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A Forecast Is Just a Forecast: It's Not a Guarantee

Tibor Faragò

Global Environment Office
Ministry for Environment and Regional Policy
Budapest, Hungary
farago@kik.ktm.hu

Donald A. Wilhite

International Drought Information Center
University of Nebraska-Lincoln
Lincoln, Nebraska, USA
dwilhite@enso.unl.edu

Michael H. Glantz

Environmental and Societal Impacts Group
National Center for Atmospheric Research
Boulder, Colorado, USA
glantz@ucar.edu

Introduction: Misinterpretations and Misuses of Forecasts

Hazards and their forecasts

Concern about the forecast, mitigation, and analysis of impacts of climate-related hazards has increased markedly since the early 1970s and has become an important element in international cooperation (El-Sabh and Murty, 1988; Ghali, 1992). The beginning of this sharp increase in interest car be connected with dramatic climate anomalies such as devastating drought, which accelerated desertification processes and sparked severe food shortages and famine in the West African Sahel and in the Horn of Africa. Anomalous climate in the eastern equatorial Pacific manifested itself through devastating impacts of El Niño (actually El Niño-Southern Oscillation) along parts of the western coast of South America. Improvements in monitoring and forecasting such hazards are essential for improving early warning systems and for lessening the adverse effects of these hazards (El-Sabh and Murty, 1988).

ENSO is one of the most important large-scale natural phenomena for which analysis can assist in the development of a general framework for climate-related impacts management. In 1987 Nicholls observed that "El Niño has apparently been given a place among widely acknowledged natural disasters, such as floods, severe storms, tidal surges, typhoons, and earthquakes that merit close scientific monitoring and investigation. ... This new-found awareness will grow as attention focuses on the impacts of this natural event on society and on the environment, and as scientists continue to unravel its mysteries."

Famine is a relatively rare phenomenon and presents special problems to those attempting to forecast its occurrence for at least two reasons. First, the occurrence of famine depends on the sequence (and/or coincidence) of many causal factors, both natural and social, each of which requires monitoring, evaluation, and modeling. Each of these factors, separately or in combination, can result in significant reductions of food production which, if they persist over a long enough period, may lead to famine. This complexity of "predictors," their dynamics (evolution), and the limited resolution of the applied forecasting system (e.g., model grid dimensions) result in considerable uncertainty about whether famine will or will not occur. Second, these events and their forecasts attract a great deal of attention from those concerned with mitigating the event. This results in high expectations of the forecasters' ability to produce reliable forecasts and the temptation to apply these forecasts in the formulation of a response mechanism or strategy.

In the context of this workshop, we are particularly interested in the application of ENSO forecasts to *fews*. However, it is extremely important to realize that ENSO is only one of many factors that may influence the occurrence or non-occurrence of famine. In reality, we are dealing with several forecasts: Forecasts about the trends of various indicators (e.g., nutritional status, rainfall conditions, crop yields), forecasts about ocean temperature tendencies in distant places (e.g., the central and eastern equatorial Pacific Ocean), forecasts of human response, and so forth. Moreover, droughts and floods may be ENSO or non-ENSO-related. In the case of ENSO-related drought, the influence will likely be both direct (e.g., crop yields) and indirect (e.g., migration, labor supply, acres planted, on-farm grain storage, household food consumption, food imports, and acreage devoted to crash crops [Gbeckor-Kove, 1989; Glantz, 1987]).

The misunderstanding of forecasts

There are at least three stages in the misunderstanding of forecasts. First, there are false expectations about various forecasting models and their outputs (e.g., forecasts of climate anomalies, crop-yield estimates, and food-price assessments). Various expectations (e.g., demands) are placed on these models not only by the "decisionmakers" and the general public, but also by experts of the climate-related impact field. In this sense, crop-yield modelers use harvest assessments which incorporate these output data in their models.

