IMPROVING DROUGHT POLICY: A PLAN OF ACTION

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ABSTRACT

In September 1986 the International Symposium and Workshop on Drought, sponsored by the University of Nebraska’s Institute of Agriculture and Natural Resources and the Illinois State Water Survey, was held at the University of Nebraska-Lincoln in the United States. More than 150 scientists and policy makers from more than twenty-five drought-prone nations participated. The symposium was organized to review and assess our current knowledge of drought and to determine what research and information is needed to improve national and international capacity to cope with drought. The symposium and workshop provided a forum for discussion of the physical and societal implications of drought in the context of a variety of spatial scales and in various socio-economic and political settings. The purpose of the workshop was to draw attention to drought as a policy issue, one that can be managed more effectively through an interdisciplinary and cooperative effort from the scientific and policy communities. The ultimate goal of the workshop was a “plan of action” to facilitate drought planning efforts worldwide. The article reviews some of the common themes that emerged from the symposium and workshop, including major constraints to effective drought planning, research priorities, and a framework to be used by governments as a model in the development of comprehensive drought plans.

INTRODUCTION

Drought, for all its disruptive tendencies, is a normal feature of climate. Yet, as droughts come and go, left behind are the visible scars of human suffering, along with the usual debates over the effectiveness of ad hoc relief efforts and, at best, inadequate or incomplete plans for dealing with future droughts. With the first rains comes a new sense of security; relief efforts are dismantled, plans for the next drought are forgotten, and society resumes its so-called harmony with climate until the rains fail and the cycle begins anew. Despite the

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dramatic awakening of the world to the plight of Ethiopia in recent years, a few wet seasons in a row there have already prompted the abandoning of some relief efforts.

This paradox was addressed by the scientists and senior-level policy makers at the International Symposium on Drought. The scientists reviewed what is and is not known about drought, and the policy makers spoke on current efforts to cope with drought effects. A post-symposium workshop was held to explore the rudiments of effective national and international drought preparedness planning.

The symposium and workshop was held out of a basic recognition that past efforts to deal with the problems of drought have tended to address only narrow aspects of drought (e.g., desertification, agricultural production, climate system anomalies, water resources, etc.). In this meeting, a comprehensive, intersystem approach was taken which, in essence, joined discussions of physical science, social science, and policy response aspects of drought, and sought to meld these discussions into a basic strategy for improving our national and international capabilities of coping with drought.

In the following paragraphs, some of the common themes that emerged from discussions will be reviewed. Specifically, major constraints to effective drought planning are outlined; a set of recommendations and research priorities is set forth; and, lastly, a drought planning framework, which draws from previous discussions, is proposed. For a more complete discussion of these themes, the reader should refer to the full report of the symposium and workshop (Wilhite and Easterling, 1987).

CONSTRAINTS TO DROUGHT PLANNING

The initial steps toward rational planning for drought involves enumeration of the major constraints to effective response to past droughts. Workshop participants were asked to address this issue. Many of the problems that have been encountered in previous efforts to cope with droughts were identified by participants.

Drought becomes apparent in complex ways and is inherently difficult to fully comprehend by nonscientists. It is often viewed by policy makers and bureaucrats as an extreme event and, implicitly, rare and of random occurrence. Thus, drought may be viewed as something that is outside of government control. Moreover, if drought continues to be perceived by policy makers as a freak quirk of nature – one for which there can be no planning – there will be no planning.

The constraints encountered in previous efforts to cope with droughts are:
- Inadequate understanding of drought occurrence
- Uncertainty of the economics of preparedness
- Lack of drought prediction skill
- Society's variable vulnerability to drought
- Gaps in information and insufficient human resources
- Poorly developed science of water management
- Inadequate understanding of drought impact-related sensitivities and adjustment and adaptation mechanisms

Any expenditure of scarce funds to mitigate vagaries of a common resource such as the atmosphere is likely to be challenged. Indeed, a major difficulty in assessing the economics of drought preparedness is the determination of the benefits of drought planning versus the costs of drought. Preparedness costs are fixed and occur now and, given an uncertain discounting in the future, may be perceived as too high given the benefits derived. Further complicating this issue is the fact that the costs of drought are not solely economic. They must also be stated in terms of human suffering and degradation of physical resources, items whose values are inherently difficult to estimate.

