



CULTIVATING FIELDS OF CHANGE

Collaborative Learning Through Research



Grants for GEC Research in Africa



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Climate change poses a significant challenge to Africa's development, given the continent's repeated exposure to droughts and floods, high reliance on rain-fed agriculture for food security, and entrenched poverty. In some parts of Africa, food production is already marginal due to high temperatures and low rainfall, and is thus highly vulnerable to future climate change. By mid-century, average growing season temperatures in parts of Africa could exceed the most extreme high temperatures on record¹ leading to an increase in the frequency of failed seasons².

Substantive and sustained action to strengthen adaptive capacities in Africa is needed. A key element of such action is to promote more robust systems for generating, interpreting, and disseminating knowledge about climate change risks. START is helping to address this challenge by supporting research and training in Africa on critical climate change and global environmental change issues. Since 2004, START has promoted place-based integrated research through the START Grants for Global Environmental Change Research (GEC) in Africa Program. START's GEC grants program seeks to strengthen both individual and institutional capacity for interdisciplinary research; contribute to enhancing knowledge of global change science; create long-term, international collaborative research partnerships among African scientists and scientists in the U.S. and Europe; and provide outreach to policy makers and the public.

We are pleased to present findings from the recently completed 2011–2012 round of START's GEC research grants that are helping to advance knowledge on adaptation to climate change. Through funding from the U.S. Global Change Research Program / U.S. National Science Foundation, the Climate and Development Knowledge Network (CDKN), and the Climate Change, Agriculture and Food Security initiative (CCAFS), START supported 16 research projects in 14 African countries on the theme of global environmental change, agriculture, and food security. The projects were topically and geographically diverse, ranging from food production and livelihoods in estuaries, river deltas and lagoons in northern, western and southern Africa, to agriculture and conservation at the forest fringe in humid areas, to livelihoods derived from agriculture and tourism in semi-arid areas.

A common thread running through much of this research is the observation among farmers that the climate is changing. They note that these changes, including delayed onset of the rainy season, shorter rainy seasons, more intense rainfall, longer droughts, and warmer temperatures, are lowering crop yields. Yet the extent to which these changes are indicative of actual climate change is difficult to determine. Recent studies^{3 4} indicate generally low agreement with how farmers' observations of climate change compare with meteorological evidence. What might explain these differences? Why do farmers at times perceive changes that are not being picked up in long-term recorded weather data? One important reason may be that agro-ecosystems and production practices are themselves changing—that is, degraded soils are becoming increasingly drought prone, or adoption of hybrid crop varieties that are ill-suited to dry periods—leading to increased sensitivity to drought and other seasonal vagaries of rainfall.

1 Battisti and Naylor, 2009. *Science*, 323, 240–244.

2 Thornton et al. 2011. *Philosophical Transactions of the Royal Society A*. 369. 117–136.

3 Moyo et al. 2012. *African Crop Science Journal*, 20. 317–335.

4 Simelton et al. 2013. *Climate and Development*. DOI:10.1080/17565529.2012.751893.

More effective management of current climate risks offers an important entry point for strengthening adaptive capacities in the face of longer-term climate change. As the research highlighted in the first two articles shows, there is ample evidence that farmers and others who depend on natural resources for food are taking proactive measures to better manage climate risks, such as through water and soil conservation practices, agroforestry, and diversification of livelihoods sources away from food production. In some cases, however, coping strategies that evolved under one set of circumstances are now difficult to sustain because of new or intensified external pressures. For example, pastoralists have traditionally moved herds to cope with drought but now find this practice increasingly problematic because of changes in how modern society views pastoralism and land-use policies that have become more restrictive. Also, poorly enforced laws and regulations, lack of clear jurisdictional responsibilities and mandates, and corruption erode incentives to develop robust responses to managing risk and adapting to change.

Given the high degree of uncertainty around future climate change and the multi-stressor nature of vulnerability in Africa, adaptation should be approached as a process whose success depends on learning to adapt well rather than one of being well adapted. A key element of adapting well is to create opportunities for strong engagement between scientific and traditional spheres of knowledge that support processes of co-exploration and learning as well as the co-development of relevant and actionable responses for dealing with climate change. The article *Whither the Weather?*

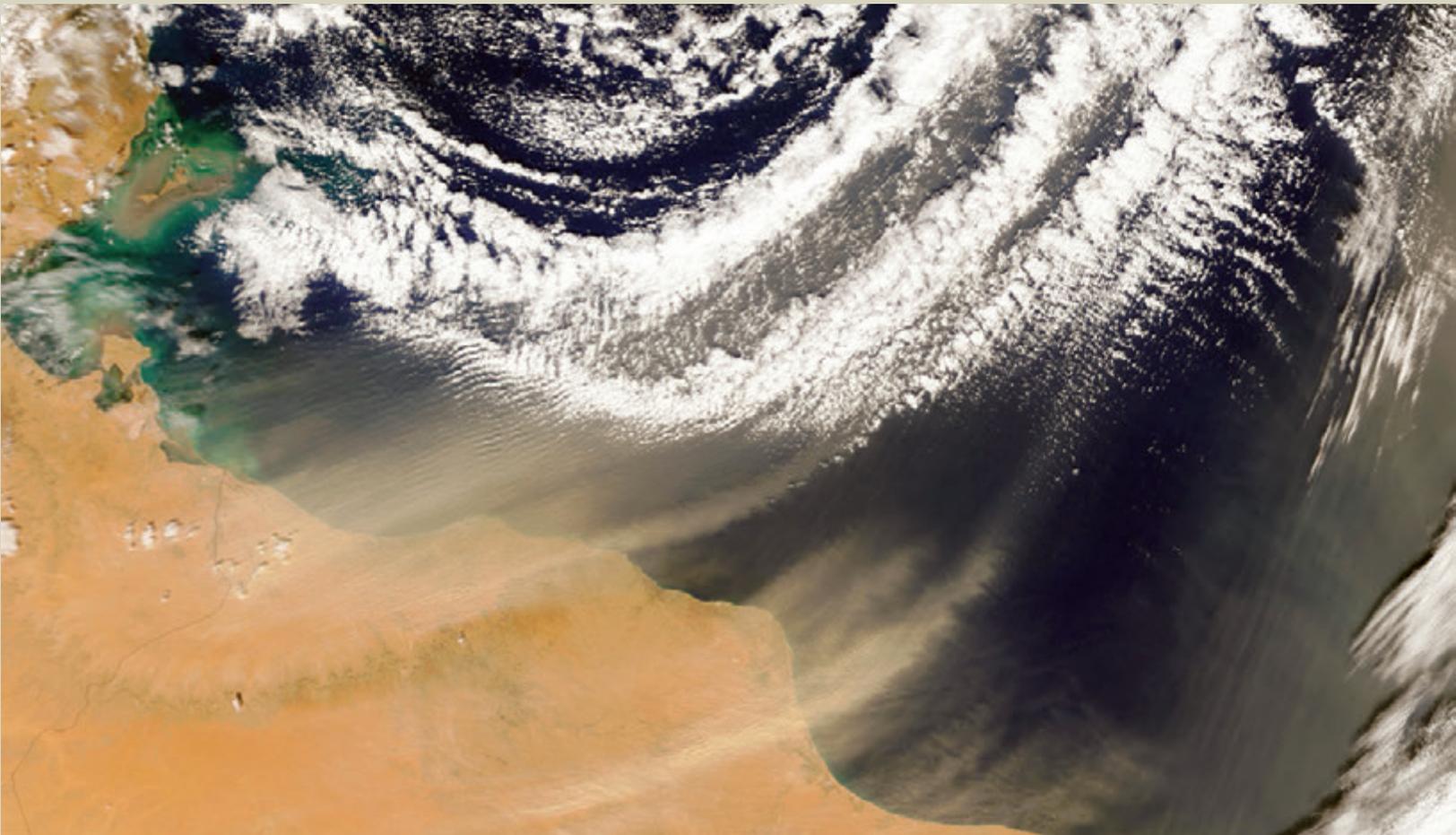
Forecasts Rooted in Scientific and Indigenous Knowledge, which describes how local and scientific weather forecasting knowledge can be integrated, offers a compelling example of this process. In fact, the GEC research featured here provides many examples of innovative partnerships between researchers, local communities, policy makers, NGOs, sectoral experts, and others, as profiled in *Collaboration Heats Up to Tackle Climate Change*.

START's efforts to promote action-oriented research on climate change in Africa continue. The current (2013–2014) cohort of grantees under the START Grants for GEC Research in Africa program is carrying out work in 11 research projects across seven countries, supported by the U.S. Global Change Research Program / U.S. National Science Foundation and CDKN. As with the work featured in this magazine, the 2013–2014 investigations are quite diverse; they include coffee systems in eastern Africa, agriculturalists and agro-pastoralists in semi-arid areas of western and northern Africa, gender roles and traditional knowledge in southern Africa, and rural communities in coastal and forest fringe areas of southern and eastern Africa.

The research community has a critical role to play in helping society to respond to the tremendous challenges posed by climate change. START is pleased to be a strong partner in this effort and is committed to supporting research and helping create opportunities for science-based knowledge to reach a wider audience.

