Making Climate Information Work for Agricultural Development

By James Hansen, on 21 Feb 2012

In 2009, at the WMO's World Climate Conference 3 in Geneva, delegates representing 155 nations called for a Global Framework for Climate Services (GFCS) "to strengthen the production, availability, delivery and application of science-based climate prediction and services." Given that the climate is changing and the past is no longer an adequate indication of the future climate, the GFCS builds on the experience of weather services, with a focus on using seasonal and longer-term, inherently probabilistic information to manage climate-related risk. A High-Level Task Force recently released a report (.pdf) that outlines priorities and a plan that is to be implemented as a U.N. process. The priority is to strengthen climate observations and address gaps in climate services in vulnerable developing countries, in support of climate-sensitive sectors such as agriculture, disaster risk reduction, health and water. Though the report highlights climate data as a core principle, it takes a rather weak position, limiting itself to stating, "The Framework should promote the free and open exchange of climate data while respecting existing data policies."

More recently, in October 2011 in New York, the first International Conference on Climate Services launched the new Climate Service Partnership (CSP), an informal global network of climate service providers, institutional users and interested researchers and donors that aims to advance climate services worldwide. It complements and seeks to contribute to the more formal U.N. GFCS process, with its emerging priorities including fostering connections between information providers, users, donors and researchers; synthesizing and sharing knowledge about existing climate services; and filling gaps in knowledge and evidence. CSP sponsors are also working to develop new initiatives to fill gaps in existing climate services.

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Meteorological and Hydrological Services (NMHSs) as a necessary component of any strategy to mitigate weather- and climate-related risks. Its recently launched Weather and Climate Information and Decision Systems program aims to identify gaps in national capacity and develop financial packages to support the modernization of NMHSs in developing countries, with a focus on investment in knowledge management, capacity development and operations.

Climate for Development in Africa (ClimDev-Africa) is an 11-year program of the African Development Bank, the African Union Commission and the U.N. Economic Commission for Africa that was launched in 2009. It seeks to protect and promote development in the face of climate risk by: building the capacity of African climate institutions to generate and disseminate useful climate information; enhancing the capacity of end users to mainstream climate into development; and implementing adaptation and mitigation programs that incorporate climate-related information. ClimDev-Africa is, in part, a response to the multistakeholder, cross-sectoral assessment of the use of climate information in Africa cited earlier.

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The Climate Change, Agriculture and Food Securing (CCAFS) initiative, which funds and coordinates research on climate change adaptation and mitigation across the Consultative Group on International Agricultural Research (CGIAR) system, includes a focus on improving climate information and climate services for agriculture and food security. Through its program theme "Adaptation through Managing Climate Risk," CCAFS is working to: address gaps in historical observations by blending station and satellite data; improve methods and tools to forecast impacts of climate fluctuations on crops, rangelands, pests and diseases; understand what institutional arrangements and communication processes can best enable rural communities to receive and act on relevant information; and derive transferrable lessons from existing farmer-focused climate information and advisory programs. It also seeks to connect the considerable research capacity of the CGIAR with new climate science and climate service partners, including the CSP.

What Remains to Be Done?

There is certainly room for investment to address gaps in meteorological observations. New investment in observing infrastructure, and particularly automatic weather stations, is needed to reverse the decline and improve near-real-time monitoring. But new infrastructure cannot address gaps in the historical record. Ongoing investment is making some headway in rescuing and digitizing older paper archives. This needs to be accelerated and in some cases extended to include older records that may reside in former colonial powers. Remote-sensing satellites, which provide a complementary source of weather data estimates, are also a potential source of improved data. But current satellite-based rainfall data products are limited by some combination of short duration, coarse spatial or temporal resolution, nonhomogeneity in time due to satellite instrument changes and poor accuracy due to limited calibration with station observations. Building on Ethiopia's recent success with merging station and satellite data, CCAFS is working to combine station and satellite data, and to extend the approach to other agriculturally important variables.

There is now sufficient momentum for initiatives, such as those described above, to contribute to significant improvements in the production, communication and use of relevant climate information in the developing world. Unfortunately, data policy continues to be a difficult challenge. Short-term cost recovery considerations for NMSs still seem to have more weight than the broader needs of development. The body of evidence of the value of climate information for development is still pretty weak. Nevertheless, one very speculative estimate put the potential value to society of climate information on the order of 20 times the cost of producing the information. This would suggest that cost-recovery policies that prompt data restrictions may be an order of magnitude more expensive than a policy of fully supporting the data collection and service roles of NMSs through public funds.

While the growing attention to climate information for development is a welcome trend, it is too soon to predict which, if any, of the efforts to change restrictive data policies will succeed. One encouraging sign is the modest steps recently taken by a few developing countries. Rwanda is reportedly making all of its meteorological observations a free public good. Ethiopia's Enhanced National Climate Time Series and web-based analytical "map rooms" are the first of their kind in Africa. Hopefully a few high-profile successes will have a domino effect, prompting other countries to turn their climate observations into a public good and a resource for development. If we do see a breakthrough in free access to climate observations in the developing world, it could catalyze major advances in agricultural development and, with them, major gains in the livelihoods of vulnerable rural populations.

