Drought and the Role of International Organizations

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Institutional Concerns

A concern for the implications of drought on society and the environment has been a focus for the United Nations Environment Programme (UNEP) since its establishment. Drought was a feature of the Stockholm Conference on the Environment, and the famine-related strategy of the seventies was a factor in establishing the World Climate Program, currently implemented by seven United Nations bodies, including UNEP. More recently, the United Nations Conference on Environment and Development, convened in Rio de Janeiro in June 1992, devoted Chapter 12 of Agenda 21, the blueprint for sustainable development and environmental protection in the twenty-first century, to "Managing fragile ecosystems: combating desertification and drought."

UNEP has tailored its program to satisfy the demands of Agenda 21. It has been charged with specific responsibilities concerning the implementation of the Agenda 21 and has been designated Task Manager for the issue identified in Chapter 12 by the Commission for Sustainable Development. UNEP's Desertification Control Programme Activity Centre (DC/PAC) is the responsible office within UNEP for coordinating the UNEP effort.

UNEP's Climate Unit will contribute to the task in view of its long-term interest in drought and its own drought-related activities implemented as part of the World Climate Impact Assessment and Response Strategies Programme (WCIRP), a component of the World Meteorological Organization-led World Climate Programme.

UNEP's climate-related activities are, in addition to contributing to the World Climate Programme, part of UNEP's Atmosphere sub-program.

The program's most recent mandate--UNEP Governing Council decision 17/24B--requests the Executive Director, within the constraints of available resources, to further develop the WCIRP and *inter alia* give increased attention to preparedness measures in connection with climate change and sea level rise and responding to drought and other adverse climate events.

More recently (August 1994), the Committee of Permanent Representatives to UNEP requested more concrete action to be proposed under the Atmosphere sub-program, especially with reference to drought. It said that UNEP should develop a program which would help countries respond to drought-related problems.

UNEP established, as part of the WCIRP, an *ad hoc* Working Group on the Socio-economic Aspects of El Niño/Southern Oscillation (ENSO), which has met three times to discuss the impacts of specific El Niño events and, most recently, to identify and discuss ENSO-climate change interactions. The ENSO Working Group was established and its meetings convened in cooperation with ESIG.

Also, in association with the International Drought Information Center (IDIC) at the University of Nebraska-Lincoln, UNEP has organized three regional seminars on drought, for Eastern and Southern Africa; for Latin America; and for Asia and the Pacific. An output of the seminars was a Climate Unit guidebook for developing countries, "Preparing for Drought." Another publication based on UNEP's ENSO and drought-related work is "The El Niño Phenomenon," a volume of the UNEP Environment Library series.

In summary, UNEP considers drought and ENSO in the context of environment. It is concerned with assessment and sustainable management of the environment and has a specific interest in response option determination, including anticipation and early warning of drought; it has a responsibility for drought impact assessment and in improving public awareness and capacity building.

Problems Faced

Agenda 21 identified six program areas for action under the area "managing fragile ecosystems: combating desertification and drought." Activities under each program area are to be undertaken by governments at the appropriate level, and with the support of the relevant international and regional organizations. The program area related directly to drought is:

> "Developing comprehensive drought preparedness and drought-relief schemes, including self-help arrangements, for drought-prone areas, and designing programmes to cope with environmental refugees."

Other relevant program areas concern education and training, strengthening the knowledge base, and developing information and monitoring systems for regions prone to drought.

Although there are strategies available to reduce or mitigate the impacts of drought, they are either not applied or inadequately utilized so that drought remains a principal element of the poverty-spiral of developing countries. Although drought is a global problem, the worst-affected continent is Africa. Drought, coupled with political instability, population expansion, inefficient agricultural practices, debt burdens and primitive infrastructures, and mechanisms for problem-solving prevents the implementation of an integrated response involving preparedness, mitigation, and relief. Where action does occur, it usually involves

relief rather than preparation. When the response involves food aid, it is frequently less than timely, arriving only after the hungry have already been transformed into the starving.

There is a growing impression that donor countries are losing interest in the drought-vulnerable. While the victim may be ill-prepared through ignorance or through lack of resources, donor countries appear to prefer the cheaper option of post-drought intervention through aid or the abrogation of responsibility to the charitable organizations rather than heeding available information on risk, financing preparatory measures, and intervening to augment existing response measures inadequate for the severe event.

