowest reported knowledge level averaging 2.9 in the post, reaching 0.9 points, almost a full category, over the baseline result. These two categories remained the highest and lowest self-assessed knowledge level in the pre and post-training surveys.

Figure 3. Mean self-assessment of knowledge level across competencies, pre and post-training (n=11)

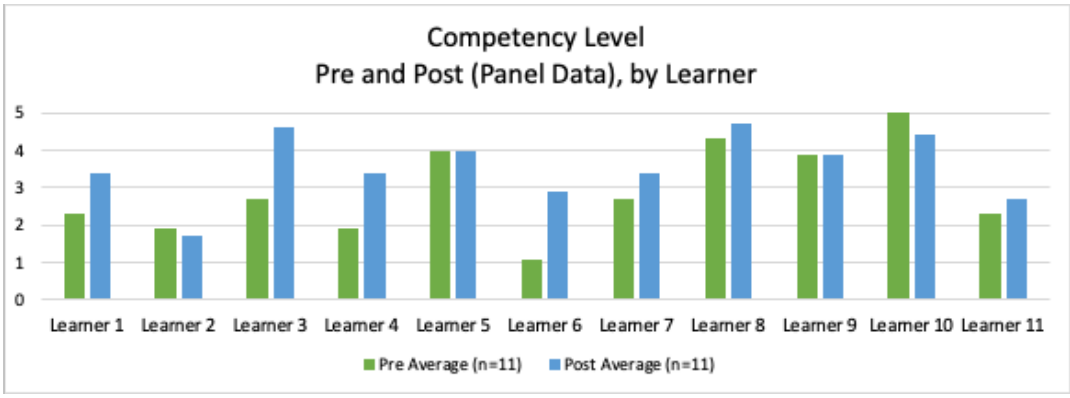


The self-assessment is reported as ordinal data on a scale of 1-5. An additional category was considered to capture "Unsure" as an answer but with no ordinal value assigned. Continuous variables are used to illustrate the average response. Where: 1 = Novice, 2 = Beginner, 3 = Competent, 4 = Proficient, 5 = Expert.

Self-Reported Knowledge Gain by Learner

Participants gained knowledge in different levels across the competencies. Average knowledge level per learner ranged from from 1.7 to 4. **See Appendix A.3 for full self-assessment data. See Appendix B for detail on individual participant performance**.

Figure 4. Mean self-assessment of knowledge level across competencies, pre and post panel data (n=11), by learner



The self-assessment is reported as ordinal data on a scale of 1-5. An additional category was considered to capture "Unsure" as an answer but with no ordinal value assigned. Continuous variables are used to illustrate the average response. Where:
1 = Novice, 2 = Beginner, 3 = Competent, 4 = Proficient, 5 = Expert.

Pre-Post Change Analysis

By comparing the average level of knowledge reported before and after the training sessions, we can observe the trajectory of the group regarding each competency. However, since the sample of participants that answered each survey was not exactly the same (n=11 participants overlapped), there is a need to distinguish between the two samples to complete the analysis. Results from the overlapping participants are discussed below.

Competencies registered an average increase in different magnitudes. *Leading a seasonal forecast communication and planning workshop* was the competency that had the biggest average increase among participants, increasing by one ordinal category, while *Using climate information and data* had the lowest average progress with 0.3 increase.

Table 1. Mean self assessment of knowledge level pre and post, by competency

Competencies	**Pre Average (n=13)**	**Pre Average, Panel Data (n=11)**	**Post Average Panel Data (n=11)**
Understanding weather, climate and climate change	3.5	3.6	4.1
Understanding climate services	3.2	3.5	3.9
Using climate information and data	3.0	3.3	3.6
Analyzing climate-sensitive farm management decisions	2.8	3.0	3.5
Understanding basics of index-based agricultural insurance	2.0	2.0	2.9
Leading a seasonal forecast communication and planning workshop	2.3	2.5	3.5
Creating and implementing a plan to integrate climate services into extension activities	2.2	2.5	3.4
Overall Average	**2.7**	**2.9**	**3.6**

The self assessment is reported as ordinal data on a scale of 1-5. An additional category was considered to allow for "Unsure" as an answer but it does not have an ordinal value. Continuous variables are used to illustrate the average response. Where: 1 = Novice, 2 = Beginner, 3 = Competent, 4 = Proficient, 5 = Expert.

Main Takeaways, Future Plans and Further Support from IRI

In addition to climate basics, the **most significant learning** reported was risk mitigation of climate variability in agriculture and concrete tools for risk management such as index insurance implementation and communication or dissemination of climate information to end users (farmers).

The group reported they would value **spending more time** on sessions to use maprooms, forecasting practice and further understanding of risk mitigation when the rainfall is above and below normal levels. Some participants see value in longer term training programs for risk management as well.

Finally, learners reported concrete activities for the **implementation of the training content** which included translating key concepts to other members of their organization or to their students as well as advisory efforts.

