



Columbia World Projects

ADAPTING AGRICULTURE TO CLIMATE TODAY, FOR TOMORROW

*2021 Highlights from the ACToday
Columbia World Project*

COLUMBIA CLIMATE SCHOOL
INTERNATIONAL RESEARCH INSTITUTE
FOR CLIMATE AND SOCIETY



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*Using climate knowledge
to improve food security
and combat hunger*

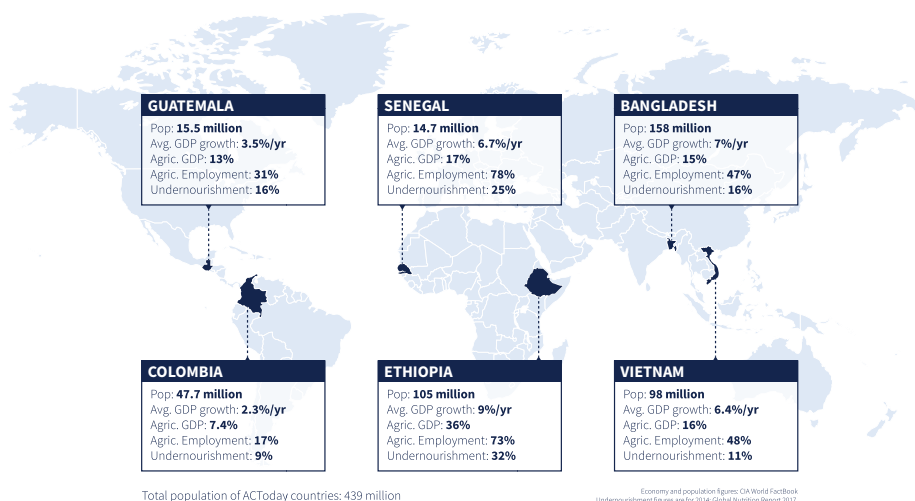
Introduction

March 2022

I write this letter having spent most of the end of last year moderating, participating in or watching dozens of events related to Climate Week, the Food Systems Summit and the United Nations Climate Change Conference, COP26. Of all the concerns that the climate crisis poses for humanity, one issue kept rising to the top: food security. The question of how to keep people well-fed so that they are healthy, able to earn a living, go to school and raise their families – no matter what the climate brings – is clearly front and center for many development institutions, governments and national leaders.

This is why the work of the Columbia World Project Adapting Agriculture to Climate Today, for Tomorrow (ACToday) is so valuable. Since 2017, ACToday has been actively working in Bangladesh, Colombia, Ethiopia, Guatemala, Senegal and Vietnam. In that time, we've not only worked to create innovative climate information, methods and

tools tailored for agriculture, but we've also helped decision makers understand how to use these products to ensure safe and stable supplies of food.



The six ACToday countries.

Global challenges such as food security require the scientific community to stop working in silos and create meaningful partnerships outside academia. At the International Research Institute for Climate and Soci-

ety (IRI), we've embodied this thinking as part of our mission since our founding 25 years ago. It is aligned with what Columbia University President Lee C. Bollinger calls the "Fourth Purpose" of universities, using university research to advance human welfare. Achieving the Fourth Purpose is also a central part of the mission of the newly established Columbia Climate School, of which IRI is now a part, and at the core of Columbia World Projects' work.

**ACToday's activities
advance four strategies to
meet the project's goal:**

Increase food production

Mitigate the impact of
climate shocks

Inform national strategic
planning and policies

Advance knowledge of the
connections between climate
and food systems

The work we've pioneered through four years of ACToday is taking hold on a global scale. Large development institutions such as the World Bank and World Food Programme are increasingly employing our approach as part of their climate and food security projects.

This comes directly out of our experiences and successes from ACToday and because of the strategic support we have received from Columbia World Projects. IRI is a key partner in a new \$60 million climate resilience project for agriculture in Africa, funded by the World Bank and led by CGIAR, one of our most important and strategic partners. We will be playing an important role in defining and developing climate services activities for the new project.

The updates included in this 2021 report highlight some of the pathways we've created to ensure ACToday's efforts and investments continue to serve the health and well-being of the people in all of the countries where the project is active for many years to come.