There is a suspicion also that drought is regarded as a less fashionable manifestation of climatic events. Resources are more easily accessed for the longer-term threat of climate change--important as that may be, rather than to meet the challenge of drought anticipation and preparedness. It is paradoxical that some developing countries actively address global change issues in their national scientific institutions and internationally in the climate change debate yet, although their countries are drought-prone, have inadequate or ineffective services to address the more immediate problem of drought.

But even when drought early warning systems exist, experience suggests that governments are unconvinced of the reliability of the forecasts and are unwilling to commit funds against speculation. A similar situation exists where national climate change impact assessments have been carried out. A survey of government responses to recommendations o UNEP-funded task teams in Southeast Asia for changed agriculture policies shows that unwillingness of ministries to initiate innovative policies in anticipation of climate change, almost certainly because of the financial risk involved for which a ministry, and perhaps even an individual minister, would be accountable. Drought occurrence can be blamed on the Almighty--speculation against an unrealized forecast of drought becomes the responsibility of the official concerned. It is hard to argue against those who chose no-risk policies until the scientific community can provide reliable and convincing prognostications of seasonal climate.

Although some early-warning systems can demonstrate accurate predictions of precipitation deficiencies with the forecasts endorsed at governmental level, the reports are not acted upon at the producer level because of failure in the warning delivery system. The farmer either does not hear or, alternatively, heed the forecast. Early warning is only useful when the delivery system is effective and the response appropriate.

Recognizing the problem does not automatically result in its solution. An action plan by the international community, such as Agenda 21, identifies what needs to occur. The bodies that desire to implement the plan need resources. Despite UNEP's successful program on ENSO and drought, resources have been reduced to levels where there is no alternative to implementing program reduction rather than program development.

Expectations

Preparation for drought requires costly decisions, where the level of investment must be compatible with the degree of risk. Accountability for what might be considered an inappropriate investment by the voter or taxpayer in the event of a forecasting mistake lies principally with the administrator or politician. He is the decision maker who might be asked to bear the responsibility for errors in which he has no control. Equally, he might overreact with misplaced confidence through misinterpretation of scientific information and misunderstanding of the qualifications attached to a drought forecast. The investment in preparedness might be inappropriate and not justifiable by the true nature of the risk. But even when the right choices have been made against an accurate prognosis, the process of implementation of drought response needs to be effective at all stages and levels if it is to be truly useful.

It is insufficient understanding of what science has to offer or poor communication between the decision maker and the scientist that inhibits the effective use of science in drought management. The initiation of dialogue between ENSO scientists (both for the prediction of events and for the prediction of effects) and drought managers is essential to the fulfillment of the expectations of the latter. Equally, the dialogue must be in the form of regular communication, preferably as part of national drought planning and part of the multidisciplinary implementation process. Such contact is essential to ensuring that managers know the degree of the level of reliability of the science which must be provided in unambiguous, assimilative language. Equally, the scientist must become aware of the minimum lead-time required for translating warnings into responses and, where that lead-time is too short, for example, to allow cost-effective importation of commodities likely to be in local short supply because of anticipated drought, then it is necessary to decide the acceptable trade-off of obtaining an earlier indication of a drought event against a lower level of confidence in the forecast.

The drought manager needs the scientist to bring to his attention the ways in which science can assist his problem solving. Communication can be facilitated through information programs such as those of international organizations. Such organizations can also help through education, training, and endogenous capacity building.

Agenda 21 outlines the perceived needs of countries for data and information. Chapter 12 suggests the following:

(a) Implementation research on seasonal forecasts to improve contingency planning and relief operations and allow preventive measures to be taken at the farm level, such as the selection of appropriate varieties and farming practices, in time of drought;

(b) Support applied research on ways of reducing water loss from soils, on ways of increasing the water absorption capacities of soils and on water harvesting techniques in drought-prone areas;

(c) Strengthen national early-warning systems, with particular emphasis on the area of risk-mapping, remote-sensing, agro-meteorological modeling, integrated multidisciplinary crop-forecasting techniques and computerized food supply/demand analysis.

It also identifies the management-related activities needed to address drought, the international and regional cooperation and coordination required, and even the means of implementation, including the estimated cost of $1.2 billion to do so.