The prediction of drought will always contain uncertainty. Some policymakers believe that because drought cannot be sufficiently predicted, drought planning is of limited value. As a result, many facets of drought response planning that are not necessarily dependent on predictions (e.g., food and/or water storage) are neglected as well.

There is a great spatial and temporal variability in society's vulnerability to drought. For example, some subnational regions are relatively more drought sensitive than others. As crop mixes change in an agricultural region over time because of factors such as economics (or climate), vulnerability to drought may also change. Superimposed on this spatial and temporal variability is the tendency to view drought as a regional rather than national problem, and unaffected regions are apt to be more hesitant to commit national resources to manage affected regions.

A particularly troublesome problem, especially in developing countries, is the general lack of information necessary to provide the foundation for all components of a drought plan – prediction, monitoring, impact assessment, adaptation, and response. This would include fundamental meteorological, agronomic, demographic, and economic data; and the availability of other necessary resources (e.g., trained people). This problem is compounded by insufficient data bases.

Considerably more scientific knowledge is needed of appropriate and effective water management practices, particularly with respect to drought. Drought should be viewed in a comprehensive systems context which incorporates all water-dependent biophysical processes and human activities. For example, in the Climate Impacts, Perception and Adjustment Experiment (CLIMPAX), water management behavior in the California Water Project was found to be significantly influenced by climatic fluctuations, especially drought. Furthermore, more normative research is needed that is aimed at
increasing water use efficiency, especially focusing on existing technologies such as irrigation.

More knowledge is needed of the indirect impacts of drought as well as direct impacts. It is particularly important that methodologies be developed that allow establishment of credible linkages between moisture deficient conditions and associated impacts. Moreover, equal effort should be given to identifying the possible range of adjustment and adaptations available to lessen the negative impacts of drought.

**STRENGTHENING THE BASIS FOR DROUGHT PLANNING: A PROGRAM OF RESEARCH**

Most, if not all, of the constraints to drought planning mentioned above can be eliminated or overcome by increased understanding of the drought phenomenon, including its biophysical and societal dimensions. Indeed, drought is a topic that remains rich in unanswered research questions, and answers to many of these questions are the key to improving our abilities to cope with the many problems drought poses. In the following paragraphs, we propose a set of drought research priorities aimed at facilitating progress toward a goal of drought preparedness.

*Research Priorities: Prediction*

The predictability of the climate system is inherently limited. The limits to predictability vary with region, season, and lead time. These variations have not been mapped adequately. Thus, an important task is diagnostic research to identify the “targets of opportunity”: the regions, seasons, lead times, and predictands for which prediction seems most feasible.

Three components of climate research can be distinguished: (1) theory, (2) general circulation modeling, and (3) empirical analysis. All three components, as well as interaction between them, are essential for the diagnostic understanding of the climate system, which in turn is basic to the development of drought prediction. Empirically based climate prediction has made the most progress toward operational application, and further work on general circulation models (GCMs) and theory is imperative. Both empirically based and GCM-based predictions of climate anomalies are expected to possess intrinsic limitations. Further research (including the verification of forecasts on an independent data set) is needed into the limits of predictability in both methods.

Predictive research priorities are determined primarily on the need to overcome important knowledge gaps that limit predictability. Tailoring the acquired prediction skills to applications is mainly the concern of scientists working directly with users. Integration of research activities and activities of researchers working directly with users can produce more appropriate products for users from both groups. Integration also facilitates innovative
adaptation of technological spinoffs from research and informs the research groups of community and policy concerns. Integration is not easy and care must be taken not to weaken the efforts of each group. Much understanding and tolerance is required on the part of research managers and others.