Improving crop production forecasts for agricultural planning and food security management. Effective management of food crises depends on early estimates of production and should benefit from any improvements in accuracy and lead time. The same holds for managing input supply and trade of agricultural commodities. Several international organizations and countries implement food-security monitoring tools that include climate and environmental monitoring, as well as simple weather-driven crop or water balance models, to estimate food production shortfalls in advance of the harvest. While their methodology is quite mature, there is considerable scope for improvement. With regard to rainfall estimates, in particular, using historical observations to calibrate forecast probability distributions would make the tradeoff between lead time and accuracy transparent.

Improving index-based agricultural insurance. Basing insurance payouts on an objectively measured index -- such as rainfall amount -- correlated to loss, rather than on losses themselves, overcomes problems with moral hazard, adverse selection and high transaction costs that have generally made traditional crop insurance unviable for smallholder farmers. Such innovative arrangements have resulted in a resurgence of interest in insurance for smallholder agriculture in developing countries. However, access to quality meteorological data is a widely recognized challenge for exploiting the full potential of index-based agricultural insurance. In particular, index-based insurance introduces a level of uninsurable risk, known as "basis risk," that results from the imperfect relationship between the index on which payouts are based and the losses that the insurance is meant to protect against. To limit this basis risk, index-based insurance pilot projects typically exclude farmers beyond some maximum distance from a long-term monitoring station, although a few are testing satellite-derived rainfall estimates or other proxy data. Efforts to improve the index or develop new indexes with lower basis risk may require access to historical data.

Detecting and attributing climate change. Poor agricultural investments and management strategies can result if either real climate change is not recognized, or if declining yields are misattributed to climate change when another driver, such as environmental degradation, is the underlying cause. It is challenging enough to determine whether particular extreme events, such as the recent string of droughts in the Greater Horn of Africa, are a result of anthropogenic climate change or consistent with natural variability, but it is impossible to do so without long-term historical observations. Analysis of the historical meteorological records may help farmers and other decision-makers determine whether the climate is really changing, whether a real change is a long-term result of anthropogenic forcing or a shorter-term result of natural multidecadal variations, or whether to look elsewhere for drivers of perceived change.

How Did We Get Here?

Global cooperation around meteorological services and observations expanded from the end of World War II into the 1980s. Most countries treated data as a public good, invested in observing infrastructure and agreed to share data and forecasts freely. However, several forces in the late-1980s and 1990s contributed to a global shift away from climate data as a public-good resource for development, and toward climate data as a source of revenue for national meteorological services. In the developed world, several countries, particularly in Western Europe, made efforts to recover a significant portion of NMS costs by commercializing aspects of their data and services. Furthermore, emerging private-sector weather and climate services were seen as competing with NMSs. Some European NMSs used data pricing and even intellectual property laws to limit competition from the private sector.

In 1995, the debate around meteorological data access led to World Meteorological Organization (WMO) Resolution 40, which now governs the international exchange of climate data. The resolution represents a compromise between proponents of data as a public good and those who seek to restrict access in order to support cost recovery and limit private-sector competition. It makes a distinction between a minimum set of "essential data and products which are necessary for the provision of services in support of the protection of life and property and the well-being of all nations," which should be freely available to NMSs and the academic community for noncommercial purposes, and additional data required to support WMO programs, which NMSs can restrict or charge for at their discretion. The net effect was that most countries greatly decreased the amount of data that they made freely available, according to a U.S. National Research Council report.

Also starting in the late-1980s, the major international development banks imposed structural reform policies that required developing countries to downsize many government programs as a prerequisite to obtaining financing. Like their counterparts in Europe and elsewhere, NMSs across the developing world were under pressure to raise revenues to supplement shrinking public budgets. While the global transportation industry provides steady demand for meteorological services in every country, the ability of vulnerable sectors such as smallholder agriculture to pay for services, and even articulate demand effectively, is quite limited. Because of the priority given to commercial sectors such as transportation that are able to pay for information and services, coverage tends to be poorest in rural areas. At the same time, budget limitations have limited the ability of NMSs to expand their range of services. This creates an incentive to turn to data as a source of revenue. Research and development initiatives that recognize the value of historical climate data and have the resources to pay for access to it are often willing to do so. In order to preserve marketability, purchases of data generally come with strict restrictions on sharing the data with others, including the intended beneficiaries.

A multistakeholder, cross-sectoral assessment of Africa released in 2006 (.pdf) described a widespread gap between the existing provision and use of climate information on one hand, and the needs of development on the other. The report attributed this to "market atrophy": Gaps in relevant climate information restricted the development of capacity within the climate-sensitive sectors to use climate information and articulate demand, while lack of effective demand from development stakeholders limited investment in the capacity of NMSs to support these sectors. It concluded that progress will require simultaneous investment in capacity on both the supply and demand sides.

Promising Initiatives

Widespread calls to treat climate data as a global public good have not yet been able to reverse the inertia of WMO Resolution 40 and the economic pressures on NMSs to generate revenues. However, in the face of increasing awareness of climate change and recognition of the need to help the most vulnerable to adapt, the issue is receiving increasing attention, with several recent initiatives investing in climate services for development.

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Dr. James W. Hansen is a research scientist at the International Research Institute for Climate and Society, at Columbia University, and leads the "Adaptation through Managing Climate Risk" theme of the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS).

Photo: Rice farmers in Mali (USAID photo).