A useful way to proceed could involve the development of national drought plans of a type described in the UNEP guidebook "Preparing for Drought," in which a prerequisite of any drought plan requires dialogue and cooperation between science and management. Effectiveness requires that each link of the implementation chain--farmer, utility manager, municipal and district leader, national drought response office, and early warning mechanisms--inspire mutual confidence in each other's products and ability.

Weather-Related Concerns of US Agriculture

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Weather-Related Concerns

The US Department of Agriculture is charged with ensuring a stable, safe, and affordable food supply for the nation's growing population. The United States is also the major source of food during periods of short supplies in many other nations of the world. The primary potential uses for El Niño outlooks is to extend or improve the economic intelligence work, land use management, water use management, and forest fire preparation efforts at USDA.

To meet these commitments, a series of farm programs have been established to increase or decrease production based on a series of economic indicators, i.e., the supply/use ratio. If the supply/use ratio is high, that is, if stocks are large, then participating farmers are required to reduce the total acreage planted to be eligible to benefit from the Federal Farm Programs. The ARP setting, flood disaster payments, and drought disaster relief are but a few of the programs through which farmers may be eligible for payments.

The idea is that if supplies are adequate but not too large, the prices farmers receive will be adequate to ensure a profit and maintain production as needed.

A decision to increase set-aside acres must be made before farmers begin planting, or realistically early in their crop planning for the next growing season. For winter wheat to be harvested in 1995, that means a set-aside decision in June 1994. For spring-planted crops, it means a decision in September 1994.

The greatest uncontrollable variable in crop production is yield variability as determined by the next growing season's weather. During the last 15 years, major reductions in US crop yields have been primarily linked to El Niño events. Thus, the potential for use of long-range outlooks in top-level policy decision-making needs to be explored carefully. It must be recognized that it will be only one of many information sources used but could indeed have a significant impact on policy with major national and international consequences, should a miscalculation be made.

Problems Faced

Many in the potential user community have long viewed the long-range climate outlook with suspicion. The product offered is mostly in a form they don't understand and cannot integrate readily into their decision-making process.

It has been understood for many years that the needs of the farmer for weather and climate data are twofold. The climate data, in terms of frequency distribution, is a key input to long-term financial decisions, i.e., investment in an irrigation support system, or seeking the solution to the size of equipment needed to complete fieldwork within the normal climatic window of opportunity in 9 out of 10 years, or selection of hybrid seed variety. The short-term weather forecasts are primarily used for the short term, 1- to 3-day management decisions, such as applications of herbicides, pesticides, fungicides, to cut hay and at times accelerate harvest efforts, possibly in advance of a frost-freeze event, or hay before a wet period returns. One bad decision can made the difference between a profit and a loss for the growing season.

These farmers, as potential users, will need to be educated on how to use an extended outlook that may be based on the potential for an El Niño weather pattern developing. With the advent of NAFTA and an expanded GATT, a farmer will be in competition for a share of the global food market, not just the national markets. He therefore must recognize that the potential for adverse El Niño impacts are likely to occur at several locations around the world in a given year. However, the degree of intensity and the total area to be impacted will be highly variable from one event to the next.

Another area of potential application is found at the policy levels of government. The government farm program policy decisions will affect the farmer-producer participating in any federal paid land division (PLD) programs. This includes making decisions on area reduction programs (ARP) for the upcoming season. The ARP decision for wheat has to be made by June 1 and by September 30 for feed grains. The ARPs are set on year-end stock-to-use ratio, which differs by crop from 0 to 20.

The federal policy decision on ARP also has strong implications for trade commitment in the international markets, and our ability to respond readily to emergencies that arise as a result of reduced food supplies in other nations. USDA works with DOS/AID/OFDA on some aspects of meeting their early warning information needs.

Another area of potential use is in the task for dealing with forest-fire training preparation and land use management, especially grazing land where estimates of biomass production determine the livestock carrying capacities.

The determination of forest-fire potential in the preceding fall and winter determines the intensity of effort to train and prepare new recruits for the upcoming fire season.

Grazing rights acquisitions are based on expected biomass production, where estimates might be improved from the use of extended outlooks.

Another problem is overall water supply for irrigation use outlook. An extended outlook that indicates above- or below-normal winter precipitation, or snowpack potential, is used to set water allocations for the next growing season. This allocation considers water in the reservoir (carryover) plus water yield expected from the current winter season. The extended lead time will better enable the farmer to set the number of acres to be farmed and crop mix to match likely water allocation. This problem and related impacts from decisions have greatly intensified conflicts between water users in the western states in the last 10 years. Urban, industrial, agricultural, and conservation users have all been left with inadequate supplies, increased prices, and loss of production capacity.