START

—Jon Padgham, Deputy Director,
International START Secretariat



Management of Ecosystems Services of the Forests of Southwest Nigeria in Support of Rural Livelihoods and Food Security



Adebunle, Victor Jimoh Adebunle,
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Oke, David
Olarewaju



Okunlola,
James Olaniyi

Reducing Tropical Deforestation and the Protection of Ecosystem Services to Support Food Security in Southwest Cameroon



Ajonina, Gordon Nwutih,
Cameroon Wildlife Conservation Society (CWCS), CAMEROON



Chuyong,
George Bindoh



Usongo, Pa-
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Sustainable Farmland Management in the Context of Climate Change in Inland Valleys of Southern Benin



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Université de Parakou, BENIN



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Changes in Tree Reproductive Phenology: Causes and Implications in and around Budongo Forest Reserve, Uganda



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Agea, Jacob



Nyeko, Philip

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Impact of Climate Change on Water Resources, Agriculture, and Food Security in the Ethiopian Rift Valley: Risk Assessment and Adaptation Strategies for Sustainable Ecosystem Services



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*Addis Ababa Uni-
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Godebo, Te-
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Teshome, Be-
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Improving Seasonal Forecast Information for Managing On-farm Decisions



Crespo, Olivier,
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Johnston, Peter



Tadross, Mark



Walker, Sue

Integrating indigenous knowledge and scientific methods for flood risk analyses, responses and adaptation in rural coastal communities in Nigeria



**Fabiyi, Oluseyi
O., Obafemi**
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ty, NIGERIA*



Akinbola,
Gabriel



Oloukoi, Joseph



Olufunmilayo,
Thontteh

Community-Based Management of Ecosystems and Natural Resources for the Improvement of Rural Livelihoods and Food Security in the Nigerian Savannah



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Johnson,**
*University
of Lagos, NIGERIA*



Adedayo, Vide



Adeniji, Grace



Elias, Pe-
ter Omu



Olorunfemi,
Felix Bayode

Engaging Farmers and Climatologists in Adaptation to Climate Variability and Change in the Okavango Delta of Botswana



Kolawole, Oluwatoyin Dare, Okavango Research Institute, BOTSWANA



Mmopelwa, G.



Ngwenya, Barbara Ntombi



Thakadu, Olekae T.



Wolski, Piotr

The Role of Urban and Peri-Urban Agriculture in Enhancing Food Security and Climate Change Resilience in East and West African Cities



Lwasa, Shuaib, Makerere University, UGANDA



Fragkias, Michail



Mugagga, Frank



Simon, David



Wahab, Bolanle

The Application of Earth Observation Methods for Monitoring and Assessment of Agro-forestry in Senegal and Ghana



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Manga, Alla



Skole, David

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Attua, Emmanuel Morgan

Ndour, Ngor

Von Vord-zobe, Vincent

Climate Change Adaptation for Rural Communities Dependent on Agriculture and Tourism in Marginal Farming Areas of the Hwange District, Zimbabwe



Nhemachena, Charles, Council for Scientific & Industrial Research (CSIR), SOUTH AFRICA



Mudombi, Shakespear

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Mano, Reneth

Assessing Adaptation Responses by Smallholder Farmers in Northern Ghana to Climate Change and Biodiversity Loss



Osei-Owusu, Yaw, Conservation Alliance International, GHANA



Al-Hassan, Ramatu



Doku-Marfo, Ernestina

The Impact of Climate Change on Food Security Among Coastal Communities of Keiskamma, in the Eastern Cape, South Africa



Ribbink, A. J., Sustainable Seas Trust, SOUTH AFRICA



Adams, J. G.



Zhou, Leocadia

Not Pictured:
deWet, C. J.

Raats, J.g.

Sensitivity of Coastal Lagoon Ecosystems to Climate and Related Global Changes: Developing a North African Lagoons Network



Snoussi, Maria, University Mohamed V, MOROCCO



Kara, Hichem



Mahe, Gil

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Targeting Crop Yield Increases Under Future Climate for Greater Food Security in the Upstream Catchment of Lake Victoria Basin



Wasige, John Ejiet, Faculty of Agriculture, Makerere University, UGANDA



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Eilu, Gerarld



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Mbazumatima, Jean-Berchmans

Mukashema, Adrie



Lubanga, Timothy



Nkondola, Daniel

WHAT WAS, IS NO LONGER: Responding to Mounting Climate Risks in Africa



**BOTSWANA
CAMEROON
ETHIOPIA
GHANA
NAMIBIA
SOUTH AFRICA
ZIMBABWE**

Africa’s vulnerability in the face of climate change is well known. Less well known is the extent of Africans’ capacity to adapt. Supported by grants from START, researchers across the continent are investigating this capacity in order to better understand the specific and often local ways in which farmers and others are currently using natural resources, coping with variable weather and climate, and responding to the challenges that they face with regards to unfavorable policies and other hindrances to adaptation.

A TIME TO SOW, A TIME TO REAP: BUT WHEN?

Climate change is already affecting Africa. The IPCC’s Fourth Assessment Report states that Africa has experienced warmer temperatures since the 1960s and increased rainfall variability since the 1970s. An increase in extreme events—longer and more frequent droughts, more intense flooding, and more frequent and more severe heatwaves—combined with still greater warming have the potential to significantly undermine Africa’s food production in the decades to come.

In many places farmers are observing that conditions are getting worse. On the Nigerian Savanna, farmers and community leaders complain that rains are

in terms of midseason droughts, is that the crop might be completely destroyed,” he observes.

“In previous years, it always rained at the expected time but nowadays things are changing seriously.” –Community Leader, Nigeria

coming later and stopping too soon or are simply inadequate for their crops. “In previous years, it always rained at the expected time but nowadays things are changing seriously,” a community leader told a team of researchers led by Mayowa Fasona, a geographer at the University of Lagos and START grantee. In Ethiopia’s Rift Valley, farmers also say that more erratic rainfall threatens their food production. Recent research, including that of Ethiopian scientist Tewodros Rango, a START grantee based at Duke University’s Nicholas School of the Environment, confirms that the valley has become hotter and drier with less predictable rainfall. In Zimbabwe’s Hwange District, subsistence farmers who raise rainfed crops, mostly maize, say that in recent years the rains have been coming later—in November instead of October. Droughts have become more frequent, and temperatures are warmer. While meteorological data does not always corroborate farmers’ perceptions of how the local climate is changing, farmers are clearly experiencing hard times and are more sensitive to drought and variability of rainfall.

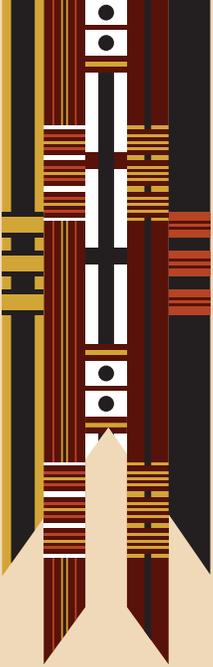
“In the past they could more reliably plant crops and harvest something,” says Charles Nhemachena, a scientist with the Human Sciences Research Council in Pretoria, South Africa. With support of a START GEC Grant, Nhemachena traveled with other researchers to the Hwange District to study local livelihoods. “What is happening now,

HEDGING BETS AND EXPLORING ALTERNATIVES

Farmers often draw on long-held traditional strategies for coping with climate variability and other risks inherent to

Herders face increasingly restrictive land use policies when searching for water for their livestock.





farming. In Ethiopia, they build terraces, plant trees, and save seeds. In Ghana, according to a research team led by START grantee Yaw Osei-Owusu of the Conservation Alliance, they mix crops and rotation schedules, mound the soil, mulch, apply manure, and vary planting dates to take advantage of rains or to avoid pests, drought, and floods. In Benin's inland valleys, researchers like P. B. Akponikpe, a scientist and START grantee at Benin's Université de Parakou, observe that farmers use different approaches in different parts of the valleys, planting rice and growing market gardens in moister valley bottoms, and cereals and fruit trees in the dry uplands. In response to greater extremes of drought and flooding in recent years, they shift planting dates and reduce the size of or even abandon upland farms.

And climate change is a challenge not just in the countryside. African cities are growing rapidly, and urban and peri-urban agriculture is being increasingly viewed as an option for helping to keep urban food baskets diverse and nutritious. An investigation of eight African cities, led by START grantee Shuaib Lwasa of Makerere University in Uganda, observes that “[u]rban and peri-urban farming activities can be found everywhere, behind houses or along roadsides, on roofs or in the middle of roundabouts, among and between railway lines, in parks, along rivers, and under power lines.” If well designed and integrated into urban planning frameworks, food production in and around cities can help cities adapt to increasing flood risks by providing permeable surfaces for slowing stormwater runoff while also contributing to food security needs.

In some cases, traditional ways of coping with climatic variability are no longer available or no longer

practiced. In Botswana's Okavango Delta, farmers have traditionally responded to drought by moving their production from rainfed upland fields to moist riverine areas. In neighboring Namibia, herders once drove their animals a thousand kilometers in search of better pastures. Today, modern land use policies and the rise of more sedentary communities have reduced the viability of such strategies.

At the same time, current climate projections suggest that traditional ways of coping with climate variability will not suffice. In Ethiopia's Rift Valley, the expansion of irrigation, widely viewed as a solution for African farming, offers good potential for guaranteeing production under uncertain conditions but also carries the risk of overexploiting water resources—resources that will be under heightened stress in an ever drier climate. To complement the benefits of irrigation, many Ethiopian farmers are also planting high yielding and early maturing crop varieties as a hedge against drought.

Across Africa it's likely that farmers will be forced to diversify their sources of income; new sources that reduce local reliance on natural resources will be needed. In Hamburg, on the coast of South Africa's Eastern Cape Province, for example, women are embroidering textiles to sell to vacationers and other more distant customers as a way to make up for recent declines in the local shellfish populations on which their traditional livelihoods depended. A blend of new and old approaches is needed to sustain local livelihoods and enable communities to feed themselves in the face of worsening conditions for agriculture.