Walter Baethgen

International Research Institute for Climate and Society
Project Lead of ACToday



REMEMBERING LISA GODDARD

The ACToday project could not have been possible without the leadership and expertise of Lisa Goddard, who served as IRI's director from 2012-2020, and as a co-lead on ACToday. Lisa passed away in January of 2022.

Even though Lisa could not co-lead ACToday in its final year, every aspect of this project bears the mark of her intelligence, her dedication, and her passion to make sure that advances in climate science benefit the world's most climate-vulnerable communities.



“Based on a forecast announcing a good rainy season, I increased the 2020-2021 budget from 40 billion CFA francs to 60 billion to purchase agricultural goods.”

-Macky Sall, President of Senegal

This investment in agriculture led to a record harvest and no food imports last year for Senegal, a country that at times has had to import up to 50% of its food needs. The forecast President Sall refers to was produced by the country’s national meteorological agency using ACToday-supported tools and trainings.

What are Climate Services?

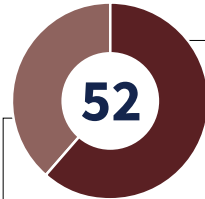
‘Climate services’ is a term used for the tools, products and activities that help translate climate science and climate information to non-scientists. Examples include seasonal climate forecasts, early-warning maps for flooding, drought monitoring tools, and financial mechanisms such as index insurance that can protect against certain climate risks.

*A climate service encapsulates not only the **development** of such tools but also the **processes** put in place to ensure these tools are understandable and useable by decision makers and policy makers in their efforts to manage climate-related risks.*

ACTODAY AT-A-GLANCE

Some of the project's key accomplishments in 2021

Trainings and Workshops



32 trainings and workshops on the use and implementation of climate services

20 technical trainings on forecasting, data management and other topics for national meteorological agencies and other government institutions



1,633

Participants in ACToday trainings. They include staff from government agencies and ministries, development institutions, nonprofits, the private sector and universities.

Institutionalization of climate data products and tools

All six project countries have installed our data management and analysis engine known as the Data Library, enabling them to access and work with hundreds of global and national climate-related data sets on one platform.



18



New custom online mapping and data visualization tools for staff working in agriculture, public health and disaster management agencies

3



New monitoring and early-warning systems for food security and nutrition

2



New decision-support platforms for crop yield predictions based on soil type, crop variety, anticipated rainfall and temperatures and other parameters

Outreach



43

Research publications, including peer-reviewed papers, manuscripts and white papers



16

Events in all six countries, plus others in the Latin American and Caribbean region, reaching more than 880 attendees



17

Conference posters and presentations



15

Master's degree students working on ACToday to strengthen climate services knowledge and implementation now and into the future

**WATCH THE ONLINE SHOWCASE
EVENT WE HOSTED FOR
CLIMATE WEEK 2021:
bit.ly/actoday_video_21**





BUILDING A GLOBAL COMMUNITY OF CLIMATE-TRAINED DECISION MAKERS

One of the key objectives of ACToday is to strengthen the capacity of local governments and stakeholders to effectively interpret and use climate data to inform policy and planning. In the last year, the project’s six country teams conducted 52 trainings for more than 1,600 government, private-sector and nonprofit professionals as well as graduate students.

The subject matter covered in these trainings has spanned the range of information that professionals need to truly understand and integrate climate knowledge into food planning and policy: climate-science basics, advanced forecasting methodologies, using mapping tools for piloting and planning agriculture projects, and more. The graphic on the next page gives a snapshot of some of the participants in ACToday-supported trainings.

The number and scale of ACToday’s trainings are noteworthy—especially considering the efforts needed to develop course materials and teaching modules for both online and hybrid environments during a global pandemic—but it’s ACToday’s approach to training that deserves special attention.

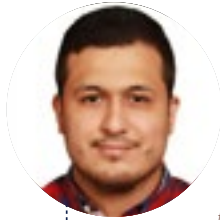
“We’re mindful that all projects eventually come to an end,” said ACToday’s training lead, Ashley Curtis. “And so we’ve framed our trainings around three principles to ensure what we hope will be a sustained impact.”

