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Workshop Report

Introduction to the Climate Data Tool (CDT):

Remote Training with Ethiopian Universities

CGIAR

AICCRA
Accelerating Impacts of CGIAR Climate Research for Africa

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About AICCRA

Accelerating Impacts of CGIAR Climate Research in Africa (AICCRA) is a project that helps deliver a climate-smart African future driven by science and innovation in agriculture. It is led by the Alliance of Bioversity International and CIAT and supported by a grant from the International Development Association (IDA) of the World Bank. Explore AICCRA's work at aiccra.cgiar.org

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Photos: Amanda Grossi

Abstract

A remote six-day training on the Climate Data Tool (CDT) was convened from January 23 to January 30, 2023, with universities across Ethiopia by the International Research Institute for Climate and Society (IRI) of the Columbia Climate School, in close collaboration with the International Livestock Research Institute (ILRI). The workshop, which was organized as part of the World Bank's Accelerating the Impact of CGIAR Climate Research for Africa (AICCRA) project, brought together 27 participants from 9 universities across Ethiopia (and 1 outside of Ethiopia) to install CDT on their operating systems and practice navigating its interface to perform a number of basic analyses and visualizations of climate data at given locations. CDT is a free, open-source, R-based software with an easy-to use graphical user interface used in Ethiopia and 23 other primarily African countries. This software ensures quality-control of rainfall and temperature observations, alongside the performance of an array of analyses and visualization capabilities that are important for tailoring and communicating climate information.

Keywords

Ethiopia; data; climate change; climate variability; capacity development

About the Authors

Amanda Grossi is a Senior Staff Associate at the International Research Institute for Climate and Society (IRI) of the Columbia Climate School. Within the AICCRA project, she is the IRI's Regional Manager for Africa where she coordinates the IRI's activities at the country-level in Ethiopia, Kenya, Zambia, Ghana, Mali, and Senegal. In this role, she provides critical support to the development and delivery of capacity building initiatives and digital innovations, including those associated with the IRI's Enhancing National Climate Services (ENACTS) approach.

Rija Faniriantsoa is a Senior Staff Associate and a Climate Data Tool (CDT) developer and expert at the International Research Institute for Climate and Society (IRI) of the Columbia Climate School.

Berhanu Belay is a Consultant at the International Center for Agricultural Research in the Dry Areas (ICARDA) and AICCRA-Ethiopia. He leads all capacity building efforts related education, including at the university level for integration of climate basics, climate-smart-agriculture, climate risk management, and climate information services, with the AICCRA team in Ethiopia.

Tufa Dinku is a Senior Research Scientist at the International Research Institute for Climate and Society (IRI) of the Columbia Climate School. Within the AICCRA project, he is the IRI's Team Lead for Ethiopia, Kenya, Zambia, Ghana, and Mali and also the lead for the IRI's Enhancing National Climate Services (ENACTS) initiative which has improved the availability, access, and use of climate data and information in more than 20 countries.

Teferi Demissie is a Climate Scientist and Climate Modeler with the AICCRA project at the International Livestock Research Institute (ILRI) in Ethiopia and a Senior Researcher at the Norwegian Research Centre (NORCE). Both for the AICCRA East and Southern Africa region and for Ethiopia, he leads activities on climate information services with a focus on weather and climate forecasting.

Acknowledgements

The Accelerating Impacts of CGIAR Climate Research for Africa (AICCRA) project is supported by a grant from the International Development Association (IDA) of the World Bank. IDA helps the world's poorest countries by providing grants and low to zero-interest loans for projects and programs that boost economic growth, reduce poverty, and improve poor people's lives. IDA is one of the largest sources of assistance for the world's 76 poorest countries, 39 of which are in Africa. Annual IDA commitments have averaged about $21 billion over circa 2017-2020, with approximately 61 percent going to Africa.

Highlights

Strengthening the capacity of users to **access and use quality climate data** is critical for supporting the use of such data in decision-making for climate adaptation.

From January 23-January 30, 2023, a **remote six-day training on the Climate Data Tool (CDT)** was convened with universities across Ethiopia by the International Research Institute for Climate and Society (IRI) of the Columbia Climate School, in close collaboration with the International Livestock Research Institute (ILRI).

A total of **27 participants representing 10 universities** partook in the remote training, successfully installing CDT on their operating systems and practicing navigating its interface to perform a number of basic analyses and visualizations of climate data at given locations.