WAYS TO SEED SOLUTIONS

One obstacle to the introduction of new agricultural technologies and strategies is that they often are adopted by only a few farmers. In a START-supported study that took place in northern Ghana, Prince Etwire, a graduate student at the University of Ghana in Legon, reports that only one in 45 farmers plants early maturing crop varieties. While international and national research organizations are developing drought-tolerant varieties of cereal crops suitable to this region, most farmers have difficulty acquiring the seed.

Also, changes in cropping systems can occur slowly, particularly where markets and policy signals run counter to those of the climate. In northwestern Zimbabwe, most farmers grow maize even though it is becoming increasingly ill-suited to the local climate. Though they plant more drought-tolerant crops, such as millet and sorghum, it is done in small amounts and mostly used for ceremonial purposes or to brew beer. More widespread planting of millet and sorghum is difficult because there is a ready market for selling maize and government policy has long favored maize production by subsidizing maize seed and centralizing its distribution. Such policies are not in place for drought-tolerant cereal crops. Farmers often have little access to alternatives or cannot afford them; even drought-resistant maize is hard to obtain in Zimbabwe. As such, incentives to change practices are weak or nonexistent.

Water management in the Nigerian savanna offers another vivid illustration of how government can jeopardize the well being of local communities. Decades ago, the government dammed two small rivers in western Nigeria. START grantee Mayowa Fasona, who led a research study in the region, emphasizes that the water behind the two dams could help local farmers immensely. With irrigation, the farmers could reap more abundant harvests and could grow crops year round. But the government has made little use of the dams, neither to generate electricity nor to provide irrigation water. Meanwhile, unproductive wells and abandoned government water projects are commonplace in the region. These failures in the system are largely the result of a lack of both sustained government support and local involvement.

For Fasona, these examples are emblematic of a larger failure. Governments, he says, often develop highly detailed policies to improve the management of natural resources and promote rural livelihoods—but fail to take the necessary steps to carry them out. “By the time you get to the communities they [the policies] have absolutely no impact,” he says. “Good intentions are not translated into action.”

While Africa faces significant challenges in responding to risks from climate change, Africans are not passive victims. Creative solutions that overcome barriers can enable positive change to occur. Collaborations between researchers and communities, such as those made possible by the START Grants for GEC Research in Africa Program, are an important ingredient for crafting solutions. 

A blend of new and old approaches is needed to sustain local livelihoods and enable communities to feed themselves in the face of worsening conditions for agriculture.





Photo by Joachim Huber



**BOTSWANA
NIGERIA**

In Africa, few activities are more critical, or more fraught with difficulty, than predicting the weather. The vast majority of African farmers grow rain-fed crops under conditions of high seasonal climate variability. Their judgments about the weather—tomorrow’s or next month’s—inform farming decisions that can have profound consequences for their livelihoods.

In Africa there are two radically different ways of predicting weather and seasonal climate. Climatologists and meteorologists issue short-term and seasonal predictions based on wind patterns, surface temperatures of the ocean, and other data, while farmers and community elders make predictions based on their observations about the flowering of plants, the hatching of insects, or the movement of clouds. Often, these two ways of understanding weather are barely comprehensible to one another.

Researchers lament that many farmers never even hear the “official” forecasts. Of those who do, most do not know how to use the information that is provided. “They don’t see the relevance to their situation,” says Piotr Wolski, a researcher in the Climate Systems Analysis Group at the University of Cape Town in South Africa. “It’s much easier for them to relate to what plants look like, or the dryness of how a leaf feels—things they perceive on a regular basis.” For their part, scientists have paid relatively little attention to indigenous weather forecasting.

Now, many researchers are working to bridge this divide. They are visiting rural communities to teach residents about seasonal climate forecasts and to learn from communities how to develop ways of presenting these forecasts that local farmers can more readily understand and use. In many cases they are asking residents to help gather more data. There is a growing conviction that collaboration between scientists and indigenous experts can deepen overall weather and climate knowledge, thus helping farmers make better decisions and enabling rural communities to adapt better to climate variability and longer term change.

AN UNTRADITIONAL MARRIAGE—INDIGENOUS AND SCIENTIFIC KNOWLEDGE

Oluwatoyin Kolawole, a scientist at the Okavango Research Institute at the University of Botswana, led a team of scientists into the Okavango Delta to talk to farmers and community leaders about weather and climate. Supported by a 2011–12 START grant for GEC Research, Kolawole and his team hoped to learn about the effects of climate variability as experienced by at-risk groups in the Delta and how farmers use both scientific and indigenous information about weather and climate. They also wanted to see if the two kinds of knowledge might be brought together, and if so, how.

Farmers in the Okavango Delta make many different decisions based on their understanding of current and expected conditions. In times of drought, water levels recede and the farmers move farther into floodplains to plant. They plant different varieties of sorghum and beans depending on how much rain they expect. During periods in which they experience declining harvests, they report feeling a heightened need for weather information.

Kolawole and his colleagues found that most farmers in the Delta rely more heavily on the predictions of local elders than on scientific forecasts when they make their farming decisions. The knowledge upon which elders make these predictions is highly complicated and involves a close study of natural phenomena. An elder from the village of Ngarange explained his method to researchers:

“Certain animals, insects, and birds serve as useful weather indicators. For example, a rainy year is imminent if wildebeests give birth in large numbers. Also, the flight pattern of bees could be used to predict whether the rains would be abundant or not in a given season; it is a year of less rain or dryness if they are seen flying toward the west, but otherwise if seen flying to the east. Dryness is imminent if the honeybee bird is seen flying close to the ground.”

Although such knowledge is based on generations of experience in local settings,

[Researchers] believe that collaboration between scientists and farmers can deepen overall weather knowledge, help farmers make better decisions, and enable rural communities adapt better to climate variability and change.



farmers admit they do not have perfect confidence in it. One out of three surveyed as part of Kolawole's project said it was not always accurate. This may help explain why over half of farmers surveyed recommended that scientific weather forecasts complement the local forecasting.

community leaders, with scientists from the Okavango Research Institute and the state Department of Meteorological Services. The group's primary focus was how to improve the collection, integra-

“The moment you are able to create an understanding of the need for data, people are interested... They would like to have a station, to be able to measure the weather and to have those numbers. It's a matter of education and organization.” –Piotr Wolski, START grantee

Piotr Wolski was a member of Kolawole's research team and said that talking with residents of the Okavango Delta about weather and climate was an eye-opening experience. “I've got lots of respect for indigenous knowledge,” he said. “It was the first time I came across that kind of knowledge. I had read about it, but it was the first time I saw it, what people know and what people come up with.”

Wolski said he was skeptical at first about some aspects of local predictions. “There were things like this: you have a ring around the moon, indicating coming rain. You say, ‘Whatever.’ Then you stop to think about it. A ring around the moon might indicate dust in the atmosphere. So there might be something to it.”

There were other indigenous observations that also struck the researchers as sophisticated and clever. In one community, women described how they were able to judge atmospheric humidity by the size of harvested root tubers. “This, for me, is a great revelation,” Wolski said.

Farmers in the Delta, most of them women, were proud to tell researchers what they knew about forecasting. At the same time, the researchers found them eager to know more about seasonal climate forecasts, which commonly project conditions like rainfall and temperature three to six months into the future. A common obstacle, however, is that seasonal forecasts are typically presented in terms of the probabilities of a specific condition being experienced and pose significant challenges to interpretation and use. “The expression of information has to be worked on,” says Wolski. “It's a matter of finding ways to translate that information and to provide it in a form that can be understood and accepted.”

That's not all. Kolawole's team organized a two-day “Weatherman Workshop” that brought together people from many local villages, including farmers, youth, tribal chiefs, and other

tion and use of weather and climate information in the Delta. General consensus was that “weather has become very unpredictable” and stressed the need to go back “to our roots” and use science with indigenous knowledge in ways that complement one another.

Workshop participants agreed on a number of ways to do this. They recommended educating local communities in how to use weather monitoring instruments, incorporating lessons on indigenous weather knowledge in school curricula and conducting more research on indigenous weather forecasting. Participants also encouraged Botswana radio and television networks to broadcast programs focused on indigenous weather knowledge and urged that meteorological services be extended across all districts.

Kolawole and his team next drew up a further list of suggestions. These included documenting local weather knowledge in both English and Setswana; forming a joint committee that would assess the effectiveness of seasonal climate forecasts and their use by local farmers; setting up experimental stations at which farmers and scientists could work together to assess the validity of local weather forecasting; and developing a common working tool that would incorporate local indicators of weather and climatic variability. They also emphasized the potential usefulness of broader outreach efforts on the part of the climate science community, including workshops, public lectures, and media programs that would support knowledge exchange between scientists and rural communities.

Meanwhile, Wolski is working to set up a network of community weather stations and to train local residents in forecasting. He





says such a network will not only heighten local interest in seasonal climate predictions but also help provide a more detailed picture of weather and climate in the Okavango region than is currently available. While he recognizes that a network of local weather stations could be difficult to maintain, Wolski is exploring the possibility of piggy-backing on small, ongoing community-based initiatives for environmental monitoring.

“The moment you are able to create an understanding of the need for data, people are interested,” he said. “They would like to have a station, to be able to measure the weather and to have those numbers. It’s a matter of education and organization.”

