NSF PIRE
Food & Water Security
2022 Celebration

Innovation Partnership Building – University of Connecticut

May 16 – 17, 2022

We would like to acknowledge that the land on which we gather is the territory of the Mohegan, Mashantucket Pequot, Eastern Pequot, Schaghticoke, Golden Hill Paugussett, Nipmuc, and Lenape Peoples, who have stewarded this land throughout the generations. We thank them for their strength and resilience in protecting this land, and aspire to uphold our responsibilities according to their example.

THE UNIVERSITY of WISCONSIN MADISON

Overview

PROJECT GOALS

MILESTONES

PROFESSIONAL DEVELOPMENT FOR STUDENTS

INTERDISCIPLINARY RESEARCH COLLABORATION

IMPACT

REMAINING WORK

Project Goals

This project establishes an international research and education partnership to promote a political-institutional model of science that links **sociological and engineering methods** in a people-centered approach to the human-climate-water-agriculture-energy nexus in the Blue Nile basin (BNB), Ethiopia. Our objectives are to:

(i) improve seasonal hydrologic and crop yield forecasts at scales relevant to farmers and water managers;

(ii) identify and reduce barriers to effective forecast communication and uptake;

(iii) train a new generation of global experts who recognize the political-institutional and climate-ecological dimensions of complex food-energy-water problems

Engineering Milestones

Statistical forecasts and resevoir operation

Dynamic seasonal forecasts

Watershed model implementation

Groundwater model Implementation

Crop yield model

Economic modeling

Social Science Milestones

Forecast communication

Qualitative Data

Household surveys

Agent based model (ABM)

Data sharing application (E-Ping App)

