

Improving access to climate-related information for adaptation

In sub-Saharan Africa, inadequate capacity to collect, analyze and disseminate climate-related information, combined with poor farmer knowledge and skills in using such information, are a significant constraint to productive farming. In response, IDRC research is using information and communication technologies to support more timely, accurate and localized weather forecasting, and building scientific understanding of climate change impacts at local level.



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A research project in Uganda used ICTs to provide localized, seasonal weather forecasts, agricultural advisories and other adaptation information in local languages to farmers in three districts.

Summary

In East and southern Africa, rain-fed farming is practised by the vast majority of smallholders, yet it is increasingly a gamble. To reduce the risk of crop failure, farmers need timely, accurate weather forecasts and agricultural advisories, and the knowledge and skills to use them. Currently, however, rainfall, temperature, humidity and other data supplied to meteorological departments in the region is scanty. Forecasts are not timely and also lack local detail and relevance to address the needs of farmers. In response, IDRC-supported research has focused on improving the collection, analysis and delivery of climate-related information and building scientific understanding of how climate change and variability is expected to impact at the local level through climate projections and forecasts. Information and communication technologies (ICTs) are increasingly being used to: gather and share climate and market data; improve collaboration between local, regional and national agencies; and distribute weather-based agro-advisories and forecasts. These strategies also have the potential to be scaled up across the region.

IDRC's Climate Change and Water program has supported research to improve the collection, analysis and provision of adaptation information for planning and decision-making in six countries: Kenya, Lesotho, Madagascar, Malawi, Swaziland and Uganda. This brief synthesizes the lessons from this body of research and also provides recommendations for future work.

The problem

Across Africa, farming communities are facing increasingly unpredictable weather patterns as a result of climate variability and change. Historically, governments in many countries were able to use meteorological data to provide fairly reliable advice to farming communities, such as what to plant, when to plant, how much to plant, and how to plant. However, increasing climatic change has made this much more challenging. Traditional, indigenous weather forecasting, based on natural signs, has also been undermined by highly variable climatic patterns seen from year to year. The challenge of providing accurate climate information is not only

related to weather forecasting; national, regional and local authorities also need to access climate information, tailored to their particular scales of responsibility, in order to develop appropriate climate adaptation plans.

The poor quality of weather forecasting is in part due to a lack of meteorological infrastructure and properly trained staff. Often, weather stations are only found in airports and serve air transport needs. In Uganda, where 1,000 rainfall stations are needed, there are only 150 functional rain gauges. In Madagascar, there are only 30 functional weather stations across the whole country. Countries that have experienced civil war in recent decades are likely to have even fewer. As a result, very limited climatic information is transmitted to central meteorological departments, and there are frequently long delays in that information being submitted or received. The manually recorded data sets are usually sent through regular mail, taking several days; by the time this data reaches the meteorological departments it can be irrelevant for making forecasts. Coordination and collaboration



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In Kenya, climate data was interpreted using expertise on soil, insects, food and other areas to generate advisory documents for farmers. These were discussed and explained during farmer meetings.

between remote weather stations and central staff can also be poor, such that national standards for data collection are not followed and local data is not properly calibrated against national systems.

Despite these constraints, meteorological departments continue to generate and disseminate weather forecasts as best they can. However, in the majority of cases, these forecasts are of very little help to farming communities. Given the variability in weather patterns, farmers need information that is specific to their immediate area, but most forecasts are generalized for country level and lack area-specific detail. They also tend to be quite infrequent, potentially being issued just once per month or longer, and are not communicated long enough in advance for farmers to respond effectively. Furthermore, they can also be challenging to understand; they are seldom communicated in local languages, and tend to describe future rainfall events in terms of percentage probability, which can be difficult to interpret.

For local and national authorities tasked with making climate adaptation plans, a lack of locally specific information on the nature and consequences of climate variability and change is a major hindrance. In southern Africa, for example, data that exists tends to be based on global and regional estimates, such that even national adaptation plans are rarely based on strong scientific evidence. Climate models are needed to provide county

or district level information, but a lack of historical data from local weather stations limits the ability of scientists to construct such models accurately.