Research Priorities: Monitoring, Detection, and Early Warning
The primary objective of monitoring systems is to provide information to a particular client or user group in a timely and reliable manner so that effective action can be taken to alleviate potential impact. Each user group has specific needs and the information derived from any monitoring system will need to be expressed in different formats to be useful to the various groups. It is crucial that research address questions of what these needs are—how they vary among groups, across regions, and over time; and what are the most basic commonalities in characterizing the needs of user groups. Information of this nature will allow monitoring systems to provide information that is of utility to a maximum number of potential users.

Research on methodology and technique development in support of monitoring and early warning systems is a high priority. It is particularly important that these monitoring methodologies and techniques adequately take into account the data and human resource constraints that exist in developing countries. The use of satellite imagery offers tremendous opportunity for monitoring developing drought conditions. It is imperative that research on the application of this technology to the early detection of drought conditions be expanded.

Research Priorities: Impact Assessment
Many simple empirical techniques have been developed (e.g., natural experiments, case scenarios, historical analogues) to assess biophysical and societal impacts of drought for which useful data are readily available for most locations. However, these techniques are not well developed and have not gained acceptance or credibility among scientists and potential users because they have not been tested or because they seem to lack sophistication.

Research is needed to assess how simple, easy-to-use techniques that could provide useful information can be applied with greater reliability, credibility, and acceptance. The potential exists to greatly improve impact assessments without a great deal of additional technical research and developmental work.

In the long run, efforts should be focused on developing more sophisticated deterministic (quantitative) impact assessment models. The data required of these types of models, unfortunately, are not uniformly available in all regions. However, as data monitoring improves in currently data-scarce areas, more sophisticated techniques should be available to utilize such data in arriving at increasingly sophisticated impact assessments. In this regard, expert systems modeling offers an opportunity to extend more simplistic empirical impact assessments and may provide a means of bridging empirical and
deterministic assessment techniques until there is adequate data and understanding to develop purely deterministic models.

Research Priorities: Adaptation and Adjustment

Human systems have remarkable capacity to adjust and adapt to dynamic environmental conditions. However, this process can be greatly speeded up when receiving direct stimulus from government and other institutions. Much of the research called for under the rubric of facilitating societal adaptation to drought concerns agricultural practices. Specific research priorities include:

1. **Water Management.** Water management research is critical since water is the major factor limiting productivity in the arid and semiarid zones. Two areas were identified as offering substantial opportunities for this research – appropriate tillage and water harvesting techniques.

   Research on appropriate tillage practices directed toward improving moisture conservation and management has shown considerable promise for various crops in arid and semiarid environments. Appropriate water harvesting methodologies need to be developed so rain water can be harvested and used in crop production.

2. **Genotypes.** Research is needed to identify and test desirable genotypes for drought tolerance, early maturity, disease resistance, high yields, and adaptation to particular agroecological zones.

3. **Climate-System Interaction.** Climate is the key factor that directly affects cropping patterns; it influences a farmer's decision to adopt a particular cropping system. There is a need to understand how cropping systems in given agroecological zones react to climate variations. Researchers also need to devise strategies that minimize the adverse effects of these variations on the productivity of different cropping systems.

4. **Alternative Crops and Alternative Uses of Established Crops.** Alternative crops should be identified and promoted for each agroecological zone. Research on alternative uses of new or minor crops must be carried out in advance to guarantee a market for these crops.

5. **Research on Fertilizer Use in Cropping Systems.** Fertilizer use may help guard against drought by encouraging development of a root system, which will utilize soil water more efficiently. There is a need to identify the economic returns associated with different rates of fertilizer application for dryland cropping systems.

6. **Alternative Land Use Systems (agroforestry, silviculture, pasture).** It is essential that alternative land use systems that are compatible with critical production factors (such as climate and soil) be identified for drought-prone regions.
Research Priorities: Planning and Response

Perhaps the first step in planning for future droughts is to evaluate the impact of and response to previous drought. This emphasizes the importance of the evaluation process itself. Indeed, five areas of research are suggested that would advance our ability to evaluate past assessment and response efforts: (1) hydrological impact, (2) recovery of agricultural activity, (3) economic impact, (4) decisions made during drought, and (5) social response to drought. These research areas are discussed briefly below.