FLOOD MAPS AND WATER GODS

The Okavango Delta isn’t the only place where scientists and local decision makers are coming together to explore a common interest in weather and climate. Researchers in Nigeria are also partnering with local residents in some of the country’s most



at-risk coastal communities, most of whom live by a combination of fishing and farming, growing paddy rice, plantains, yams, coyams, and other vegetables as well as tropical fruits like guava and mangos. The coastal ecosystem is characterized by

mangrove swamps, barrier islands, and tropical rain forests. Rising sea levels and high water in local rivers have resulted in increased flooding in recent years. This flooding has not only ruined homes and threatened lives but also damaged crops,



Through the work of Oluseyi Fabiyi and his team, community stakeholders from coastal Nigeria, learned to read the maps and monitor the newly installed flood gauges and weather forecasting equipment.



Researchers assist in installing flood gauges.

killed livestock, diminished local fisheries, and undermined food security.

Local people have ways of predicting the timing and magnitude of floods, most of which happen in August or October. They expect floods soon after a particular wind or storm, or when the moon is full, or when the clouds thicken. Their understanding of flooding is often religious; some communities attribute flooding to the displeasure of water spirits. Communities react to flooding by building mud or concrete embankments and plank bridges or by appealing to churches for help.

Oluseyi Fabiyi, START grantee and Director of Studies at the Regional Centre of Training in Aerospace Surveys in Ile-Ife, Nigeria, led a team of researchers on site visits to coastal communities. The researchers assembled focus groups of local residents and undertook surveys to learn about the nature of local flooding, indigenous knowledge of the causes and timing of flooding, and the ways in which the communities respond to the flooding. Fabiyi and his team also installed flood gauges and weather forecasting equipment in ten of the communities. They brought GIS-based flood maps and trained local volunteers in how to read the maps and monitor the instruments. In follow-up visits to the communities, the scientists distributed hand-drawn posters that warned residents about the dangers of flooding, sea level rise, and climate change, many of which drew on indigenous beliefs about the connection between flooding and water spirits. Examples of the posters' slogans include: "Water Loves



Hand-drawn posters warn residents about the dangers of flooding, sea level rise, and climate change.

Fisherman But Can be Angry. Don't Annoy Water," "Learn from Nature; Build on Piles," and "Climate Change Affects You. Don't Sit on the Fence."

At least one community benefited immediately from this collaboration between scientists and local communities. People in Gbekebo, a village on a tributary of the Niger River, saw from their new flood gauges that the river was rising. (The flooding was due not to rains but the release of water from an upstream dam in Cameroon.) Residents were able to react quickly as the river spilled its banks.

TOWARD AN INTEGRATIVE APPROACH

START-supported research in Botswana and Nigeria demonstrates the potential usefulness of closer collaboration between local decision-makers and scientists. Such collaboration involves not just exchanging information about weather and seasonal

climate but developing what Fabiyi describes as "an integrative approach" that combines indigenous knowledge and simplified scientific methods of prediction. This approach improves forecasting overall, making it more relevant to local circumstances and enhancing engagement with and of farmers who can use the information to make crucial decisions about when, where, and what to plant.

Enhanced emphasis on integrating these perspectives might also help to preserve a rapidly disappearing resource. "Most of these indigenous knowledge heritages are lost, hidden, or outright forgotten," Fabiyi writes.

"We believe that local and scientific weather forecasting knowledge are not mutually exclusive," Kolawole concludes. "There are some common features in the two forms of knowledge. Combining ideas from both could go a long way in ensuring sustainable development in agro-climatology and agricultural production in the long run."

CHOICES FOR THE FUTURE: Protecting Nature and Promoting Livelihoods



ALGERIA
CAMEROON
MOROCCO
TUNISIA
SOUTH AFRICA

One dilemma facing many parts of Africa is how to conserve natural resources while also sustaining the livelihoods of people who depend on them for their subsistence—growing crops, harvesting timber and other forest products, and fishing in rivers and estuaries and along coasts. Increasingly, scientists and policy-makers are recognizing that conservation cannot be only about protecting natural resources; it also must accommodate human needs.

Often it's not a matter of choosing one priority over the other. Research in many parts of Africa shows that protecting natural resources and ecosystems, including fertile soils, clean water, biodiversity, and the land's carbon-holding capacity, is not only compatible with but necessary for sustaining rural livelihoods. The question is how to protect these ecosystems in the face of climate change and population pressures.

Tony Ribbink, the Director of Sustainable Seas Trust in Grahamstown, South Africa, and 2011–12 START grantee, vividly describes the problem:

“Natural resources upon which communities depend are being modified by climate change and human activities daily. Low-income people have no option but to degrade their lands, use the trees, hunt wildlife, pollute rivers and exploit sea life. In essence, poverty forces people to erode the environmental goods and services to subsist.”

These intertwined relationships between people and the natural world need to be better understood to manage risks to natural systems. This is especially important given that future climate change is expected to exert even greater negative pressures on African ecosystems and have significant impacts on biodiversity.

FORESTS AND FARMS

The challenge is finding ways to protect the forests from degradation while allowing local people to still use them for fiber, fuel, food, and timber. One solution, some researchers argue, is to encourage communities to participate in the management of local forests and protected areas. “In the past, the conservation of biodiversity has been mostly understood in terms of the management of protected areas and natural forest, ignoring the possible role of farm areas and the ways through which rural communities have promoted biodiversity in their subsistence agricultural production systems,” notes Lyonga.

Victor Adekunle, START grantee and scientist at the Federal University of Technology in Akure, Nigeria, argues that communities should be given a more prominent voice in the management of natural resources, including a role in decision-making and developing local policies. They should be granted “judicious utilization” of local resources and offered incentives to create effective and transparent governance structures to protect the forests where they live, he says. This transition is already underway on a small scale in Zimbabwe, where the number of community forests is rising. These are small forests that the government, which owns most of the forested land, has turned over to the management of local councils.

Cameroon’s Congo Basin, home to some of the richest and most diverse tropical forests in the world (second only to the Amazon), is one place where this balancing act is clearly underway. Forests of the Congo Basin contain an abundant diversity of species of mammals, birds, and plants. They also function as an immense carbon sink. Today, however, the forests are threatened on many sides—by multi-national timber interests as well as by local communities that clear forests for food production. Supported by a START GEC grant, Gordon Ajonina, a scientist at Cameroon Wildlife Conservation Society, led an investigation of the productivity and biodiversity of different farming systems that form critical buffers around the Basin’s Korup National Park.

Farmers in this area typically plant small plots of cassava using shifting cultivation and slash-and-burn techniques. Ajonina’s aim was, in part, to explore the potential for alternative farming systems, including perennial agroforestry crops such as bananas,



Varying the types of crops planted allows farmers to have the standard, bumper crop of cassava (below, an example of annual cropping), as well as promote future production with a perennial crop of cocoa (above).





plantains and cocoa, and the payment for ecosystem services (PES) to increase protection of natural resources. In such schemes, productivity is low at first but increases as the trees mature. The long-term result, however, are landscapes with more trees, greater biodiversity, more fertile soils, and communities who have greater income and food security.

So why don't all farmers adopt agroforestry practices and preserve more trees in their farming systems? In some cases, converting a field to perennial agroforestry requires a farmer to give up the immediate income of a cassava or other crop harvest. For families who depend heavily on yearly production, this price is typically too high to pay, regardless of the long-term benefits of agroforestry.

Ngoh Lyonga, a graduate student at the University of Buea in Cameroon and a member of Ajonina's group, discovered other obstacles to agroforestry beyond the monetary short-term challenges. The structure of land tenure is one major constraint. Farmers invest in perennial agroforestry only when they have secure rights to the land. A renter who improves a plot by growing economically valuable trees on the land risks having the landlord take it back for his or her own economic purposes. Uncertain tenure thus discourages renters and other subsistence farmers from choosing alternatives to the annual cropping of cassava. Another problem is the lack of an effective extension service to demonstrate to farmers the benefits of agroforestry.

A challenge facing both researchers and conservation practitioners then is how to make agroforestry more attractive to all farmers who face insecure land tenure. One solution, Ajonina and his colleagues suggest, is paying farmers to grow trees, with payment set at a level sufficient to compensate for the value of a cassava crop. "We have to change farmers' attitudes and show them they can be better off," Ajonina says. "It takes time. They need to see results."

FROM COASTS TO COWS

Promoting conservation while protecting livelihoods is a challenge not just in forest and farming communities. In parts of coastal Africa, population growth and the pressure of local livelihoods, especially through harvesting marine life from the seas, estuaries, and beaches, is simultaneously degrading local ecosystems and endangering the economic base of coastal communities.

Maria Snoussi, a scientist at University Mohammed V-Agdal in Rabat, Morocco, assembled a team of researchers from North Africa to study a group of coastal lagoons in Morocco, Tunisia, and Algeria. The project was designed to improve cooperation among regional scientists and to call attention to the lagoons' economic and ecological importance. The lagoons are rich ecosystems that provide essential habitat for many species of fish and shellfish and attract large numbers of migrating birds. They are vital to local economies. One-third of the residents in the watershed of Algeria's Mellah lagoon live directly or indirectly from the lagoon's fishery.

Recently, however, the lagoons have become threatened by population growth, pollution, and climate change. As transitional ecosystems, the lagoons are highly vulnerable. Variations in inflow due to an increase in coastal storms could alter many of their features, including bottom sediments, oxygen and salinity levels, and impact fish populations. The warming of the Mediterranean Sea also could modify food chains, threatening livelihoods and local food security.