CDT is a **free, open-source, R-based software** with an easy-to use graphical user interface that ensures quality-control of rainfall and temperature observations, alongside the performance of an array of analyses and visualization capabilities that are important for tailoring and communicating climate information.

The training **aimed to better prepare professors** who participated in the December 2022 training of trainers (ToT) on the Climate Risk Management in Agriculture (CRMA) short course to implement Chapter 2 (Climate Data and Analytics) at their respective universities in March 2023.

The **hands-on, practical, remote training** demonstrated that while CDT was developed for meteorological services in Africa, it is also valuable for an array of other institutions such as universities which would like to support the use of climate data in research.

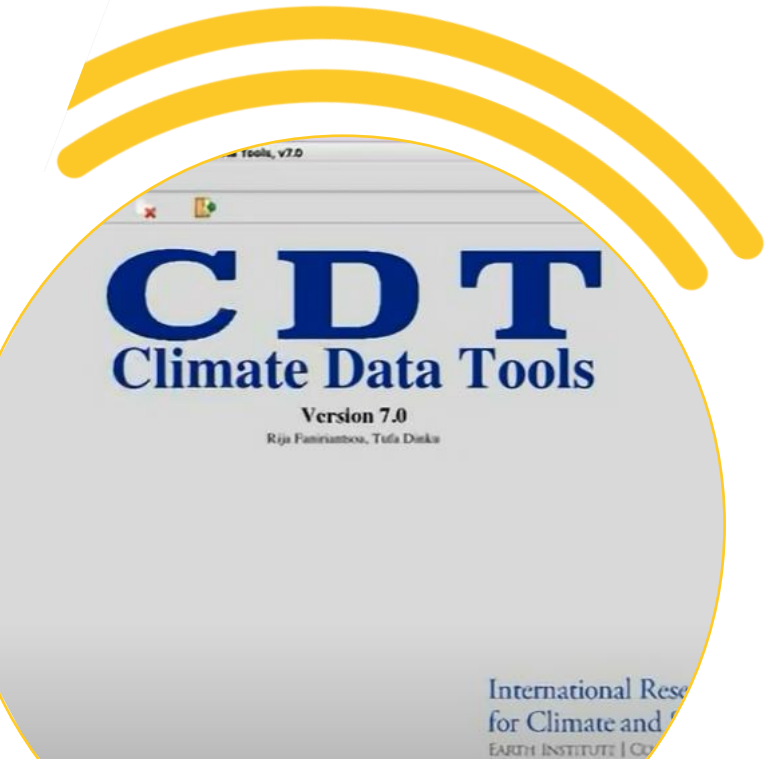
1: Introduction

Climate Data Tool (CDT) is a free, open-source, R-based software with an easy-to use graphical user interface used in Ethiopia and 23 other primarily African countries (Dinku et al., 2022). This software ensures quality-control of rainfall and temperature observations, alongside the performance of an array of analyses and visualization capabilities that are important for tailoring and communicating climate information.

While CDT was developed for meteorological services in Africa, it is also valuable for an array of other institutions including agricultural research institutions such as the Ethiopian Institute of Agricultural Research (EIAR), as well as universities which carry out research to understand linkages between climate and multiple sectors such as that of agriculture.

In this remote, hands-on introductory training from January 23-27, 2023 (15:00 -17:00 East Africa Time each day), professors from 9 Ethiopian universities (and one non-Ethiopian university from South Africa) installed CDT on their operating systems and then practiced navigating its interface to perform a number of basic analyses and visualizations of climate data at given locations.

The training aimed to better prepare professors who participated in the December 2022 training of trainers (ToT) on the Climate Risk Management in Agriculture (CRMA) short course curriculum (Grossi et al., 2022) to implement Chapter 2 (Climate Data and Analytics) at their respective universities in March 2023.



The CDT interface allows users to easily manipulate and perform various analyses of climate data.