Drought has a considerable impact on the hydrology of a stricken area. An assessment of this impact through ground surveys and satellite monitoring would be beneficial in future planning efforts, particularly with respect to water use, energy, and agricultural activity.

Depending on the duration, intensity, and spatial characteristics of drought, the agricultural recovery of an area could be handicapped despite average or better rainfall. Input requirements (e.g., seed, fertilizer, pesticides, implements, energy) could be determined on the basis of the magnitude of the drought impact. Assessment of this type would be helpful when drought recurs.

An assessment of losses in agricultural and agriculture-based industries should be made following each drought episode. This type of assessment in developing countries must include the condition of people and livestock and market prices of essential commodities. It is also important to assess the impact of relief measures on the various economic sectors and to determine if individual citizens, industries, municipalities, or others were affected substantially but were neglected by available assistance programs. What groups or individual persons should be targeted for assistance in the future? To what extent did assistance programs discriminate against women or female children or children in general?

Decisions made by governments during periods of drought are made for humanitarian and political reasons. It will be difficult, if not impossible, to change this reasoning. Therefore, it is important that evaluations of drought assessment and response efforts are carried out by an organization other than the one with responsibility for implementing program plans.

In many developing countries the occurrence and effects of natural disasters are considered inevitable and unavoidable. The general population considers these events and their effects to be unmanageable and out of the realm of governmental influence. A change in this outlook, based on scientific explanations and approaches, could help in mitigating the effects of events such as drought. This change could be accomplished by organizing meetings and symposia in developing countries where governmental leaders could explain the strategies to the people.
DROUGHT POLICY: TOWARD A PLAN OF ACTION

There is a long tradition of responding to natural disasters purely in a crisis response mode, and drought is no exception. Airlifting hay from the American Midwest to drought-stricken farmers in the Southeast makes for good publicity, but it is very cost-ineffective drought management. In his keynote address to the symposium, Nebraska’s governor, Robert Kerrey, stressed the need to plan for drought with a philosophy of risk assessment. This is far more effective than crisis management. Perhaps the most difficult of positions for an elected official is not to be able to respond to the needs of constituents during times of duress. And this is far more likely to happen in a crisis for which there has been inadequate pre-crisis planning.

In this concluding section, we have distilled and synthesized wisdom gained from symposium and workshop discussions and we propose the tenets of a plan of action predicted on risk assessment. This “plan” could serve as a model for drought planning at various levels of government and in various socioeconomic and political settings.

Figure 1 is a ten-step drought planning process that represents the culmination of previous discussion. This process is sequential and it is dynamic in the sense that several iterations are possible in which component parts (steps) can be modified or adapted to fit existing sociopolitical realities. The process is necessarily flexible and highly generalized so that it can be adapted to many geographic areas and in many levels of government.

The first three steps actually involve mustering the necessary resources to initiate development of the plan. These include:

1. creation of a joint government-industry-research task force to oversee plan development;
2. careful articulation of the specific objectives of the plan such as to:
   • provide timely and systematic data collection, analysis, and dissemination of drought-related information;
   • establish criteria for starting and ending various assessment and response activities by governmental agencies during drought emergencies;
   • provide an organizational structure that assures information flow between and within levels of government and defines the duties and responsibilities of all agencies;
   • maintain a current inventory of governmental agency responsibilities in assessing and responding to drought emergencies;
   • provide a mechanism to improve assessments of the impacts of drought on agriculture, industry, municipalities, vulnerable population groups, etc.; and
Appointment of
Drought Task Force
(STEP 1)

Statement of Purpose
and Objectives
(STEP 2)

Inventory of Natural and Human
Resources, Financial Constraints
(STEP 3)

Development of Drought Plan
(STEP 4)

Identification of Research Needs
and Institutional Gaps
(STEP 5)

Synthesis of Drought Management
Science and Policy
(STEP 6)

Identification of Response Options
(STEP 7)

Implementation of Drought Plan
(STEP 8)

Development of Educational
and Training Programs
(STEP 9)

Development of
System Evaluation Procedures
(STEP 10)

Figure 1. A ten-step drought planning process.