Citizen Science Iniative

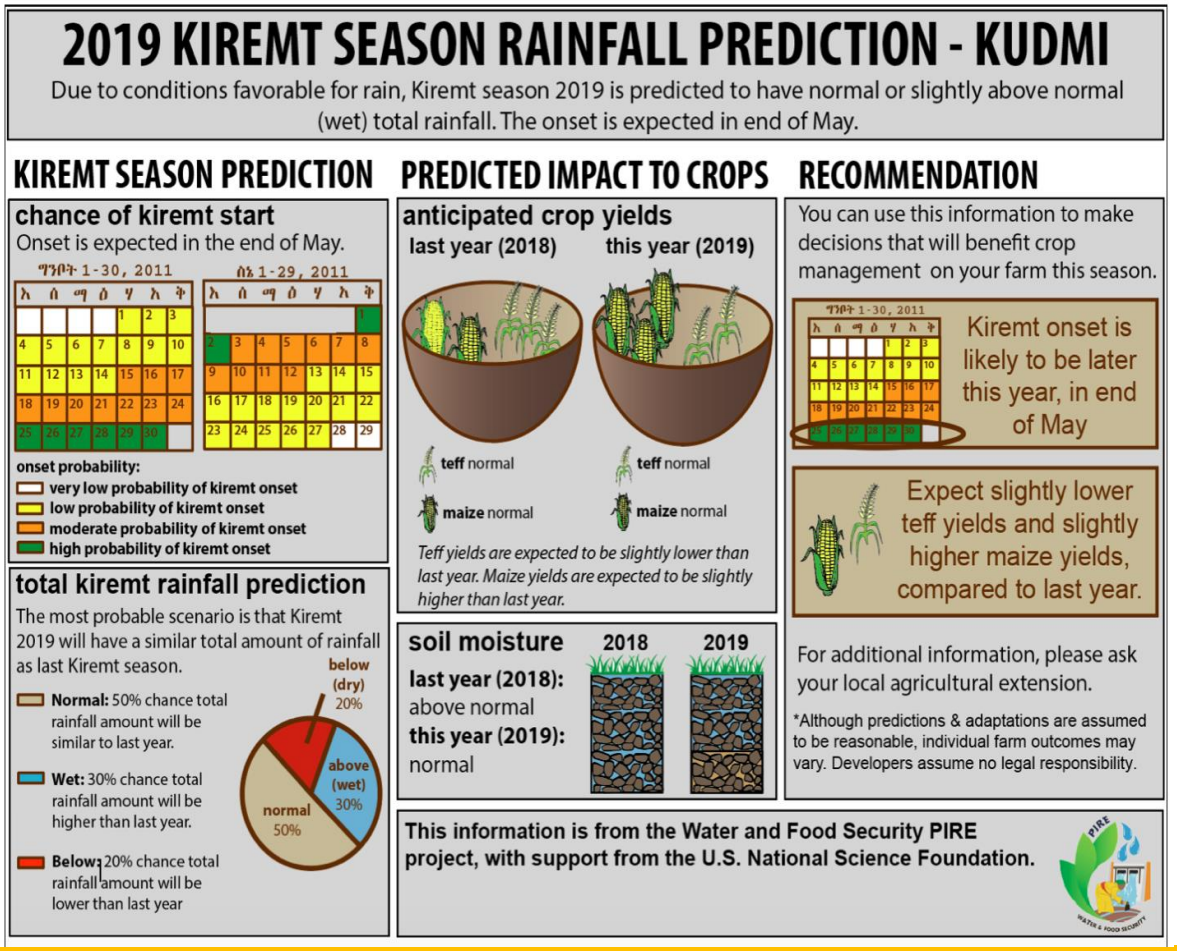
Professional Development for Students

- Undergraduate research and cross disciplinary training for students
- Conference and workshop presentations
- Brownbag series between undergraduate and graduates & sociology and engineering students
- 3 Internships at IFPRI for UW - Madison & UConn students

Interdisciplinary Research Collaborations

- Probabilistic information games (UConn, University of Wisconsin & Addis Ababa University: BAMS)
- Household surveys & model simulated irrigation and soil moisture estimates
- Combining agent-based and crop productivity models to study farmer's management decisions
- Evaluating the citizen science process and output as contributing to the Sustainable Development Goals
- New partnership with Ethiopian research at IFPRI

Project Goals Revisited



(i) improve seasonal hydrologic and crop yield forecasts at scales relevant to farmers and water managers;

Five forecasts produced (two wet & three dry season)

Onset of rains prediction

Project Goals Revisited

"We have specifically talked about this when you were here." –Chair, Water Users Association, Gayta, June 17 2021

(ii) identify and reduce barriers to effective forecast communication and uptake;

The case of the Kiremt 2020 and the November dry spell

- **Gayta prepared**, November dry spell did not disrupt irrigation
- Koga/Kudmi did not prepare, water released not adequate; farmers stole water, and several were detained and arrested

Project Goals Revisited

(iii) **train a new generation of global experts who recognize the political-institutional and climate-ecological dimensions of complex food-energy-water problems**

- US institutions
  - 11 PhD degrees awarded/to-be awarded
  - 1 master degree awarded
  - 2 undergraduate research studies
  - 9 graduate students and 8 undergraduate students at Field Visit
  - Developed an interdisciplinary water-energy-food graduate course
- Ethiopia
  - 6 Ethiopian Graduate Students
  - 9 Ethiopian citizen science high school students

27 publications, 6 *in review*, 9 in preparation

Remaining Work

- Conduct policy workshop (Ethiopia(?)/**Washington D.C.**) in Fall 2022
- Citizen science E-PING training
- Continue citizen science data collection through the end of the project
- Explore ways to sustain forecast and data collection system going forward

Impact *Science*

Developed new ways to understand human security and complex decision-making under uncertainty through the combination of hydro-climatic and social scientific research

Improved aspects of forecast communication with innovative and hyper-local methods of delivery.

Improved the ways that hydrologists/scientists have engaged in developing forecasts, and the ways water managers and farmers have received the information, with a special emphasis on probabilistic thinking.

Provided seasonal prediction on water levels and soil moisture at local scales through a combination of high-resolution sectoral models (seasonal atmospheric forecast, hydrologic model, lake water balance model, groundwater model, and crop yield model); demonstrated how these models can be used to support irrigation management.

Impact
Stakeholders

Developed new soil **moisture** sensors & established in situ observation network in BNB

Building capacity for US institutions to conduct interdisciplinary-international research

Developed interdisciplinary course on water-food nexus that can be offered in future years

Impact *Ethiopian Institutions*

Increased technical capacity, namely, receiving **training & equipment** for hydrological data monitoring

At the end **of project they will receive tech transfer on how to sustain forecasting system in Ethiopia**

Congrats!

Kudos to the team for truly being able to come together from different disciplines, backgrounds and countries to innovate approaches towards food and water security issues in climatic vulnerable remote regions in Sub-Saharan Africa.