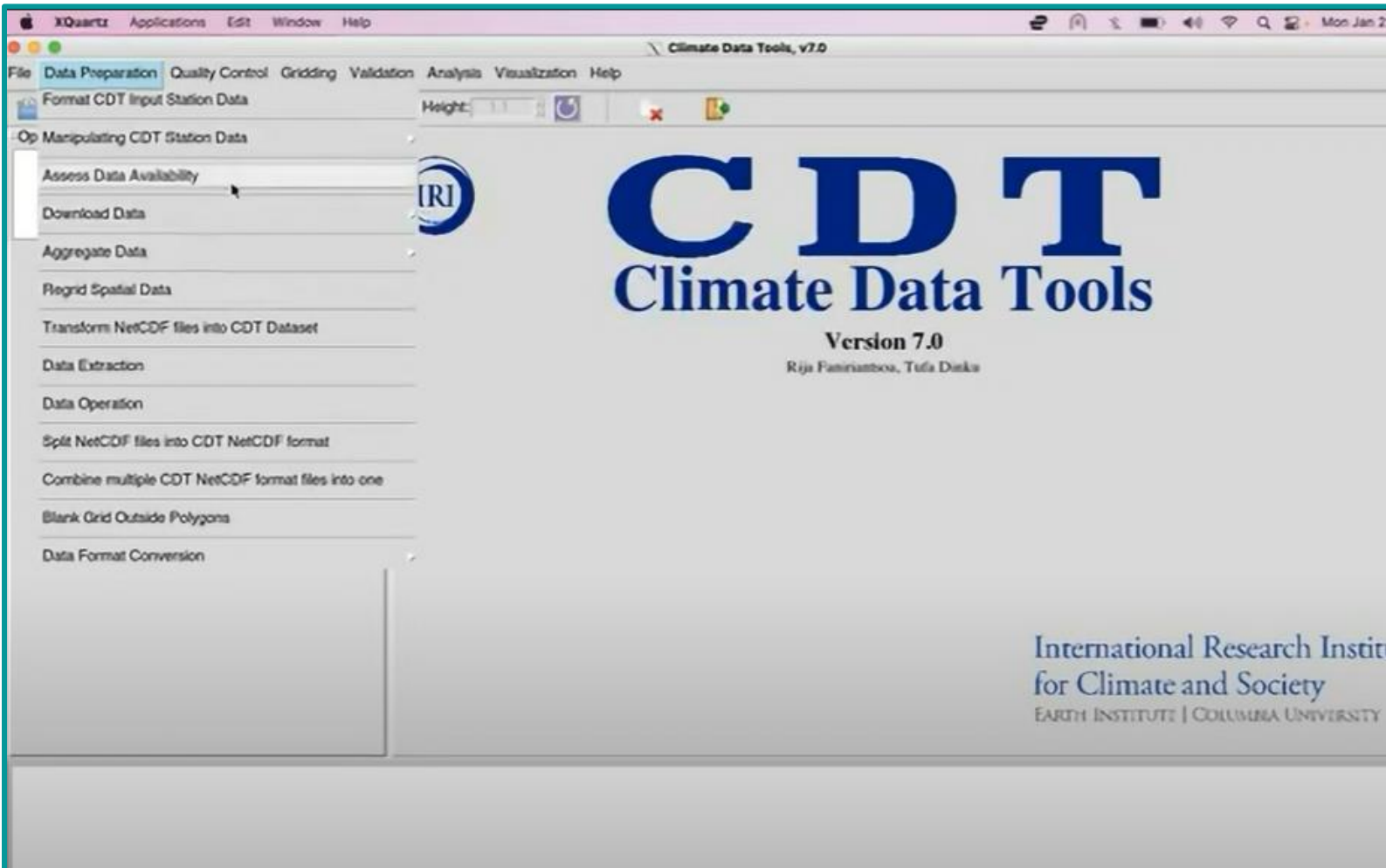
2: Approaches and Methods

Towards its goal of equipping Ethiopian professors, and in turn their students, with skills to analyse and visualize climate data, which can support numerous applications as well as climate research and professional roles in climate-sensitive sectors, the training introduced the various functions of CDT, alongside actual hands-on practice with real climate data to ensure participants' understanding and comfort in using the application.

A full list of participants and their respective universities is available in **Box 1**. A total of 9 Ethiopian universities participated, as well as a non-Ethiopian university (the University of Cape Town in South Africa).

The list of trainers and support staff for the workshop can be found in ***Box 2***, and the full agenda for the workshop can be found in ***Section 6 (Agenda)***.

Rija Faniriantsoa of the IRI walks participants through the various functions of CDT on its interface, from data preparation to quality control, gridding, validation, analysis, and visualization.



3: Key Results and Findings

A total of 27 participants representing 10 universities (9 of which were Ethiopian) partook in the introductory training program on CDT.

During this training, the following **main functions of CDT** were covered:

• Organization of station and proxy data;

• Assessment of data availability;

• Assessment and correction of data quality;

• Merging station observation with proxies;

• Extraction of data from gridded products, including satellite, reanalysis and combined data products, at any point, for a selected box, and for any administrative boundary; and

• Analysis and visualization of station and gridded datasets.