3. careful inventory of natural and human resources available to help
meet these objectives should be undertaken by the task force.

Development of the actual plan (Step 4) can be accomplished
through establishment of three interdependent organisms: (1) moisture
assessment committee, (2) impact assessment committee, and (3) policy
committee.

The moisture assessment committee will have four primary
objectives: (1) to inventory data quantity and quality from current
observational networks, (2) to determine the needs of primary users, (3) to
develop a drought monitoring system, and (4) to develop or modify current data and information delivery systems. The functions of this committee will necessitate close interaction with the impact assessment committee.

The impact assessment committee's responsibility is not only to ascertain the impacts of drought but also to identify and muster available resources to mitigate those effects. The committee must then identify those government agencies and nongovernmental organizations that can provide some level of assistance in response to drought as well as the exact nature of that assistance. The committee must also determine the proper protocol for requesting assistance by affected groups.

The policy committee, comprising senior-level officials, will serve as a coordinating body to oversee the activities of the moisture assessment committee and the impact assessment committee(s), keep political officials advised of the status of impacts in the distressed area, and make recommendations about further actions that need to be taken. This coordinating committee would have direct access to political leaders. The task force could evolve into this policy committee following completion of the plan, since the composition of the two groups is similar.

To be carried out concurrently with Step 4, the purpose of Step 5 is to identify research needed in support of the objectives of the drought plan and to recommend research projects to remove deficiencies that may exist. Early assessments of the likely impact of drought on crop yield, for example, may require the development of plant response models or the calibration of existing models.

Institutional deficiencies in drought response should be identified as part of Step 5. Agency responsibilities or missions may need to be modified to support activities to be performed under the rubric of the drought plan.

An essential aspect of the planning process is the synthesis of the science and policy of drought and drought management (Step 6). Previous steps in the planning process have considered these issues separately, concentrating largely on assessing the status of the science or on the existing or necessary institutional arrangements to support the plan. It is clear from the workshop discussions that communication and understanding between the science and policy community is poorly developed and must be enhanced if the planning process is to be successful. Direct and extensive contact is required between the two groups in order to distinguish what is feasible from what is desirable for a broad range of science and policy issues. Integration of science and policy during the planning process will also be useful in setting research priorities and synthesizing current understanding.

In Step 7, reasonable response options must be determined for each of the principal affected sectors identified by the impact assessment committee in Step 4. These options should examine appropriate drought mitigation measures on three timescales: (1) short-term (reactive) measures implemented during the occurrence of drought, (2) medium-term (recovery)
measures implemented to reduce the length of the post-drought recovery period, and (3) long-term (proactive) measures or programs implemented in an attempt to reduce societal vulnerability to future drought. Again, it should be noted that societal vulnerability to drought may be influenced substantially by non-drought-related actions taken or policies implemented during nondrought periods. Thus, government must establish agricultural, environmental, and natural resource programs only after giving full consideration to their effects on the vulnerability of drought-prone regions.

The drought plan should be implemented in such a way that it gives maximum visibility to the program and credit to the agencies and organizations that have a leadership or supporting role in its operation. It is suggested that all or a portion of the system be tested under simulated drought conditions before it is implemented (Step 8). It is also suggested that announcement and implementation occur just before the most drought-sensitive season to take advantage of inherent public interest. The media is essential to publicizing the plan and must be informed fully of its purpose, objectives, and organizational framework.

Educational programs must be established to heighten public awareness of the drought problem and the need for water conservation and environmental management in the long run (Step 9). These programs must be long-term and directed to all age groups and economic sectors. If such a program is not developed, it is likely that interest in and support for drought planning by government officials and the public will wane during long periods of nondrought conditions.