What We Would Like to See

The El Niño outlook for forecasts need to be user-friendly. Just what "user-friendly" means will vary from user to user. If the primary user has a background in meteorology, climatology or hydrology, the outlook could be furnished in terms of probabilities by region that may be impacted. The meteorologist will then convert this to language that is understandable to his user client.

In the case of a farmer, the application of the outlook to management decisions might lead to a recommendation for modification of his management system. This could start with selection of the type of crop, hybrid seed, use rates for fertilizer, management of pre-emergence and number of acres to be planted.

In the case of the policymaker, the information would be converted to different terms such as impacts on yield, which translate to impacts on price support programs, ARP decisions, commitment to international trading partners, and requests for authorization to implement special programs where chemicals not normally available to the farmers may be made available too, as needed. In the case of certain disease vectors, they are always present in the field but are a problem only under certain climate/weather conditions.

Experience has shown that, for potential users not trained in meteorology, the standard outlook maps currently available from NOAA/NWS/CAC are not well understood and are thus under-used, unless the informational content is extracted into terms the user understands and how it impacts on potential products with which he deals.

Some users are only interested in local effects. They often want the outlook presented as the direction of departure from normal and/or the magnitude of the departure from normal. These people are usually running some type of crop/biological response model which takes specific data formats.

Some users may simply ask for the data or outlook in a simple, normal, above- or below-normal format. These users consider many other factors and view the weather outlook as an ancillary bit of information that may tilt the final decision one way or another.

For the people, the use of maps is usually acceptable, but some users will ask that the outlooks be quantified for their unique uses.

In short, what I'd like to see is better contact and communication established between the producer and user community. This will lead to establishing a degree of credibility for the user, and an insight of what the best form of information provided should be for the forecaster. The establishment of application centers within user agencies is an essential part of promoting increases in use of climate and weather outlooks.

Usable Science: USDA's Weather-Related Concerns

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USDA's Weather-Related Concerns

USDA is concerned with the sustainable management of our natural resource base for the production of food, fiber, and non-market goods and services. The Department's interests are quite wide-ranging, from management of forest habitat for threatened and endangered species in the Pacific Northwest (e.g., Northern Spotted Owl and salmon species), to the breeding of maize cultivars that maintain yield under drought conditions, to the development of businesses in rural communities.

USDA's Forest Service manages almost 200 million acres of national forests and grasslands for multiple uses such as outdoor recreation, range, timber, watershed, wildlife and fish, and wilderness, and the sustained yield of products and services. The newly established Natural Resources Conservation Service (formerly the Soil Conservation Service) advises private landowners on the best management practices for their land and farming operations in order to minimize soil erosion and nonpoint source water pollution, preserve wetlands and wildlife habitat, and optimize production. And the Consolidated Farm Service Agency offers insurance to farmers to protect them from catastrophic losses due to natural disasters such as droughts and floods. Most importantly, USDA is charged with ensuring that the Nation has sufficient food and fiber to meet its needs.

The improvement of mid- to long-term weather forecasts would allow the Department to refine its management strategies and recommendations prior to the onset of weather-related anomalies and make better assessments of associated risks to farmers and rural communities.

USDA's Weather Problems

Agriculture faces a number of problems which more accurate forecasts would help to alleviate. Farmers, like most businessmen, make decisions about the particular cultivars and other inputs they will use months before the growing season begins. For example, winter wheat farmers plan their crop in the fall of 1994 for harvest in late spring or early summer 1995. So they need to purchase seed for the cultivar they intend to grow in the late summer or fall . Seed companies (e.g., Pioneer, DeKalb, etc.) make their decisions about the wheat cultivars they will have available the previous growing season when they multiply seed. In this case, winter wheat seed available now probably was grown in the 1993-94 growing season.

If seed companies knew a year in advance that the winter wheat growing region of the US was likely to have a drought in the 94-95 season, they might recommend a cultivar that had a lower yield under normal rainfall conditions, but achieved stable yields under drought conditions. Other cultivars may mature faster or earlier, shortening the length of the growing season. In the case of winter wheat, a shortened growing season would result in reduced evaporative demand and decrease the likelihood of exposure to drought conditions.