At the other end of the continent, on the coast of South Africa's Eastern Cape Province, residents of the town of Hamburg have traditionally gathered a rich harvest of mussels, abalone, limpets, winkles, and other shellfish from the rocky shore. Most

residents are poor and live mainly on social welfare grants, but fishing and gathering along the coast have historically been a valuable contribution to their subsistence. In recent years, over-harvesting has badly depleted this once-abundant food. Marine ecosystems will continue to be impacted by changes in water temperature, wave action, and rising water levels, which can change fish and invertebrate populations, and subsequently affect those peoples whose livelihoods depend on the resources.

This relationship between local livelihoods and natural resource use in Hamburg was the focus of a study that Ribbink undertook with a diverse collection of researchers from both the natural and social sciences. These researchers explored the town from many different angles, investigating the history of natural resource use, the town's social and economic conditions, and the food security of local households.

Consulting with local residents, Ribbink and his fellow researchers proposed a range of strategies to improve livelihoods and protect natural resources. These strategies include starting oyster farms and other enterprises in the local estuary, taking steps to resolve conflicts between subsistence and commercial fishermen, and encouraging home gardens. Unlike their parents and grandparents, few residents of Hamburg grow their own food. Historically, 55 percent of the land was under cultivation; today most families choose to purchase food in neighboring towns, and as a result only three percent of the land is now cultivated. Ribbink



A fisherwoman prepares mussels for cooking in Hamburg, South Africa.

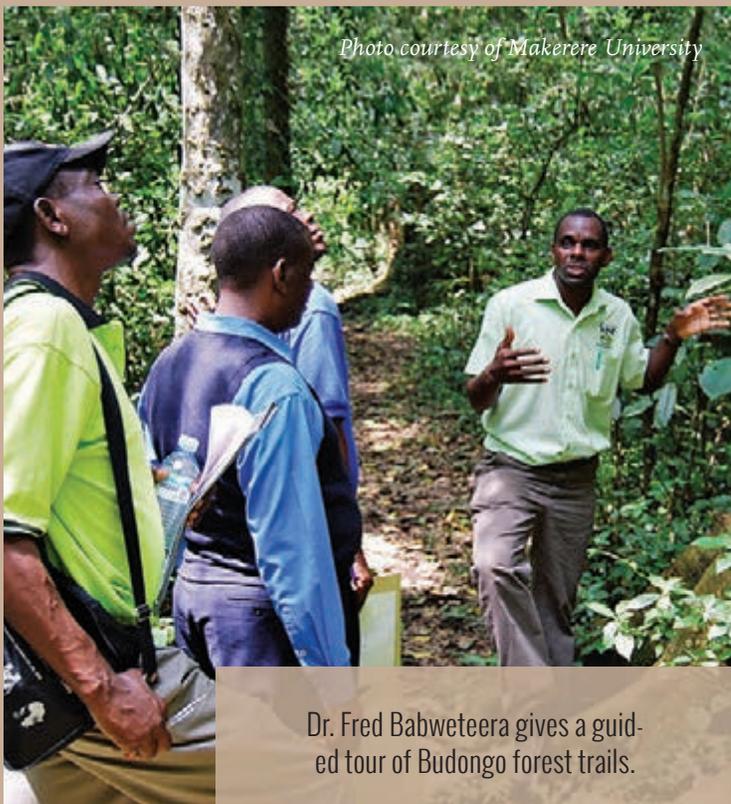


Photo courtesy of Makerere University

Dr. Fred Babweteera gives a guided tour of Budongo forest trails.

RESEARCHER SPOTLIGHT: WILDLIFE-HUMAN CONFLICT IN UGANDA

Fred Babweteera, a scientist at the Budongo Conservation Field Station in Uganda, studied a different kind of human-nature relationship involving the intensifying human-wildlife conflict in forest communities. He and his colleagues learned that farmers around the Budongo Forest Reserve, the largest remaining tropical rain forest in East Africa, have for the past 15 years suffered an increase in crop predation by baboons, chimpanzees, and other primates from the surrounding forest. During the same period, the primates have shifted their diet from fruit to leaves, possibly as a response to the growing scarcity of fruit in the forest.

Babweteera and his colleagues do not know the reason for this scarcity, but they speculate that it could be due to a decline in insect pollinators. Other factors might be a larger population of wild animals in the forest, the destruction of habitat, and the cultivation of crops too close to the reserve. Climate change may also be playing a role, though that is difficult to determine. As intertwined global environmental stressors continue to intensify it will be important to devote further resources to understand the critical connections between humans and wildlife in forest communities.

“If we’re going to make a difference in Africa, we have to deal with the marginalization of people. People living in impoverished circumstances actually have no choice except to degrade the natural environment that they’re in.” –Tony Ribbink, START grantee

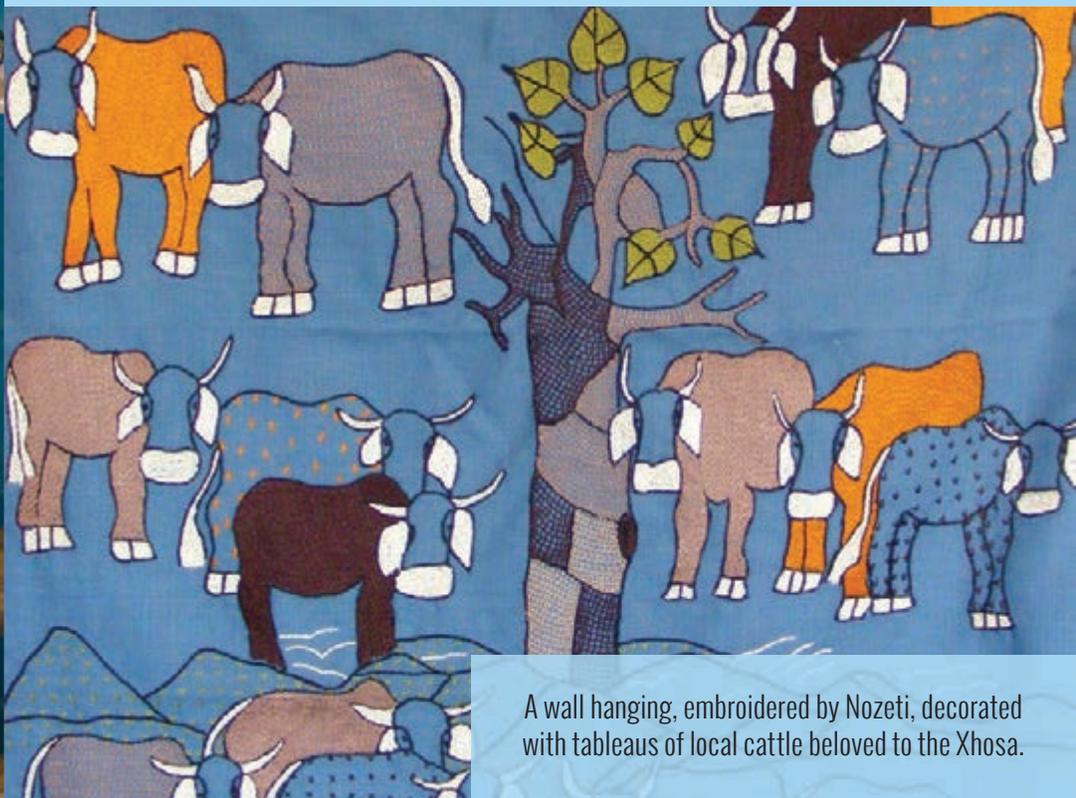


says townspeople are reluctant to risk what little money they have on gardening when their vegetables might be ruined by drought or eaten by a neighbor's goat.

To address this problem, the University of Fort Hare is working with local residents to install water systems and build fences to keep out livestock. But the most ambitious plan focuses on improving education and training through the formation of the Sustainable Education and Skills Centre for Employment, an institution Ribbink envisions as a model for other communities in Africa. The center would draw on the expertise of several institutions, including universities and NGOs, to offer job training for local residents. Ribbink believes that education is the key to solving problems of poverty and environmental degradation in Africa. Education, he says, can create opportunities for livelihoods that are less destructive of local resources and at the same time lift rural people out of poverty.

One effort, with roots going back more than a decade, illustrates the reach and power of similar training initiatives. In 2000, a handful of local women, with the help of the Keiskamma Trust, a local charity, learned to embroider textiles, which they then sold to visitors who came to Hamburg to vacation by the sea. The project flourished, and the women became well known and respected. Today the group is composed of over 100 women. Their artwork can be found on the internet, in South African galleries and museums, and in the South African Parliament, where a 120-meter tapestry tells the story of the Xhosa people. Nozeti, a woman who once poached shellfish to feed her family, now embroiders pillow covers and wall hangings decorated with tableaux of local cattle beloved to the Xhosa. She's proud of her work, which now sells far from Hamburg. "Wherever you go," she says, "you can see my cows."

Ribbink says this project is one of Africa's success stories. It's the kind of initiative that can both help alleviate poverty and relieve the pressure on local resources that may become increasingly endangered with climate change. It's also empowered a new sense of confidence and hopefulness among Hamburg residents. "The community seems to be quite enthusiastic," he said. "They've also bought into the fact that the future depends on themselves." 



A wall hanging, embroidered by Nozeti, decorated with tableaux of local cattle beloved to the Xhosa.



COLLABORATION HEATS UP TO TACKLE CLIMATE CHANGE



**ALGERIA
BENIN
BOTSWANA
GHANA
MOROCCO
NIGERIA
SOUTH AFRICA
TUNISIA
UGANDA
ZIMBABWE**

Scientific research plays an important role in informing societal responses to climate change risks. Through engaging with local communities, START-supported researchers are discovering new opportunities in many places to start conversations about climate change in which farmers, local leaders, and scientists share their perspectives, exchange knowledge, and work together to develop strategies for adapting to climate change.