The final step (Step 10) in the establishment of a drought plan is the creation of a detailed set of procedures to ensure adequate system evaluation. To maximize the effectiveness of the system, two modes of evaluation must be in place:

1. An ongoing or operational evaluation program that considers and incorporates, as appropriate, new technology, the availability of new research results, legislative action, changes in political leadership, and so forth, as they may affect the operation of the system.

2. A post-drought evaluation program that documents and critically analyzes the assessment and response actions of government and offers recommendations for improving the system.

The operational evaluation program is proposed to keep the drought assessment and response system current and responsive to the needs of society.

Governments should conduct or commission a post-drought evaluation of the responses to each major drought episode. These evaluations should include an analysis of the physical aspects of the drought itself; its impacts on soil, ground water, plants, and animals; its economic and social consequences; and the extent to which pre-drought planning was useful in mitigating impacts, facilitating relief or assistance to stricken areas, and in
post-drought recovery. In this regard, attention must be directed to situations in which drought coping mechanisms worked and where societies exhibited resilience; evaluations should not focus only on those situations in which coping mechanisms failed. Evaluations of previous responses to severe drought are recommended as a planning aid to determine those relief measures that have been most effective. Questions to be addressed by the post-drought evaluation review team as part of this evaluation process are included in the report of Task Group 5.

It is recommended that governments place the responsibility for evaluating drought and societal response to it in the hands of a nongovernmental organization to ensure an unbiased appraisal of actions taken. Much of the talent needed for the conduct of such studies lies in the world’s universities. Private foundations and research organizations should be encouraged to support post-drought evaluations. In many countries there are specialized agencies or corporations capable of analyzing climate impact.

International agencies, both intergovernmental and nongovernmental, should realize the value of post-drought evaluations and be prepared to sponsor them when an emergency extends beyond national boundaries, especially when internationally coordinated relief projects might be mounted.

In conclusion, it is stressed that these steps represent only the superstructure of an effective comprehensive drought response plan. It is incumbent on individual states, provinces, nations, or regions to adapt this superstructure to particular instances. Indeed, some aspects of this model may already be in place in some cases. In other cases, there will undoubtedly be aspects of the model that are irrelevant or impractical. Such is the liability of striving for absolute maximum applicability. However, this model represents state-of-the-art thinking by experts on how best to join science and policy in bettering humankind’s response to drought.

Finally, it is recognized that the impacts of drought on society and the environment often linger for years after the drought itself has passed. Conversely, actions taken during nondrought periods often determine the level of vulnerability to future drought episodes. Thus, it is necessary to avoid the pitfall of focusing only on the impacts of drought and ignoring the effects and interrelationships of decisions made and actions taken during nondrought periods. Governments must commit the financial and human resources necessary to complete evaluations of drought impact and drought recovery to gain a full appreciation of the lingering societal effects.

SUMMARY

To those that study drought, regardless of our perspective, it is clear that drought is a normal feature of climate and its recurrence is inevitable. And, the widespread occurrence of severe drought during the past decade has once
again underscored the vulnerability of both developed and developing societies to its ravages. Whether referring to the well-documented recent tragedies of Ethiopia or the physical and socioeconomic impacts of the 1986 drought in the southeastern United States, the message seems clear—society has typically chosen to react (i.e., employ crisis management) to drought rather than prepare (i.e., employ risk management) for it. With few exceptions this approach has been grossly ineffective.

Progress toward improving the drought coping capacity of national and provincial governments and international (as well as donor) organizations through better planning was the principal goal of the International Symposium and Workshop on Drought. The information, experiences, and recommendations presented in the proceedings of this meeting represent the collective wisdom of an interdisciplinary and international roster of scientists and policy officials. Perhaps their insights and recommendations will provide a model that can assist all drought-prone nations in achieving a more effective drought management strategy.

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REFERENCE