Research focus

Through the Climate Change and Water program, IDRC has supported research focused on finding practical and affordable solutions to climate change challenges faced by rural communities in East and southern Africa. Solutions include developing and testing technologies and systems for climate information delivery, developing analytical models to inform climate adaptation planning at a variety of levels, and improving collaboration between climate, agricultural and other agencies. Research in the region has taken the following approaches:

Kenya

The project generated precise estimates of the impacts of climate change on some key food crops, provided farmers with seasonal forecasts and agro-advisories, and assessed a variety of adaptation strategies to mitigate the impacts. These results are being used to support three county governments in semi-arid eastern Kenya in developing appropriate adaptation strategies and programs to assist farmers in adapting better to climatic changes.

Lesotho, Malawi and Swaziland

The project worked on building scientific understanding of localized climate scenarios in the three southern African countries. The team then integrated these scenarios with crop growth, adaptation models and information on household vulnerability, in order to determine the overall feasibility of recommended cropping options for different categories of vulnerable communities.

Madagascar

The project gathered reliable information on surface water and groundwater stocks in the Mahafaly plateau (in southwest Madagascar) and created a database for local authorities, the Ministry of Water, and other project partners. Focus groups and surveys were

used to gather information on communities' water demands and water use practices, to inform decision making on sustainable water management.

Uganda

Using information and communication technology (ICT) tools, the project provided localized, seasonal weather forecasts, agricultural advisories and other adaptation information in local languages to farmers in three districts. It then assessed how improved access to such information enabled farmers to take appropriate adaptation actions, such as planting early maturing crops, to minimize the impact of climate variability and change.

Adaptation solutions

Gathering, processing and delivering information

Gathering rainfall and other climatic data is vital if the accuracy of forecasting is to be improved. The first step to improving access to climate-related information is to ensure this data can be gathered, by rehabilitating or installing meteorological equipment. The Uganda project installed rain gauges and rehabilitated some automatic weather stations in 22 sub-counties across three intervention districts. The



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Sending rainfall data by mobile phone has improved the accuracy of forecasts in Uganda.

project also provided mobile phones to data collectors so that daily rainfall readings and other weather information could be sent directly, using the mobile network, to the national meteorology department for analysis. The phones were also used to collect market price information from 46 market outlets for local crops and livestock.

In Madagascar, gathering of information to guide sustainable management of water resources took the form of a comprehensive inventory of water points in three municipalities in the southwest of the island. This included capturing data on water quality, quantity, local water needs and community-level water management practices. Feeding that information back to the communities will inform water point management, including the servicing and maintenance of water infrastructure. Failings in management will also be used to guide improvements in municipal development plans.

Once rainfall data and other information has been gathered, systems are needed to manage and process it. In southern Africa, the three country project initiated the development of climatic and agronomic databases by local meteorological offices and research stations, respectively, for wider use. Most of the data was converted into digital formats, improving access and sharing. In Madagascar, water point information is fed into a database where it can be accessed and analyzed by a variety of actors, including local authorities and the Ministry of Water.

Improved delivery of information is another key area. In Uganda, the project introduced the use of interactive community radio, loud speakers in markets, as well as mobile text messaging and email. Around 100,000 farmers were provided with seasonal and 10-day localized forecasts by the Uganda National Meteorological Authority (UNMA). Previously, it would take 1-4 weeks for the 10-day forecasts to reach farmers. With support from the project, these arrived the same day, sent to their mobile phones as text messages in local languages.



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Gathering local data, such as on market prices, is important in developing valuable, relevant and timely information services that improve farmers' decision-making in the context of an uncertain climate.

Supplementary information

Provision of timely, localized weather forecasts may not, by itself, be sufficient to enable farming communities to mitigate climatic challenges. Farmers working with the Uganda project were able to demand and receive weekly market information, guidance on low cost rainwater harvesting technologies, drought and flood coping strategies, agricultural advisories and termite control measures. It was found that 75% of the households used the information, and were able to reduce crop loss and damage by up to 67% in one year compared to previous years.