According to Mayowa Fasona, START grantee at the University of Lagos in Nigeria, “one key issue is how to revamp the old working partnership between government agencies and communities, now to be joined by other stakeholders such as researchers and other nongovernmental organizations.” He and others are creating and using innovative lines of communication to expand partnerships at all levels.

REPORTS GATHER DUST

Researchers have found that one simple but effective means of reaching a larger audience is through radio broadcasts. In southwestern Nigeria, researchers led by START grantee Victor Adekunle of the Federal University of Technology in Akure, Nigeria, found that more than a quarter of farmers they surveyed had learned about climate change from the radio. In Benin, grantee Irenikatche Akponikpe, a researcher at the Université de Parakou, together with colleagues, organized programs in French and local languages that discussed climate change, its likely effects on agriculture, and the advantages of improved crop management. Along coastal Nigeria, Oluseyi Fabiyi developed jingles and slogans in pidgin English to communicate with local communities about climate change.

START-supported researchers have also used film to reach a wider audience. In Hamburg, South Africa, Ribbink and his fellow researchers made a short movie to illustrate problems involving food security and the overuse of natural resources—in this case, marine life in a local estuary. “Reports gather dust,” said Ribbink. Researchers have shown the film to audiences in Hamburg and elsewhere. “When they

see the message and hear what people say, it is much more meaningful,” he says.

GETTING THE WORD OUT

Many researchers organized workshops that brought together farmers, community leaders, scientists, government officials, and NGO representatives to discuss research findings and problems facing local communities. A research team led by Olivier Crespo, a scientist at the Climate Systems Analysis Group at the University of Cape Town, organized meetings with farmers and other stakeholders in Free State, South Africa, that integrated collaborative analysis of crop records and crop model outputs with discussion of farmers’ experiences in choosing production and risk management strategies. The meetings enabled scientists and stakeholders alike to ask questions of one another and talk through shared examples of challenges and successes.

In the Lake Victoria Basin, which straddles Uganda and Rwanda, John Wasige, a researcher at Makerere University in Kampala, Uganda, and a team of researchers held workshops with farmers, local



John Wasige from Makerere University brought together National University of Rwanda students to discuss climate change indicators.

leaders, and government officials in both countries. They discussed local problems, including intense storms and flooding but also drought and delayed rains, as well as a range of adaptive measures, including cultivating drought-tolerant crops, planting trees, and building soil and water conservation structures. Joseph Gasana, head of the Uganda Agriculture Border station in Karama, noted that “previous local development programs were top-down but this workshop was now a direct opportunity for the community to plan something that will work for themselves.”

COLLABORATION ACROSS BORDERS

In these ways, researchers have tried to directly engage local communities and other stakeholders in thinking about the problems of natural resource use and livelihoods in the face of climate change. At the same time, many START researchers have reached out to peers at other institutions and in other countries,

Participant presents group work at workshop in Botswana.



number of researchers from France, Italy, and Norway, who were invited to foster closer ties between African and European scientists. “Just from that point of view it was a successful project,” said Mahe, who added that colleagues in France had already expressed interest in working with the North African scientists.

FORGING INNOVATIVE PARTNERSHIPS

START-supported projects have led to other innovative ways of encouraging communication and collaboration within research teams. A project that investigated the adaptation strategies of smallholder farmers in Ghana was organized by scientists from the NGO Conservation Alliance. It aimed at demonstrating the potential for bringing scientific rigor to the developmental efforts of NGOs.

“Researchers in Africa have often been accused of undertaking studies just for the purpose of satisfying academic require-

Stakeholders in the Eastern Cape of South Africa discuss sustainable agriculture.



creating new opportunities for collaboration across disciplines and borders. In northern Africa, researchers from Morocco, Tunisia, and Algeria came together for a series of workshops and field trips focusing on the condition of coastal lagoons across the region. The aim of these workshops was to discuss threats to the lagoons posed by population growth and climate change, but also to foster professional collaboration.

“One of the difficulties in North Africa is getting researchers from different countries to work on the same project,” said Gil Mahe, a researcher at University of Mohammed V-Agdal in Rabat, Morocco. A result of their collaboration was the formation of the Maghrebien Lagoons Network, an ongoing research network of North African scientists. The workshops also included a small

ments rather than finding solutions to the many challenges that confront society,” said Yaw Osei-Owusu, the Principal Investigator of a START-supported grant. “Similarly, the academy has labeled most non-profit organizations as implementing projects that lack a sound scientific base and are therefore unable to provide lasting solutions to any community problem. Our work combined the benefits of academic excellence with concrete development impact.”

In these and other ways, African scientists are using their research to open up new lines of communication and collaboration

through START grants. From their perspective, helping fellow Africans meet the challenge of climate change and other threats to their livelihoods, especially environmental degradation and poverty, demands not just more research, but also greater cooperation, wider outreach, and more sustained effort at the local level. It is work that needs to engage other researchers as well as farmers, policy makers, NGOs, and governmental officials. Perhaps the most critical part of this outreach, researchers say, is seeing the local community members not merely as beneficiaries of scientific research but as ongoing participants, collaborators, and partners.

START

START researchers have reached out to peers at other institutions and in other countries, creating new opportunities for collaboration across disciplines and borders... helping Africans meet the challenge of climate change and other threats to their livelihoods, especially



Village chief in Okavango Delta speaking during weatherman workshop in Botswana

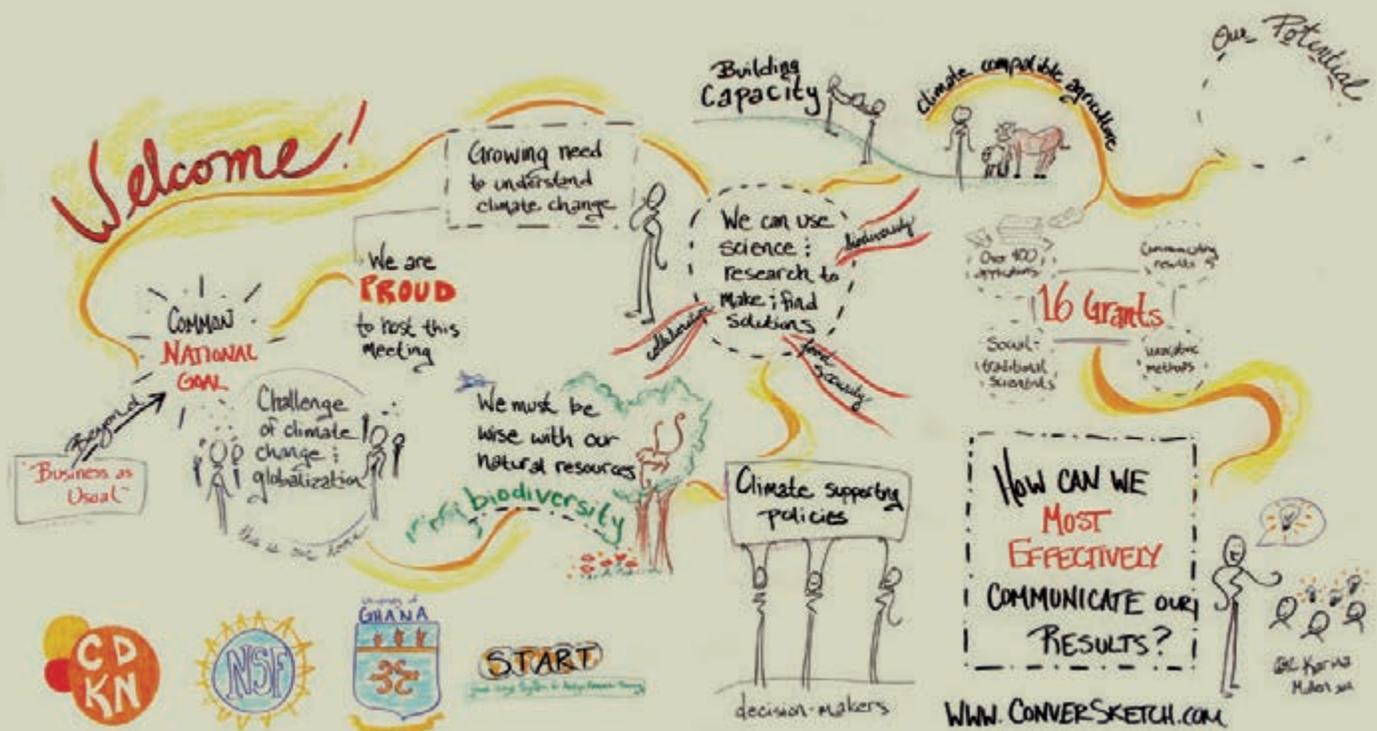


Workshop on lagoons in Annaba, Algeria

environmental degradation and poverty, demands not just more research, but also greater cooperation, wider outreach, and more sustained effort at the local level.



GLOBAL ENVIRONMENTAL CHANGE RESEARCH & LEARNING FORUM



In November 2012, a group of nearly 60 researchers, educators, and development practitioners from 17 countries across Africa and abroad came together in Accra, Ghana, for the first annual GEC Research and Learning Forum. The three-day event was organized by START in partnership with the Institute of Environment and Sanitation Studies of the University of Ghana. The forum provided an opportunity for recipients of the 2011 START Grants for GEC Research in Africa as well as other regional and international experts to present their research and shared experiences on how climate change is impacting agriculture and food security in Africa. Included in the Forum's events were targeted training activities offered by Nairobi-based Well Told Story and other integrative, participatory exercises that aimed to strengthen future research and communication efforts.