Recordings from the Training

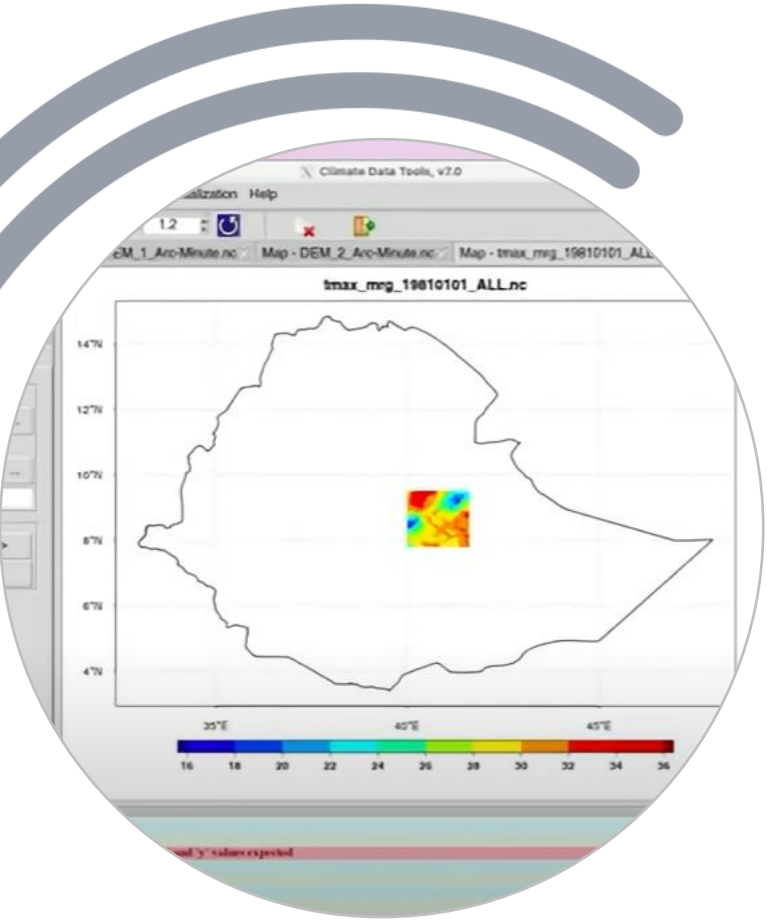
Recordings from all six days of the training were made available to participants for their reference and sharing with their institutions through the following links:

Day 1 (January 23) recording
Day 2 (January 24) recording
Day 3 (January 25) recording
Day 4 (January 26) recording
Day 5 (January 27) recording
Day 6 (January 30) recording

They were also made available in a more permanent location on the shared Google Drive[1] from the December 2022 Climate Risk Management in Agriculture (CRMA) Short Course Training of Trainers (ToT) workshop, which contains all materials the professors need to implement the short course curriculum pilot.

[1]https://drive.google.com/drive/u/0/folders/1wcOUiz2a_McI79nH02xcRrZ--V4O4JDh

4: Conclusions and Recommendations



A screenshot from the training demonstrating some spatial and temporal analyses that can be done for any given location (pixel) in Ethiopia

Several participants noted that the CDT was very practical in supporting the analysis and visualization of climate data and would be useful in supporting their students on climate-related research projects, as well as in their future professional roles in climate-sensitive sectors where understanding of and familiarity with such data analysis techniques may be required or advantageous.

Overall, participants of the remote CDT training appreciated the opportunity to learn more about the interface and practice its use. This training was a demand-driven training unanimously requested by participants of AICCRA-Ethiopia's Climate Risk Management in Agriculture (CRMA) university curriculum training of trainers (ToT) in December 2022, which had participation from 12 Ethiopian universities.