The first principle is to work with academic partners to integrate climate services curricula directly into existing graduate programs, as ACToday has done at Independent University, Bangladesh, Senegal’s Cheikh Anta Diop University, and Ethiopia’s Bahir Dar University, along with three other universities in Ethiopia. In this way, the next generation of leaders come out with a solid understanding of the connections between climate and food security.

The second principle is to develop training courses that meet the immediate professional needs of decision makers who work at climate, agriculture and humanitarian institutions inside and outside of government. The knowledge about climate science, forecasting, insurance design and other topics that these decision makers receive through these courses are quickly incorporated into day-to-day operations.

The third principle is to foster connections and working relationships among the critical stakeholders and partners needed to adequately address climate threats to a country’s food systems. These include national meteorological agencies, ministries of agriculture, research institutions and development agencies.

“By the end of ACToday, we will have trained a professional cohort of thousands who work at all levels of government and within every part of the climate services landscape,” said Curtis. “These are the experts who will continue the work of helping ensure their countries have safe, nutritious and stable supplies of food despite what climate conditions may bring.”



"We acquired knowledge ranging from basic climate concepts to methodologies for better decision making in agriculture, taking into account climatic risks. It is very important that we are all on the same page regarding the analysis and interpretation of climate data for correct decision making with the farmers of the region."

Bernardo Andrés Díaz Espina
Assistant in Resilience and Climate Change, World Food Programme



"The collaboration that we have with ACToday has greatly contributed to the capacity building on climate and nutrition of our institute through our exchanges and the training of our students. ACToday's workshops are giving them a solid foundation on which to build their future research and professional aspirations."

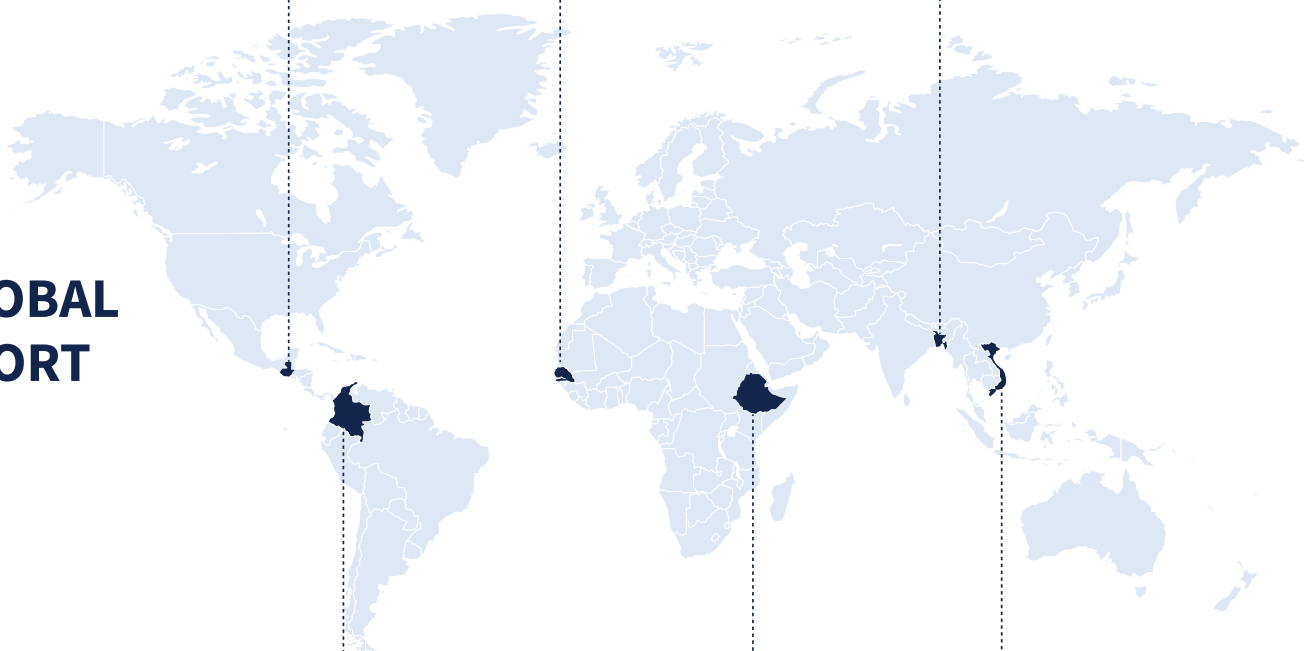
Adama Diouf
Professor and Master's Coordinator, Human Food and Nutrition Research Laboratory, Cheikh Anta Diop University



"The insurance trainings gave us the confidence to decide when and how to go for index-based insurance and, more importantly, when not to! The training cohort and advisory group brought together most insurance stakeholders, which helped us get closer as practitioners and created an avenue to continue working closely to innovate and also scale up insurance solutions together."