In Kenya, once a forecast had been prepared, representatives of the meteorology department, farmer representatives and specialists in soil, insects and food were invited to discuss its implications. This led to the production of an advisory document to share recommendations on which farming strategies would have the highest chance of success in a given season. Farmer meetings were then called to discuss the advisory and to see which options they wanted to take. In a study conducted to determine the usefulness of this information to farmers, over 80% of them

appreciated its value and indicated their willingness to pay for this service.

As was the case in Kenya, coordination and collaboration in the Uganda case brought together national, district and village level institutions. This process was incorporated into the routine activities of participating institutions such as UNMA, the Climate Change department, and district government departments responsible for water, agricultural advice and natural resource management, among others. As in Kenya, this enabled the timely generation and delivery of adaptation information to communities. Households were also linked with community support organizations that could provide resources to enable farmers to take action on the information and knowledge they acquired.

Informing policy and improving coordination

The southern Africa project focused primarily on generating evidence to inform policy and decision-making processes. Using global climate information known as General Circulation Models, local projections were developed to predict future changes in crop yield. A locally developed Household Vulnerability Index was used to target households with specific technologies that were, in turn, chosen on the basis of a cost-benefit analysis. Thus, the project took a multi-dimensional approach, including economic and livelihood information as well as climatic and agronomic data. The findings were shared with a wide range of organizations, including NGOs, farmers' organizations at national and regional levels, research institutions and extension agencies, as well as the communities themselves.

Likewise, the project in Uganda applied 20 different General Circulation Models for downscaling temperature and rainfall projections, to predict how the changes would affect productivity of major crops in the country. These results were subsequently shared with policymakers. The work also led to the participation of the researchers as a party to the Ugandan Government



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Feedback from farmers on the quality and accessibility of information delivered, and on their willingness to pay for it, are important elements in enhancing the value and sustainability of climate information services.

delegation during the 18th – 20th sessions of the Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC). Meanwhile, the work in Madagascar has led to greater synergy and complementarity among national and international organizations working in the study area, enabling three major NGOs to reach an agreement on where to focus their interventions.

Future investments and research priorities

In countries such as Uganda and Kenya, where climate information delivery systems have been put into operation at a pilot scale, there is need to undertake further research on the technical, financial and institutional infrastructure for such adaptation information systems to be scaled up and made sustainable. This should include not only weather forecasting, but also more developed information such as the agricultural advisories produced in both the Kenyan and Ugandan projects. Increased coordination and collaboration between county or district governments and national meteorological departments will be essential, in order to develop sustainable mechanisms for gathering, analyzing, processing and delivering appropriate, timely information to farmers. It is

also important to ensure that feedback from farmers is incorporated to enhance the content shared. Trials should be developed to assess the applicability of these systems for other agro-ecological regions and in other countries.

One important issue that requires further research is to assess different options in terms of how to finance the delivery of weather forecasts and other adaptation information. This includes assessment of communities' and community support organisations' willingness to pay, and the role of the private sector in the dissemination of adaptation information. Increased funding, whether from local or national authorities and agencies, is likely to be necessary. Researching the longer term benefits of information delivery, in terms of community resilience to climate variability and change, may be necessary in order to justify this investment.

In providing advice to local and national authorities on how limited adaptation funds can be targeted, further research is needed. At a technical level, research should focus on how projected future climate scenarios can be used to determine the choice of adaptation options, drawing on cost-benefit studies. It is important to be able to offer the right range of options to households with differing levels of vulnerability.

For this, more work is needed to determine the optimal level of resource endowment for the effective adoption of specific adaptation strategies.

Contributing authors:

Berhane Gebru, Patrick Kibaya, Tiana Ramahaleo, Kizito Kwena and Paul Mapfumo

More information

To learn more about climate change research funded through IDRC, please visit: www.idrc.ca/ccw

 Edith Ofwona: eadera@idrc.ca

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International Development Research Centre
 Phone: +1 613 236 6163
 Fax: +1 613 238 7230
info@idrc.ca
www.idrc.ca

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