5: List of Participants and Trainers

Box 1: List of Participants

No.	Name	Gender	Organization/ Structure	Discipline	Email
1	Dr. Yohanis Muluneh	M	Debre Berhan University	Climate	joemam21@gmail.com
2	Dr.Yitea Senshaw	M		Agriculture	yiseneshaw@gmail.com
3	Ms. Meskerem Terefe	F		Agricultural Economics	meskiterefe21@gmail.com
4	Dr. Zerihun Demerew	M	Hawassa University	Agriculture	zerkelem@yahoo.com
5	Dr. Mamuye Belihu	M		Climate	mamuyebelihu@gmail.com
6	Dr. Nugussie Bekele	M	Ambo University	Agriculture	niguse_21@yahoo.com
7	Dr. Gudeta Nepir	M		Climate	gudetangt@gmail.com
8	Mr. Chala Hailu	M		Economics	Caalaa2012@gmail.com
9	Mr. Abinet Tadesse	M		Climate	abinetds@gmail.com
10	Dr. Alemu Nega	M	Wolaita University	Agriculture	alemunega531@gmail.com
11	Mr. Desalegn Dargaso	M		Agriculture	desdargaso@gmail.com
12	Dr. Yibekal Alemayehu	M	Haramaya University	Climate	yibekalabebe@gmail.com
13	Mr. Tasisa Temesgen	M		Agriculture	tasisatemesgen@gmail.com
14	Ms. Hanna Samuel	F		Economics	hanna.sami4@gmail.com
15	Abdisa Alemu	M		Agriculture	abdanne12@gmail.com

Box 1 (continued)

No.	Name	Gender	Organization/ Structure	Discipline	Email
16	Mr. Wondwosen Kibre	M	Injibara University	Climate	wondwossonkibrie2009@gmail.com
17	Ms Enetye Gesese	F		Economics	mazimoges@gmail.com
18	Mr. Sintayehu Eshetu	M		Climate	sintayehue9@gmail.com
19	Ms. Shewanesh Abrham	F		Economics	Shewaneshabrham20@gmail.com
20	Dr. Solomon Addis	M	Bahir Dar University	Climate	soladd2000@yahoo.com
21	Mr. Fentahun Mihret	M		Agriculture	fentahunmeheret@gmail.com
22	Hawlet Mohammed	F		Economics	Hawlet.mohammed08@gmail.com
23	Mr. Muluneh Getaneh	M		Disaster Risk Management	bemushe2014@gmail.com
24	Mr. Woyessa Gardew	M	Jimma University	Agriculture	woyessa.garedew@ju.edu.et
25	Mr. Sintayehu Teka	M		Social Sciences	sintayehu.teka@gmail.com
26	Rondrotiana Barimalala	M	University of Cape Town	Unknown	rondrotiana@gmail.com
27	Olbamo Lopiso Yennore	M	Wachemo University	Agriculture	Not available

There were a total of 27 trainees, 5 of whom were women (19%) and 11 of whom were youth (under the age of 35).

Box 2: List of Facilitators

List of Facilitators: Introduction to CDT for Ethiopian Universities (January 23-30, 2023)					
No.	Name	Gender	Organization/ Structure	Position/Title	Email
1	Rija Faniriantsoa	M	IRI	Senior Staff Associate	rija@iri.columbia.edu
2	Amanda Grossi	F	IRI	Senior Staff Associate	amanda@iri.columbia.edu

6: Agenda

The agenda for the Introduction to the Climate Data Tool (CDT) remote training with Ethiopian universities was as follows:

Monday (Jan 23)
• Introduction to CDT • Transforming stations data from different formats to CDT Station Data format • Manipulating CDT Station Data format
Tuesday (Jan 24)
• Downloading Satellite Rainfall Estimates and Reanalysis data • Data visualization with CDT • Converting gridded data to different formats used by CDT • Performing operation with CDT
Wednesday (Jan 25)
• Manipulating gridded data: extraction and conversion • Aggregating time series data (station observation and gridded data) to different temporal resolution • Regrid netCDF data
Thursday (Jan 26)
• Summary statistics • Climatologies and Anomalies • Spatial analysis • Daily rainfall analysis
Friday (Jan 27)
• Rainy season onset and cessation • Rainy season analysis
Monday (January 30)
• Climate Extremes Indices • Drought Indices computation, monitoring and analysis

References

Dinku T, Faniriantsoa R, Islam S, Nsengiyumva G, Grossi A. The Climate Data Tool: Enhancing Climate Services Across Africa. Frontiers in Climate [Internet]. 2022 [cited 2022 Dec 9];3. **Available at:** https://www.frontiersin.org/articles/10.3389/fclim.2021.787519

Grossi A, Dinku T, Hansen J, Belay B, Demissie T, Solomon D, 2022. Training of Trainers (ToT) on the Climate Risk Management in Agriculture (CRMA) University Short Course Curriculum. AICCRA Workshop Report. Accelerating Impacts of CGIAR Climate Research for Africa (AICCRA). **Available at:** https://hdl.handle.net/10568/126912

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