Enamul Mazid Khan Siddique
Interim Country Director & Head of Climate Justice, Oxfam in Bangladesh

A GLOBAL COHORT



"The trainings enabled Cenicafé to combine coffee crop criteria with ACToday's NextGen climate models to develop a prediction system that is better tailored to the needs of our coffee growers."

Ninibeth Gibelli Sarmiento Herrera,
Assistant Researcher, Cenicafé
(Colombia's National Coffee Research Center)



"Analysis of historical climatology and seasonal trends, made possible through the ACToday project and its curricular materials, will enhance the ability of our communities to access and use the kinds of robust information needed to improve farming practices and advance resilient agricultural management systems."

Girma Kibret
Climate Smart Agriculture Specialist,
Ethiopian Ministry of Agriculture



"The training helped me understand the working principles of agricultural index insurance and be better able to help design insurance based on an appropriate index to maximize farmer participation. I look forward to incorporating what I learned to help increase farmers' literacy on insurance and encourage their participation to protect themselves from the risks posed by climate change."

Đoàn Ngọc Phà
Deputy Director of Project Management,
Vietnam Sustainable Agriculture Transformation



CROWDSOURCING TO BUILD BETTER INSURANCE

What is Index Insurance?

Index insurance is an innovative, affordable type of insurance based on an index of weather, such as rainfall measured by satellites or by a local weather station. If the amount of rainfall during critical stages of a crop's growth cycle doesn't reach a pre-specified threshold, farmers who purchased the insurance automatically get compensated without having to file any claims. This innovation has significantly lowered the transaction costs and risks for insurance companies, enabling them to keep premiums low and enabling millions of farmers access to coverage previously unavailable to them.

During times of drought, insurance helps farmers and their families keep food on the table. In non-drought years, insurance coverage helps farmers feel safe to take out loans to buy fertilizer and other inputs that can significantly increase their yields and income.

ACToday's work with country partners to develop sophisticated forecasting systems and new climate services tailored for agriculture has also enabled the World Bank and World Food Programme to significantly scale their provision of affordable index insurance to more than a million farmers in multiple countries.

In order to offer protective insurance to even greater numbers of smallholder farmers, in 2021 ACToday began testing mobile crowdsourcing apps that tap into the experiences and memories of farmers themselves.

"We know from our decades of work that index insurance programs can't scale up successfully if they don't include farmers in the design process," said Daniel Osgood, who leads ACToday's work on insurance.

Farmers help improve the index that underlies the insurance they're buying. If a poorly designed index doesn't capture the reality on the ground accurately enough, farmers may not get insurance payouts when they deserve to. Not only would this cause unnecessary hardship, it also damages the credibility of the insurance program.

"We ask farmers what they've experienced in past years and what they're experiencing in the current season, and see how that matches with the climate data we have from weather stations, satellites and forecasts," said Osgood.

"If they're in agreement, we know we can safely use our insurance models to help farmers in times of drought. If they don't agree, we work to figure out why and solve that problem if we can."

Ultimately, this process leads to a more reliable index, which leads to more trust and community buy-in for the insurance.

ACToday's insurance team knew that obtaining information from tens of thousands of farmers in the six project countries could never be done through traditional in-person community visits, even in the absence of a global pandemic.

As a result, they developed a phone-based game to do it instead, and conducted a pilot run in 2021 with around 200 Colombian coffee farmers. The participating farmers were asked questions such as [translated

from Spanish]:

“Guess which year was worse, according to most of your neighbors and satellite and rain gauge datasets: [Year 1] or [Year 2]?”

