

# Python Climate Predictability Tool (PyCPT) Training for improved Seasonal Climate Prediction over Ethiopia

Jemal Seid | Asaminew Teshome | Teferi Demissie

Workshop Report



**AICCRA**  
Accelerating the Impact of CGIAR  
Climate Research for Africa



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## Workshop Report

Accelerating Impact of CGIAR Climate Research for Africa (AICCRA)

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Jemal Seid  
Asaminew Teshome  
Teferi Demissie



RESEARCH PROGRAM ON  
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**About AICCRA**

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**Contact us**

CCAFS Program Management Unit, Wageningen University & Research, Lumen building, Droevendaalsesteeg 3a, 6708 PB Wageningen, the Netherlands. Email: [ccafs@cgiar.org](mailto:ccafs@cgiar.org)

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# Acknowledgment

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## About the authors

Jemal Seid is a Python Climate Predictability Tool (PyCPT) coordinator at the Ethiopian Institute of Agricultural Research.

Asaminew Teshome is a Senior Meteorologist at the National Meteorological Agency in Ethiopia.

Teferi Demissie is a Scientist on Climate Information and Agro-Advisory at the CGIAR Research Program on Climate Change, Agriculture, and Food Security East Africa.

## Background

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Training on weather forecasting tools and techniques is a fundamental requirement for meteorological services to improve the accuracy and reliability of weather and climate forecasts. These tools greatly support the generation and packaging of forecasts that are destined for private and public consumption.

Ethiopia's National Meteorological Agency (NMA), under the support of the International Research Institute for Climate and Society (IRI), through the project Adapting Agriculture to Climate Today, for Tomorrow (ACToday), is working together with the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) - East Africa (EA) to address the needs and demands of different stakeholders including governmental, non-governmental organizations and other non-state actors by conducting staff training to improve the generation of reliable, timely and accurate weather and seasonal forecasts.

With the support of the IRI and CCAFS - EA, training on the Next Generation (NextGen) seasonal forecasting was given from January 11-15, 2021, to 26 participants from the National Metrological Agency of Ethiopia (NMA). Participants were selected from NMA's Regional Meteorological Service Centers (RMSC's) and NMA head office.

The Next Generation (NextGen) multi-model approach is a general systematic approach for designing, implementing, producing, and verifying objective climate forecasts. It involves identifying decision-relevant variables by stakeholders and analyzing the physical mechanisms, sources of predictability, and suitable candidate predictors (in models and observations) for key relevant variables. When prediction skill is high enough, NextGen helps select the best dynamic models for the region of interest through a process-based evaluation and automizes the generation and verification of tailored multi-model, statistically calibrated predictions at seasonal and sub-seasonal timescales.

## Training Objectives

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The main objective of the training was strengthening the capacity of NMA's staff in the application and use of PyCPT to generate approved and accurate seasonal forecasts.

The specific objectives include:

- strengthening the capacity of meteorologists at both regional and head offices of NMA;
- enhanced packaging of weather forecasts using flexible information by improving the packaging of seasonal forecasts using flexible format information; and
- enabling NMA staff to access the predictability skill of the North American Multi-Model Ensemble over Ethiopia in different seasons.

## Training Tools and Modules

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- Processing of dynamical forecasts using the Python Climate Predictability Tool (PyCPT) package. Including:
  - Introduction to CPT, the software operation and the purpose of calibration;
  - Downscaling of model outputs using Canonical Correlation Analysis (CCA);
- Tailored forecasting for climate services;
  - Skill assessment of each real-time North American Multi-Model Ensemble (NMME) model, which includes (CMC1-CanCM3, CMC2-CanCM4, NCEP-CFSv2, COLA-RSMAS-CCSM4, GFDL-CM2p1-aer04, GFDL-CM2p5-FLOR-A06, GFDL-CM2p5-FLOR-B01, NASA-GEOSS2S);

- Compare Principal Component Regression (PCR) and CCA with respect to non-calibrated model;
- Flexible representation of forecast;
- Real-time forecast script; and
- Use PyCPT for all the above.
- Data formatting and analysis packages like grads and climate data operator tool /CDO/



Proceedings during the PyCPT training workshop

## Training Outcomes

At the end of the workshop, participants had underpinned understanding of the principles of generating tailored forecasts for climate services and the development of skills to independently install and operate PyCPT to calibrate CHRIPS forecasts and apply seasonal forecasting procedures and techniques by using the PyCPT tool. In general, the participants were able to:

- Independently, Install and operate PyCPT to calibrate CHRIPS forecasts
- Understand the principles of generating tailored forecasts for climate services
- Understand seasonal forecasting procedures and techniques by using the PyCPT tool.
- Understand the whole process of the PyCPT scripts
- Experience sharing of within their staff members regarding PyCPT tool

## Training Schedule – January 11-15, 2021

Day 1	
Activity	Speaker / facilitator
<ul style="list-style-type: none"> <li>Opening remarks</li> </ul>	Fetene Teshome
<ul style="list-style-type: none"> <li>Ongoing seasonal forecasting projects in the region including PyCPT</li> </ul>	Teferi Demissie
<ul style="list-style-type: none"> <li>System configuration and installation of PyCPT on individual laptops</li> </ul>	Jemal Seid, Asaminew Teshome, Aderajow Admasu, Sinegiorgis Gurmu, Bekele Kebede
<ul style="list-style-type: none"> <li>Introduction to to PyCPT tool</li> </ul>	Jemal Seid, Asaminew Teshome, Aderajow Admasu
Day 2	
Practical PyCPT session <ul style="list-style-type: none"> <li>Describing the different components of PyCPT script</li> <li>Generating forecast and skill assessment of PyCPT product</li> </ul>	Asaminew Teshome, Aderajow Admassu, Jemal Seid
Day 3	
Practical PyCPT session <ul style="list-style-type: none"> <li>Visualisation and interpretation of products and skill assessments using the tool</li> </ul>	Asaminew Teshome, Aderajow Admassu, Jemal Seid
Day 4	
Individual assignment/ exercise and production of results	Asaminew Teshome, Aderajow Admassu, Jemal Seid
Day 5	
Presentation of results for individual assignment/ exercise	Individual participants from regional meteorological service centers and national meteorology agency

## Annex 1: List of Participants

	Name of facilitator	Organization
1	Endeg Aniley	Western Amahara Regional Meteorological Service Center – Bahir Dar
2	Hiwot Taye	Western Oromia Regional Meteorological Service Center – Jimma
3	Lubaba Mohamed	Eastern Amhara Regional Meteorological Service Center – Kombolcha
4	Shimlis Shiferaw	Gambela Regional Meteorological Service Center - Gambela
5	Zerihun Bikila	Eastern and Central Oromia Regional Meteorological Service Center – Adama
6	Gebreyohanes G/Silasie	Afar Regional Meteorological Service Center – Semera
7	Kefiyalew Ayele	SNNPR Regional Meteorological Service Center – Hawasa
8	Ashenafi Muluneh	Somali Regional Meteorological Service Center – Jijiga
9	Demissie Tadesse	Sothern Oromia Regional Meteorological Service Center – Bale Robe
10	Sinegorgis Gurmu	National Meteorology Agency – Information Communication Technology
11	Bekele Kebebe	National Meteorology Agency - Meteorological Forecast and Early Warning Directorate
12	Mesay Tolosa	National Meteorology Agency - Meteorological Forecast and Early Warning Directorate
13	Bekalu Tamene	National Meteorology Agency - Meteorological Forecast and Early Warning Directorate
14	Henock Hailu	National Meteorology Agency -Regional Meteorological Service Center Directorate
15	Tamiru Kebede	National Meteorology Agency - Meteorological Forecast and Early Warning Directorate
16	Ajebush Gochawu	National Meteorology Agency - Meteorological Forecast and Early Warning Directorate
17	Deriba Muleta	National Meteorology Agency – Meteorological EDT Directorate
18	Chali Debele	National Meteorology Agency - Meteorological Forecast and Early Warning Directorate
19	Asaminew Teshome	Python Climate Predictability Tool (PyCPT) Coordinator
20	Jemal Seid	Python Climate Predictability Tool (PyCPT) Coordinator
21	Aderajow Admasu	Python Climate Predictability Tool (PyCPT) Coordinator
22	Teferi Demisse	Python Climate Predictability Tool (PyCPT) Coordinator
23	Fetene Teshome	Director-General of National Meteorology Agency
24	Kinfe Hailemariyam	Deputy Director-General of National Meteorology Agency
25	Ahmedin Abdulkerim	National Meteorology Agency – Public Relations
26	Hirut Alemu	National Meteorology Agency – Public Relations





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**The CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) brings together some of the world's best researchers in agricultural science, development research, climate science and Earth system science, to identify and address the most important interactions, synergies and tradeoffs between climate change, agriculture and food security. For more information, visit us at <https://ccafs.cgiar.org/>.**

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