Research presented at the Forum spanned a spectrum of themes, topics, and achievements. Presentations are available for download on the START website at <http://start.org/programs/africangec/2011-grants/learning-forum>.

DEBATING THE POWER OF NETWORKS

The establishment of networks is often touted as a powerful solution to the perennial challenge of advancing science in Africa, and indeed many networks relevant to climate change are beginning to emerge within the African research community. However, it is too often the case that a network is created, initial actions are taken, perhaps early results are achieved—and then activity stops. Participants of the 2012 GEC Research and Learning Forum noted that this cycle is largely due to a systemic lack of continuity in many networks' communication and collaboration processes, and general lack of resources to continue research and to evaluate the effectiveness of the network.

This begs the question: Do networks truly offer the catalyzing and sustaining force needed to enable useful and productive connections? Discussions at the Learning Forum echoed these concerns, calling for networks that bring together multiple types of groups to work together effectively and sustainably to improve research processes and outcomes in Africa. Forum participants emphasized that the lack of opportunities for coordination between research groups is creating missed opportunities for knowledge sharing and collaboration, leading to unnecessary duplication of efforts. Participants also challenged the African climate change community to work together to change the “face” of networks. They emphasized that we must rethink how networks are perceived, re-envision how they operate and reignite the successes that networks can instigate and sustain.

RESEARCH AS PRACTICE

Not enough research is action-oriented.

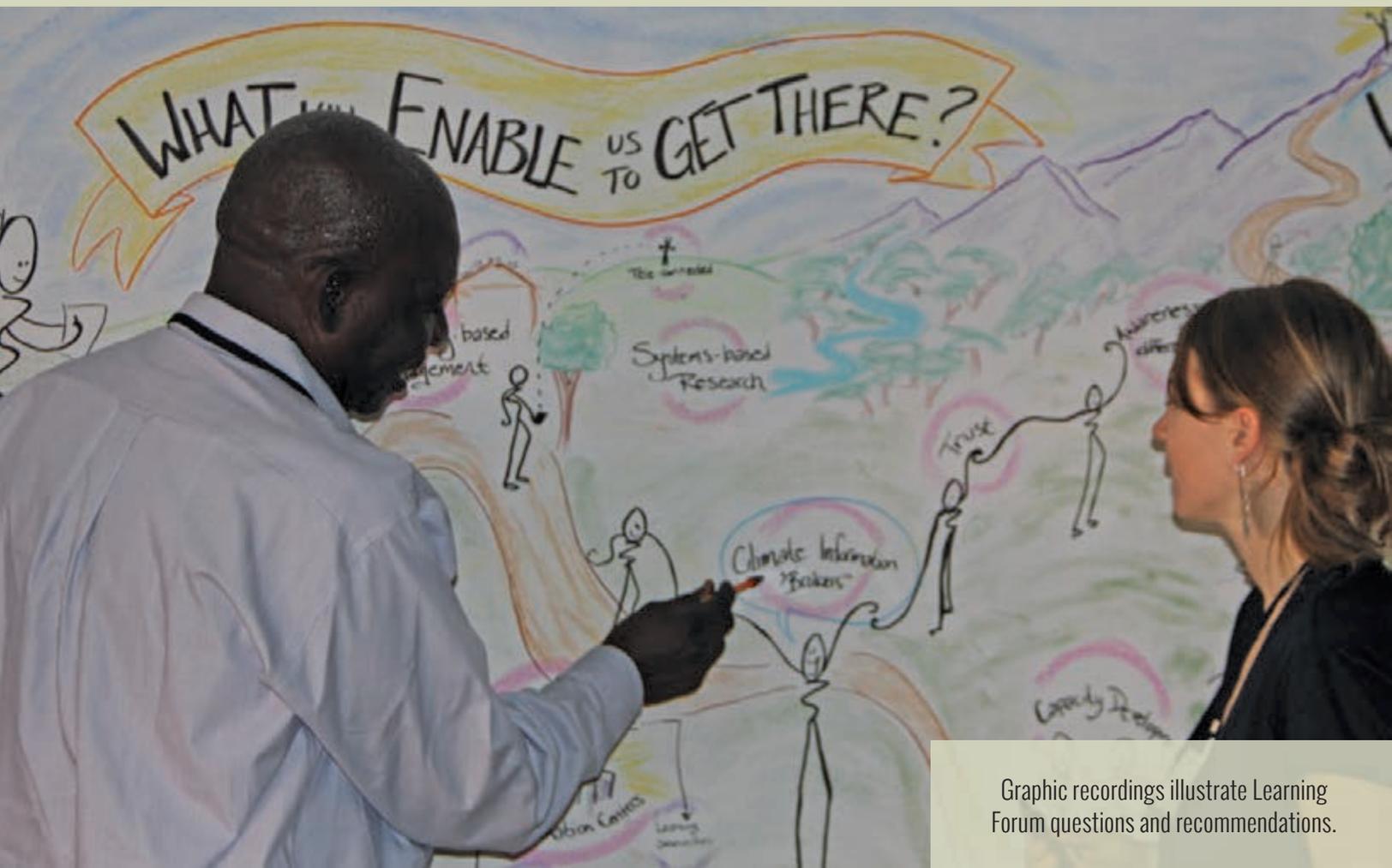
Project timeframes are too short.

Lack of follow-up after a project or activity.

Communication is too often one-sided.

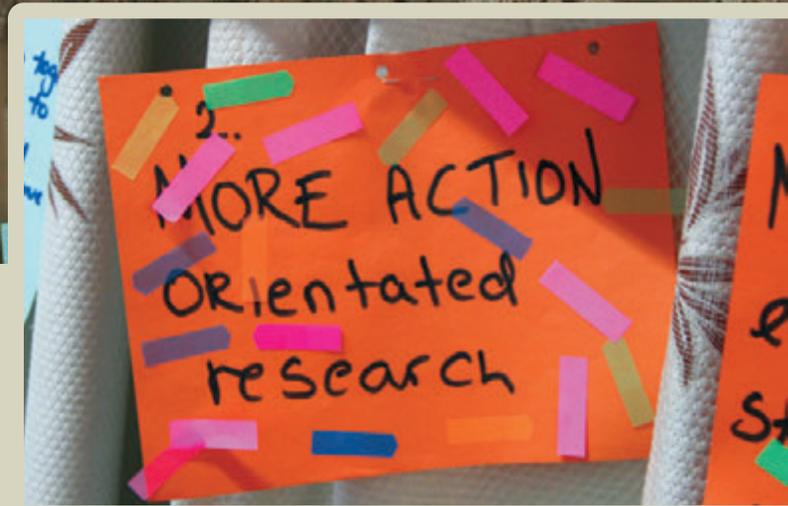
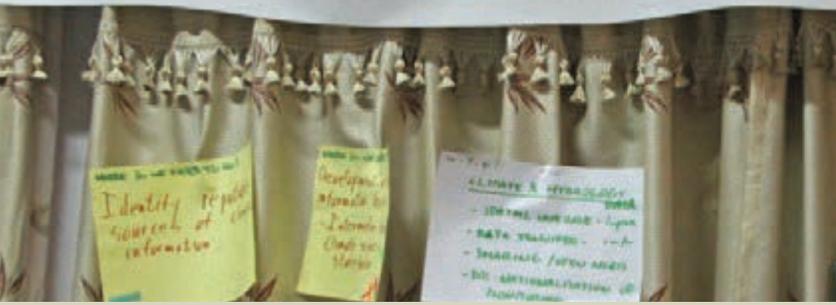
Many times, the gap between research and its application into practice or decision-making is blamed on these complaints. Discussion then turns, inevitably, to frustration over the perceived silos of scientific disciplines—and the similarly confined knowledge that they produce. Participants of the 2012 GEC Research and Learning Forum agreed that real-time, real-world challenges cannot be slotted into the same silos that so often characterize academia. The usual calls for more interdisciplinary research collaborations and increased engagement with stakeholders quickly gave way to serious questions, however—questions that challenged Forum participants to consider what is meant by action-oriented research and where the most effective entry points for influencing change, by way of such cooperation, might lie.

Forum participants expressed a common desire to integrate research with development efforts that directly affect people, and they emphatically identified **more action-oriented research and communication** as a way forward in this respect. Strategic and effective communication tools and pathways are not only important parts of the research experience—indeed, they are required to achieve research objectives. Communication enables



Graphic recordings illustrate Learning Forum questions and recommendations.

Where do we need to go?



engagement, sharing, and relationship building. Research carried out in true partnership, as collaboration between multiple groups, interests, and perspectives, demands multi-directional communication at every step along the way.

Given their strong emphasis on action-oriented research, Forum participants also reiterated **the need for improved communication about real experiences** in designing, implementing, and advancing the goals of relevant approaches and methodologies. This was emphasized by Bougouna Sogoba, a researcher at the Association Malienne d'Eveil au Développement Durable (AMEDD) in Mali:

“Action research is largely carried out in developing countries. Lots of work is done ... and we're not sharing that with each other! Transferring that knowledge is a challenge. To address that challenge, we need new approaches and new strategies.”

Indeed, an overarching message that emerged from the Learning Forum was the need for sustained provision of opportunities for knowledge exchange as well as training and skill development for all members of the climate change community in Africa—researchers, practitioners, and educators—based on priority interests and needs.

BROKERING KNOWLEDGE

Forum discussions also underscored the daunting data constraints that climate change researchers and practitioners constantly face. Availability of data is inadequate, and significant knowledge gaps persist in many regions and sectors, despite a surge in interest, funding, and research. As a result, it is not uncommon to design research based on the datasets that are available, rather than what is actually needed, thus limiting the potential of the research community as a whole. Although data portals and platforms are proliferating in response to these well-recognized challenges, it is difficult to evaluate their effectiveness or the quality of data that goes into them.