Once they picked, the game would then tell them the answer, and then ask the same question for a different pair of years. The game is designed in such a way that farmers can learn which years were the worst according to official records, and the researchers learned which years showed significant disagreements between farmers and historical records.

While the results won’t be fully analyzed until later in 2022, preliminary indications are very encouraging. For example, the game was shared widely among the farmers, who played an average of 200 rounds (comparing 200 pairs of years) over the four days the pilot lasted. The team is expanding the game into Guatemala and other ACToday countries in 2022.

The phone game is part of a suite of new ACToday crowdsourcing technologies that have been successfully piloted recently around the world for projects that reach millions of people.

“The exciting thing is that this kind of bottom-up approach has never worked before at a massive scale, Osgood said. “We’ve never had a framework that would allow millions of local people to drive decision making on a project designed to benefit them—and it’s still completely based on science. It’s like artificial intelligence, but it’s actually human intelligence or community intelligence.”

“We’ve never had a framework that would allow millions of local people to drive decision making on a project designed to benefit them—and it’s still completely based on science.”

- Daniel Osgood, IRI



Coffee farmers in southwestern Colombia play iKON, a phone-based game that’s designed to help create better insurance products for the region. Courtesy of Tecnicafe and Caficauca, November 2021.



Climate, Nutrition and Women's Empowerment

ACToday and its partners see the development of climate services for nutrition as a critical pathway to empowering women to manage climate risk in their own lives and that of their families. Women are responsible for the bulk of agricultural labor, they play a central role in children's health and are the key to stopping the intergenerational cycle of malnutrition that plagues many rural communities around the world. Yet women are one of the groups with the least access to climate services in Senegal and many other countries.

Integrating the voices and needs of women in the creation of new climate services will have positive effects on human health and well-being in rural households.

THE CLIMATE-NUTRITION CONNECTION IN FOOD SECURITY

In 2021, ACToday's Senegal team formalized a partnership with the Human Food and Nutrition Research Laboratory at Cheikh Anta Diop University – Senegal's most prestigious higher education institution and home to the country's largest graduate training programs. The partnership aims to address one of the most under-researched topics in development – the links between climate and nutrition.

“We're seeing a growing concern in the agricultural development and humanitarian communities that ignoring the nutritional aspects of food security can have long-term consequences on people's health, which in turn can impact their future livelihoods,” said James Hansen, the ACToday country lead for Senegal.

The issue is particularly salient for West Africa, which already has one of the highest rates of malnutrition in the world. Climate change could make the nutritional situation worse for the region, and not just by decreasing crop and livestock productivity and eroding agricultural incomes that rural communities need to purchase diverse, nutrient-rich foods. It could also lead to more frequent flooding and heavy rainfall events that cause outbreaks of diarrheal diseases, which affect the body's capacity to absorb nutrients.

In early 2021, ACToday, Cheikh Anta Diop University and Senegal's national meteorological service, the Agence Nationale de l'Aviation Civile et de la Météorologie (ANACIM), organized a three-hour webinar for the academic, policy, climate and nutrition communities to launch discussions about connections between climate and nutrition.

“We wanted participants to explore the fundamentals of climate and climate-nutrition pathways on a conceptual level, as well as allow Senegal's meteorological service to present examples of existing climate tools that could



A girl traverses her family's dry peanut field in Kaolack, Senegal. Increasingly frequent and severe droughts threaten not only the food security but the nutrition of women and girls in Senegal. Amanda Grossi/IRI

“We cannot overstate the convening power of ACToday.”

- Amanda Grossi, IRI

be tailored for the nutrition community,” said Amanda Grossi, ACToday Senegal’s country manager. The webinar’s success exceeded everyone’s expectations, Grossi said.

“More than 110 attended, and not just from Senegal but from across West Africa. This was clearly a conversation people were waiting to have, and it highlighted a demand for including nutritional outcomes when discussing climate impacts on food security.”

Informed by the webinar discussions, ACToday and Cheikh Anta Diop University quickly produced a six-module, 15-hour ‘short course’, which they piloted with 15 graduate students. The course was designed to provide foundational knowledge on climate and climate-nutrition pathways, as well as an overview of existing tools and resources that can be used to both analyze climate risks and support nutrition interventions.

