Team helps African scientists to use remote sensing and climate data to predict poor harvests and prevent severe

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In the aftermath of an intense El Nino-induced drought, people gather around an Oxfam provided water tank in Hariso, Ethiopia. Credit: Oxfam International

In 1984, drought conditions in Ethiopia led to the country's worst famine

in 100 years. The picture was even more dire last year, but food aid from the international community staved off a full-blown crisis.

With 10 million Ethiopians still hovering on the edge of starvation, is it possible to predict food deficits while there is still time to mitigate them?

Geographers with the UC Santa Barbara/U.S. Geological Survey's Climate Hazards Group (CHG) will soon be able to answer that question, thanks to a new three-year NASA SERVIR award. SERVIR (the name is derived from the Spanish word meaning "to serve") is a joint venture between NASA and the U.S. Agency for International Development, which provides state-of-the-art, satellite-based Earth monitoring data, geospatial information and tools to help improve environmental decision-making among developing nations in eastern and southern Africa.

"We want to help African scientists and their colleagues in using to their advantage both remote sensing tools and the data sets and analysis we provide digitally," explained CHG Research Director Chris Funk. "That way, when conditions point to a poor harvest, they can prepare by sharing the information with local decision-makers and reduce the impact of climate-related disasters such as famine."

Since 2003, the CHG has taken a climate science-based approach to determining where and when food insecurity will occur, where food shortages will affect the lives of large numbers of people in the coming months and how anthropogenic climate change will impact food production in future decades.

CHG scientists have developed rainfall and other models that reliably predict crop performance in parts of the world vulnerable to crop failure. Policymakers within governments and at nongovernmental organizations rely on CHG decision-support products for making critical resource

allocation decisions.

Using data sets with a 30-year history, CHG researchers endeavor to rewind the clock to see how far back they can go and still provide useful early indicators of such events. For example, data showing that rainfalls began a month late would indicate some percentage reduction of food. Rather than waiting for harvest to assess the need for assistance, it could be known months in advance that food aid relief would be needed.

"If we know we can predict a shortfall at the time of onset rather than at harvest, that gives an extra four months of advanced warning to start positioning relief and make sure it's going out to the right people," said principal investigator Greg Husak, a member of UCSB's CHG. "We can look at the balance between rainfall versus water demand and figure what the deficit is and how it compares to previous years. We get that in a spatially explicit way where we can really start highlighting the regions that are facing dire conditions."

Going forward, the CHG is working on a new temperature dataset similar to its rainfall data set. Temperature is an important factor because when it increases, so does water demand for agriculture. Monitoring both components gives planners a more robust picture of local plant production. Another new dataset is evapotranspiration, which—in addition to temperature—also considers wind, incoming radiation and relative humidity.

"A key component of this newly funded project will be to build technical capacity at the Regional Center for Mapping of Resources for Development (RCMRD) in Nairobi," Husak said. "Then decision-makers can get their information from the region rather than from the U.S. For example, we're going to help RCMRD build web-based data viewers and expose them to a variety of other available tools."

Through enhanced capacity, the hub will improve environmental management and resilience to climate change by strengthening the ability of governments to integrate Earth observation information and geospatial technologies into development decision-making.

Additional UCSB CHG members working on the NASA SERVIR project include principal investigator Shraddhanand Shukla, scientific programmers Greg Ederer and Pete Peterson and graduate student researcher Sari Blakeley.

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