General consensus at the Learning Forum was that we must strengthen the base of data that is available and make that information and knowledge more accessible within systems of

Do networks truly offer the catalyzing and sustaining force needed to enable useful and productive connections? Discussions at the Learning Forum echoed these concerns, calling for networks that bring together multiple types of groups to work together effectively and sustainably to improve research processes and outcomes in Africa.

efficiently managed and usable sources. Aligned with the Forum's call for more action-oriented research, participants strongly advocated for the involvement of communities in data collection and monitoring. Participants also urged that intermediaries must be created and nurtured to support exchange of data, information, and knowledge. They proposed that the climate change community consider promoting "Climate Information Brokers"—individuals who can transform and translate data, making it readable and usable for multiple audiences and purposes.

TAKING IT FORWARD

The 2012 GEC Research and Learning Forum marked the first time since inception of START's Grants for GEC Research in Africa that the program's research teams were able to come together to share their work. By design, the interactive event aimed to catalyze creative strategizing and future collaborations through face-to-face interactions among grantees and other leaders in their fields. The event was well received, with many participants underscoring the need for more such opportunities for peer-to-peer learning and joint development of ideas.

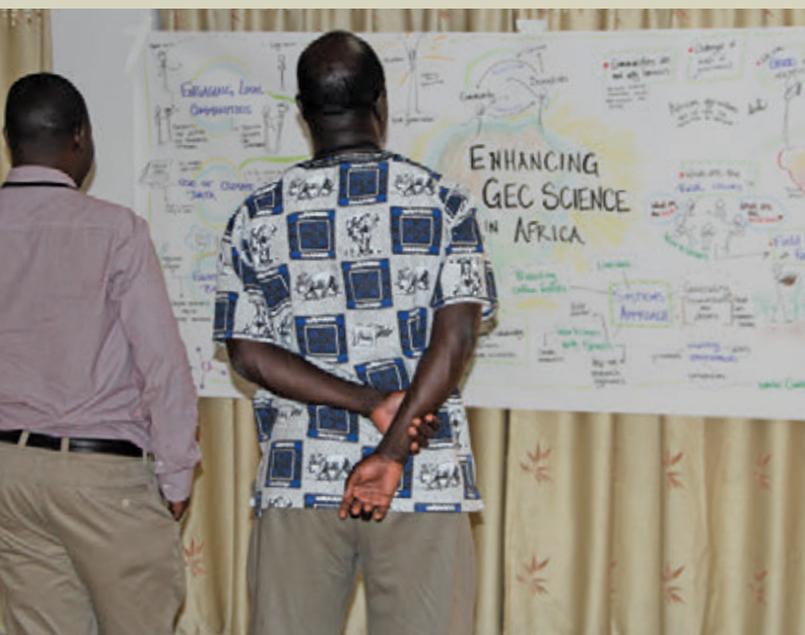
Several participants committed to follow-on activities after returning to their home countries, some in partnership with others they met at the Forum. For example, Jane Bemigisha, a researcher at the International Foundation for Science in Uganda, was encouraged by the connections that she made in Ghana. Brought together by shared interests in issues of gender and climate change, Bemigisha and several new colleagues from the University of Ghana and the Climate Change, Agriculture and Food Systems (CCAFS) Program brainstormed ideas for collaboration. By the end of the Forum, Bemigisha announced the group's commitment to initiating a "think tank network" that enables continued communication and collective planning between East and West African institutions. When asked how the network might be sustained, the group shared innovative ideas for visioning and support.

With a mandate to "help communities build," Baba Niber of World Vision (Tanzania) described providing a pipeline for research results as one of his institution's responsibilities. Niber led a series of discussions during the Forum with the goal of identifying common goals for improving uptake of research into practice. Reneth Mano of the University of Zimbabwe, who actively participated in the discussions, challenged all Forum participants to harness their frustration over lack of uptake as fuel for instigating change. Participants agreed that an easy first step would be for each individual to integrate something that they learned from the Forum into a proposal back home. Hubert N'djafa Ouaga and Bougouna Sogoba, both based in Mali at the International Union for Conservation of Nature and AMEDD, respectively, took this charge seriously, collaborating on the last day of the Forum to produce the first draft of a concept note that describes a joint program of research and applied action between their organizations. "We want to have a cluster of partners," said Sogoba. "The Learning Forum is helping us get things started."

Participants' other ideas for follow-on actions included "Adopt a journalist" and "Adopt a policymaker" partnerships in which researchers could reach out to, educate and be educated by representatives in media and policy arenas. Several participants explored possibilities for curriculum-sharing between their institutions, and Forum participants from Mali devised a plan for organizing a national fair for scientists and traditional knowledge representatives to promote knowledge exchange and collaboration.

The 2012 GEC Research and Learning Forum was made possible by generous support from the Climate Knowledge and Development Network (www.cdkn.org). Renewed support to START from the U.S. Global Change Research Program (www.global-change.gov), administered by the U.S. National Science Foundation, is enabling the Forum to persist as an integral annual activity of the START Grants for GEC Research in Africa program.

For more information on Grants for GEC Research in Africa or the GEC Research and Learning Forum, please visit www.start.org or contact Sarah Schweizer at start@start.org. 





START announces the 2013-2014 research teams

The theme for the 2013-2014 grants is **global environmental change, agriculture, and food security**, with an emphasis on creating an understanding of how those subjects are linked to ecosystem services and sustainable livelihoods.

This year the program is supporting 11 research teams with investigators coming from Morocco, Nigeria, Uganda, Zimbabwe, South Africa, Colombia, and the U.S. The START Grants for GEC Research in Africa are provided only to research teams with investigators who are associated with an African institution of higher learning or with an African non-governmental organization.

The high quality interdisciplinary GEC research contributes to international collaborative research partnerships and strengthens African research networks. The project outcomes contribute to knowledge sharing and informed decision-making among communities of science, policy, and practice within Africa.

Funding for the grants is provided by the Climate and Development Knowledge Network, and the U.S. Global Change Research Program, administered by the U.S. National Science Foundation.

Modeling the Potential Impacts of Afforestation on Mitigating Climate Change and Extreme Events in Southern Africa



Abiodun, J. Babatunde, *University of Cape Town, SOUTH AFRICA*



Anderson, Pippin



Mackellar, C. Neil



Steynor, C. Anna



Bamutaze, Yazidhi, *Makerere University, UGANDA*



Kayendeke, Ellen



Oyana, Tonny



Waiswa, Daniel

Implications of Climate Change on Agricultural Practices and Food Security in Fragile Mountain Ecosystems: A Case Study of Mt. Elgon in Eastern Uganda

Vulnerability of Settled Fulani Agro-Pastoralists' Livelihoods to Climate Change and Emerging Innovations For Adaptation and Land Accessibility in Southwest Nigeria



Fabusoro, Eniola, *Federal University of Agriculture, Abeokuta, NIGERIA*



Fasona, Mayowa



Oyedepo, John



Sodiya, Comfort Ibironke



Hetem, Robyn S., *University of the Witwatersrand, SOUTH AFRICA*



Archer-Van Garderen, Emma



Koelle, Bettina

Heat Stress of Sheep: Livestock Monitoring in the Suid Bokkeveld of South Africa

An Assessment of Gender Roles and Traditional Knowledge Systems in Enhancing Climate Change Adaptation and Household Food Security in Lake Victoria Basin, Uganda



Leju, Julius Bunny, Mbarara University of Science & Technology (MUST), UGANDA



Asiimwe, Joyce Ayikoru



Tolo, Casim Umba



Weisheit, Anke

Assessing Adaptation Capacity of Crop Management Strategies for Small Holder Farmers in Zimbabwe



Crespo, Olivier, University of Cape Town, SOUTH AFRICA



Mhizha, Teddious, University of Zimbabwe, ZIMBABWE



Hachigonta, Sepo



Mashonjowa, Emmanuel



Zinyengere, Nkulumo

Enhancing Resilience to Climate Change and Variability: Cassava and Sweet Potatoes in Uganda



Otim-Nape William George, Africa Innovations Institute, UGANDA



Andresen, Jeffrey



Ddumba, Saul



Olson Jennifer



Sengendo, May

Trade-Offs and Synergies in Climate Change Adaptation and Mitigation in Coffee Systems



Van Asten, Petrus J.A., International Institute of Tropical Agriculture (IITA), UGANDA



Grab, Stefan



Läderach, Peter

Linking Agriculture and Socio-Economic Drivers to Assess Vulnerability and Food Security in Morocco for The Horizon 2030



Messouli, Mohammed, University Cadi Ayyad, MOROCCO



Boukacha-ba, Niama



Bounoua, Lahouari



Ifaadassan, Issam



Kahime, Kholoud



Mahdi, Mohamed



Rochdane, Saloua

Integrating Indigenous and Empirical Knowledge to Stabilise Household Food Security in a Changing Climate in Smallholder Communities of Zimbabwe



Nezomba, Hatirarami, University of Zimbabwe, ZIMBABWE



Mapfumo, Paul



Rurinda, Jairos



Siziba, Shephard

Coping With Global Environmental Change: Resilience and Adaptability of Rural Communities on the West Coast of South Africa



Palmer, Anthony, Agricultural Research Council, SOUTH AFRICA



Atkinson, Doreen



Cupido, Clement



Gabriels, Natasha



Knight, Richard



Samuels, M. Igshaan



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