The two partners also identified a number of opportunities for students to work with Columbia’s Center for Climate Systems Research and the Rutgers School of Public Health on potential master’s thesis topics related to climate and nutrition. This research is now underway at both universities.

Building on this momentum, in November 2021, ACToday Senegal organized a first-of-its-kind workshop with the national meteorological service, Cheikh Anta Diop University and the National Council for Nutrition Development – the governing body responsible for all nutrition interventions in Senegal – to develop climate services specifically tailored to the nutrition community. The workshop’s participants came from a broad range of academic, government, UN and nonprofit organizations working in nutrition. They identified a number of priority areas where relevant climate information could improve nutrition. One was to use forecasts to predict off-season rains and prevent post-harvest loss due to aflatoxin – toxic substances produced by fungus that thrives in warm and humid conditions that devastate harvests across Africa. Another was to develop seasonal forecasts and monitoring systems that could help anticipate outbreaks of diarrheal diseases.

Previously, these institutions only met occasionally, if at all, said Grossi, so getting them together is a big deal for future nutrition-related policy and planning in Senegal. “We cannot overstate the convening power of ACToday.”

“The webinar was just a first step to open up many other doors and avenues of collaboration between those working in climate and nutrition, including and especially project managers. Addressing these issues is critical for our future.”

-Nicole Dossou, Human Food and Nutrition Laboratory, Cheikh Anta Diop University



An ACToday training in March of 2021 drew more than a hundred professionals and students working in food security, nutrition, policy and climate.



EMPOWERING NATIONAL METEOROLOGICAL SERVICES

At a launch event in May of 2021, Ethiopia's National Meteorological Agency unveiled a national climate plan to ensure that, for years to come, the country will have the best climate information available to guide it as it adapts to the realities of climate change. ACToday had been working with the meteorological agency and other Ethiopian government agencies since 2017 to finalize the plan, officially known as a national framework for climate services.

An important part of ACToday's goal of increasing food security has been to help develop new climate services that lead to better agricultural decision making. National frameworks for climate services serve this strategy in two important ways – by getting national meteorological services the recognition and support they need from national budgets and international donors, and by placing climate services at the center of adaptation efforts.

ACToday's Ethiopia country lead, Tufa Dinku (middle) stands with officials from the country's National Meteorological Agency and other agencies during the launch of Ethiopia's national framework for climate services, May 25, 2021.
Photo: Asaminew Teshome/NMA



“The technical support, knowledge-sharing and collaboration provided by IRI through the ACToday project has enabled us to develop a robust national framework for climate services,” said Fetene Teshome, the director-general of Ethiopia’s National Meteorological Agency. “This will serve as a strong foundation for our country’s efforts to adapt and prosper in a varying and changing climate.”

“We understood from the start that any long lasting impacts we would have on reducing climate threats to food security in these countries depended on empowering and supporting the national meteorological services,” said ACToday’s Walter Baethgen. “Akin to the U.S. National Oceanic and Atmospheric Administration, they are government institutions mandated to understand and communicate to their users what the climate is doing now, what it did in the past and what it is likely to do over the coming days, weeks, years and decades.”

The close partnerships between ACToday and the national meteorological services in each of the six countries where ACToday is active have led to significant leaps forward in capacity, capabilities and forecasting, such as:

- + Adding millions of new data points to the countries’ historical climate records;
- + Using these data points to build powerful maps and platforms targeted to those working in agricultural ministries, national development and humanitarian agencies;
- + Deploying advanced forecasting systems that have led to significant upgrades to countries’ climate seasonal prediction capabilities, and to the development of experimental short-term forecasts that are of keen interest to food security agencies.

All of this work was done collaboratively with the national meteorological services, said Baethgen. ACToday provides whatever expertise they need as well as resources to support training courses and skills-building events. “The data we help generate belongs to the country, the platforms we help build are served locally,” he said.

These investments have helped bolster the reputation and credibility of meteorological agencies in the six ACToday countries among other parts of government.

“ACToday’s biggest impact is fostering direct and ongoing collaborations among meteorological agencies and other sectors of government, including agriculture, insurance and disaster response,” said Baethgen. “These communities now understand each other in ways they didn’t four years ago. As a result, we’re seeing the creation of many new useful tools and services that directly support decision making to help achieve food security.”