Additional Evaluation Considerations

Collection issues: The format used was paper copy with handwritten answers of which some information was lost due to unintelligible sections. Also, two participants did not answer the post-training survey, so the average change analysis was done over a smaller sample.

In addition, the original list of competencies numbered 15 and was reduced to seven to limit the number of competencies and reduce potential redundancies in the training survey.

Additional assessment results or demonstrated learning objectives achieved: *None reported.*

Appendix A.1 Pre-Training Survey: Self Assessment Current Engagement Level Data

	Participants													
Competencies	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**Average**
Understanding weather, climate and climate change	2	4	4	2	4	2	3	5	5	5	3	2	1	**3.2**
Understanding climate services	3	2	3	2	5	1	4	5	4	5	3	1	1	**3.0**
Using climate information and data	2	1	3	2	5	1	3	5	5	5	2	1	1	**2.8**
Analyzing climate-sensitive farm management decisions	3	1	2	1	3	1	4	5	4	5	2	1	1	**2.5**
Understanding basics of index-based agricultural insurance	2	1	2	1	1	1	3	3	2	5	2	1	1	**1.9**
Leading a seasonal forecast communication and planning workshop	2	1	2	1	3	1	4	4	3	5	3	1	1	**2.4**
Creating and implementing a plan to integrate climate services into extension activities	2	1	2	1	4	1	4	3	2	5	3	1	1	**2.3**
Mean	**2.3**	**1.6**	**2.6**	**1.4**	**3.6**	**1.1**	**3.6**	**4.3**	**3.6**	**5.0**	**2.6**	**1.1**	**1.0**	**2.6**

Where: 1 = Not at all, 2 = To some extent, 3 = To a moderate extent, 4 = To a great extent, 5 = To a significant extent.

Appendix A.2 Pre-Training Survey: Self Assessment Knowledge Level Data

	Participants													
Competencies	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**Average**
Understanding weather, climate and climate change	3	4	3	3	4	2	3	5	5	5	3	2	3	**3.5**
Understanding climate services	3	3	3	3	5	1	3	5	4	5	3	2	2	**3.2**
Using climate information and data	3	2	4	2	5	1	2	5	5	5	2	2	1	**3.0**
Analyzing climate-sensitive farm management decisions	2	1	3	2	4	1	3	5	5	5	2	2	1	**2.8**
Understanding basics of index-based agricultural insurance	2	1	2	1	2	1	2	3	2	5	1	2	2	**2.0**
Leading a seasonal forecast communication and planning workshop	2	1	2	1	4	1	3	4	3	5	2	1	1	**2.3**
Creating and implementing a plan to integrate climate services into extension activities	1	1	2	1	4	1	3	3	3	5	3	1	1	**2.2**
Mean	**2.3**	**1.9**	**2.7**	**1.9**	**4.0**	**1.1**	**2.7**	**4.3**	**3.9**	**5.0**	**2.3**	**1.7**	**1.6**	**2.7**

Where: 1 = Novice, 2 = Beginner, 3 = Competent, 4 = Proficient, 5 = Expert.

Appendix A.3 Post-Training Survey: Self Assessment Knowledge Level Data

	Participants											
Competencies	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**Average**
Understanding weather, climate and climate change	4	3	5	4	4	3	4	5	5	5	3	**4.1**
Understanding climate services	4	3	5	3	4	3	4	5	4	5	3	**3.9**
Using climate information and data	3	1	5	4	5	3	3	5	4	5	2	**3.6**
Analyzing climate-sensitive farm management decisions	4	1	5	4	4	3	3	4	4	4	3	**3.5**
Understanding basics of index-based agricultural insurance	3	2	4	3	3	2	2	4	3	4	2	**2.9**
Leading a seasonal forecast communication and planning workshop	3	1	4	3	4	3	4	5	4	4	3	**3.5**
Creating and implementing a plan to integrate climate services into extension activities	3	1	4	3	4	3	4	5	3	4	3	**3.4**
Average	**3.4**	**1.7**	**4.6**	**3.4**	**4.0**	**2.9**	**3.4**	**4.7**	**3.9**	**4.4**	**2.7**	**3.6**

Where: 1 = Novice, 2 = Beginner, 3 = Competent, 4 = Proficient, 5 = Expert.

Appendix B. Comparative analysis of self-reported knowledge level within individual participants that participated in both surveys

Participant	Before Average level	After Average Level	Change in trajectory
1	2.3	3.4	*Increase*
2	1.9	1.7	*Decrease*
3	2.7	4.6	*Increase*
4	1.9	3.4	*Increase*
5	4.0	4.0	*No Change*
6	1.1	2.9	*Increase*
7	2.7	3.4	*Increase*
8	4.3	4.7	*Increase*
9	3.9	3.9	*No Change*
10	5.0	4.4	*Decrease*
11	2.3	2.7	*Increase*
Average	**2.9**	**3.6**	***Increase***

Where: 1 = Novice, 2 = Beginner, 3 = Competent, 4 = Proficient, 5 = Expert.

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