Prior knowledge of a drought would allow farmers to adjust the management of their wheat crop, as well as the cultivar. For example, the farmer could reduce the planting rate and the amount of fertilizer. He might also choose to plant wheat in the lower field that was likely to retain more moisture, and plant barley in the higher fields.

Then again, if a forecasted drought in the winter wheat growing region of the US was accompanied by a predicted bumper crop for the wheat growing regions of Argentina, Australia and Russia, the US farmer may choose not to plant wheat at all. Likewise, if the USDA was fairly sure that an impending El Niño event would disrupt world supplies of wheat, or other program crop, the Secretary could reduce the acreage set-asides and allow farmers to increase production.

Farmers also insure their crops prior to planting. Those growing winter wheat would have insured their crop through USDA's Federal Crop Insurance Corporation (FCIC) in late summer. Accurate mid- to long-term forecasts would help FCIC assess risks and set actuarially sound rates and coverages.

USDA also manages forest lands, and the accompanying fish and wildlife. Natural hazards such as brush and forest fires can take a terrible toll in terms of life and nature's wealth, as they did this year. Although the fires can't be stopped, nor would that be advisable, more accurate forecasting might enable better management of the fire-prone regions.

Uses of El Niño Forecasting

Farmers are a very risk averse lot. Reliable forecasts would have to be provided in plain English in order for them to incorporate the information into their decision-making. This is also true for the USDA, as the government agency with responsibility for ensuring and controlling food production in the US. But accurate forecasts that allowed country- or region-specific grain production estimates would be incredibly useful in setting profitable production goals and meeting them. Inaccurate forecasts, on the other hand, could reek havoc with world food supplies and commodity futures.

Reliable early forecasts would also open new avenues for natural resource scientists and managers to explore. They could look for shorter term interventions for managing droughts or floods, that is, temporary, inexpensive measures that could be applied prior to the

forecast events (4 months to 1 year) and reduce negative impacts. For example, in normal rainfall years, the flood plain of the Sacramento River is planted. If twice normal rainfall was forecasted during the growing season, then seeding vegetative bunds six months ahead of the predicted flood could reduce erosion and siltation.

Can the Western Governors' Assocation Benefit from El Niño Forecasts?

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Weather-Related Concerns

The Western Governors' Association (WGA) is an independent, nonpartisan organization of governors from 17 western states, two Pacific territories and one commonwealth. The WGA identifies and addresses key policy issues in natural resources, the environment, human services, economic development, international relations, and fiscal management.

The WGA has not previously been involved with global climate issues such as El Niño. Yet, with four Pacific island members (Hawaii, American Samoa, and the Northern Mariana Islands), five other coastal states, and farm belt members in the WGA, El Niño forecasting could be of interest to the majority of our members. As chief executives of their states, governors' weather-related concerns encompass all areas of public policy and emergency management. Individual state agencies dealing with agriculture and natural resources could also benefit from reliable data on climate phenomenon such as El Niño. My limited knowledge of state agencies does not permit me to know the extent to which El Niño information is already being utilized.

Problems with the Use of El Niño Data

In making significant political decisions, governors are constrained from directly using certain scientific data because its reliability can be called into question. They must instead rely to a large extent on the advice received from state agencies that employ scientists and science-based decision makers. These agencies must first filter outside science and express support for its reliability before policy may be derived from its conclusions. Therefore, the lead time and the reliability of scientific data are keys for a state agency and ultimately for a chief executive. El Niño data, therefore, has these two very basic hurdles to overcome before it can be used on a widespread basis in state government.

El Niño Needs

Research communities need to demonstrate the reliability of the data and demonstrate successes in its use. Case studies should be developed that illustrate both of these features. For example, a particular crop or water policy benefitted because of El Niño data and the

willingness of a government to use it. Government entities in the United States should be the focus of the case study when possible and case studies on distinct geographic regions or states will appeal to a wider audience. Moreover, I am sorry to say that popular media coverage of these successes will help to develop support for the use of El Niño forecasting, thus making its use more acceptable in policymaking.

To the extent that they are not already doing so, the scientific community should also be reaching out to policymakers and their staffs. Offers of technical assistance and additional data may help government employees feel more comfortable about relying on El Niño forecasting data.