“The technical support, knowledge sharing and collaboration provided by IRI through the ACToday project has enabled us to develop a strong national framework for climate services that will serve as a strong foundation for our country’s efforts to adapt and prosper in a varying and changing climate.”

Fetene Teshome,
Director-General of
Ethiopia’s National
Meteorological Agency

UPDATES FROM THE OTHER COUNTRIES WHERE ACTODAY IS ACTIVE

Vital work to support national meteorological services is underway in all of the countries where ACToday operates. Highlights from this past year include:

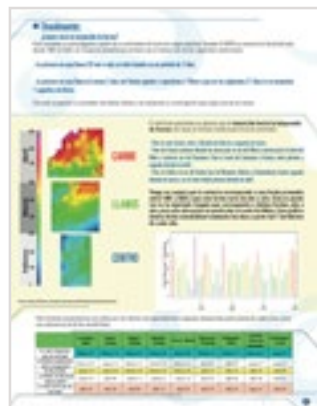
Vietnam's National Center for Hydrometeorological Forecasting (NCHMF). We provided advanced trainings on forecasting and other topics for technical staff, building on the previous year's successful trainings. We co-developed new tools to forecast drought risk and severity, as well as an experimental forecast for tropical cyclones. We also assisted NCHMF in getting recognized by the World Meteorological Organization as the official coordinating agency for Vietnam's efforts to develop its national framework for climate services.

Senegal's Agence Nationale de l'Aviation Civile et de la Météorologie (ANACIM). Work continued to upgrade the country's current forecasting capabilities, building on similar work done in Guatemala, Colombia, Ethiopia and Bangladesh in previous years.

Guatemala's Instituto Nacional de Sismología, Vulcanología, Meteorología e Hidrología (INSIVUMEH). Based on the successful launch of an upgraded climate forecasting system, we have been working INSIVUMEH to build specialized tools to take advantage of the new forecasting capabilities. These include an early-warning system for malnutrition, more reliable indexes for insurance products, and an expansion of our forecast system for coffee yields into additional growing regions.

Colombia's Instituto de Hidrología, Meteorología y Estudios Ambientales (IDEAM). We worked with IDEAM to finish the development of new high-resolution, daily historical climate datasets for the entire country. These enhancements will enable Colombia to generate new and experimental forecasts for rainfall and temperature conditions a few weeks to many months ahead of time.

Bangladesh Meteorological Department (BMD). We provided advanced training courses for the country's forecasters. In collaboration with BMD, we launched a set of online mapping and forecasting tools that express rainfall and temperature probabilities in terms most useful to decision makers working in agriculture and disaster-risk management.



Two pages from a monthly advisory bulletin produced and distributed by Colombia's national rice farming federation, Fedearroz. The federation has started to incorporate the new forecasts that Colombia's Instituto de Hidrología, Meteorología y Estudios Ambientales (IDEAM) developed with ACToday expertise and support. Thousands of rice farmers in the country now benefit from IDEAM's enhanced forecasting capabilities.

The accomplishments featured in this report would not have been possible without the dedication of the six ACToday country teams, the in-country institutions and individuals with whom they worked, and our international partners, who have helped amplify and broaden the impact of ACToday's work. We are also grateful to the staff at Columbia World Projects for supporting ACToday and enabling the projects to reach its goals.

Produced by the IRI Communications Team

For more information about ACToday, please visit
iri.columbia.edu/actoday.

To support work like this, please email
ACToday@iri.columbia.edu.

For more information on Columbia World Projects, visit
www.worldprojects.columbia.edu.

ACToday is working in six countries

*—Bangladesh, Colombia, Ethiopia, Guatemala, Senegal
and Vietnam—*

to help meet the U.N.'s Sustainable Development Goal 2:
**ending hunger, achieving food security, improving
nutrition and promoting sustainable agriculture.**

These countries are home to nearly **450 million people**,
many of whom are chronically undernourished because
they depend largely on rainfed agriculture for the food
they grow, eat and sell. Ultimately, **climate variability is
an ever-present threat to their lives and wellbeing.**



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