Second, there is often a genuine lack of understanding about the interpretation and application of a forecast to a specific case. If forecasts are used, one must decide whether or not to issue warnings about the probability of occurrence of famine or some other specified phenomenon. The seriousness of this final step in the forecast process should not be downplayed, as it will directly motivate decisionmakers, food-aid organizations, and other actors in the food security management community to respond or not. Because of the potentially severe consequences of the events being forecast, several key questions arise about the forecasters' responsibility at all stages in the forecast process, namely: Should forecasters consult with the users or consumers of forecasts in advance to ensure that the final product will suit their needs? Should forecasters train users in the application of forecasts to "real world" problems? Should forecasters provide more insight into the conditions, assumptions, and uncertainties underpinning their analyses?

Often, the roots of "misunderstandings" about phenomena lie in the differences in how persons and organizations define, characterize, and analyze the phenomena (Wilhite and Glantz, 1985; Faragò et al., 1990). Confusing or misleading forecasts only serve to further delay action by decisionmakers and others charged with mitigating the impacts of natural and human-induced disasters.

The third stage in the misunderstanding of forecasts is in their misuse. Here, misuse refers to an inappropriate application or response based on forecast information. The overall objective of the forecast is, in general, either to maximize benefits or minimize adversity.

Uncertainty is one of the crucial factors which generates the various stages of misunderstanding. Inherent in each part of the forecast chain, there is a degree of uncertainty. When aggregated, these uncertainties are compounded. How then should users of famine early warnings apply information that they are given? How should users incorporate uncertainty in the forecast chain into the formulation of a response strategy? Regardless of how reliable, timely, and effectively communicated the forecast, an inadequate or poorly conceived response strategy will render the forecast useless or of little value. This fact emphasizes the importance of preparedness to provide the institutional capacity required to carry out a prescribed response strategy (Wilhite, 1993).

It is important to make a distinction between organizations with primary responsibility for *fews* and those organizations with responsibility for the various components of the system. A famine early warning system must integrate many forecasts, including an ENSO forecast. Davies et al. (1991) noted: "The question of responsibility is particularly complex because of the multiplicity of actors involved: national (and sometimes subnational) government; bilateral and international donors; NGOs; and local communities," while the "process of analysis, communication to decisionmakers, and feedback, which determine the effectiveness of information in planning and implementation, ... are ignored in the context of early warning."

Predictors, Target Variables and the Uncertainty Cascade

The famine process is a relatively long-term, low-grade, but cumulative environmental phenomenon. As discussed above, meteorological forecasts are only one of several forecasts relevant to *fews*. Each type of forecast has a target variable or variables (the predictands). In the case of famine prediction, the variables could be expressed in quantitative or qualitative terms. The specific indicators of *fews* are as follows: meteorological-climatological indicators, natural resources, agricultural, nutritional and health, and socioeconomic (Davies et al., 1991). Of course, the space and time attributes of these variables are important for the forecasting scenario. The success of *fews* may be determined ultimately by the cascade of uncertainty for each of the specific indicators mentioned above. In the case of meteorological forecasts, decisionmakers must understand the strengths and weaknesses of forecasts. They also need to be informed of the economic value of using meteorological forecasts and climatological information (i.e., how this information can be used as a mitigation tool to reduce potential impacts).

Decisions under Uncertain Conditions

An extremely important consideration for forecasters lies in how forecast users perceive probabilities and risks. Forecasters must know how to express the risks to the at-risk populations and to the decisionmakers responsible for their well-being. Forecasters must also learn how to communicate important scientific concepts, such as probability of occurrence, to decisionmakers so that they can incorporate this information into the decision process. Scientists must demonstrate to decisionmakers the cost of inaction when a reliable forecast has been provided. We must assist policymakers in understanding these costs. Perhaps the best way to do this is to bring decisionmakers into the different stages in the discussion process that lead to a decision to intervene or not. This approach will enable them to hedge in increments. For example, some forecasts are issued in the following stages: advisory, warning, and watch - raising awareness at each level. This approach also allows for early action, such as the import of small amounts of food, providing an additional "buffer" for policymakers in case the situation worsens. There is a need to educate appropriate decisionmakers about risk-averse, risk-taking, and risk-making behavior. In the case of the latter, decisions made today can create risk for certain populations (but not necessarily including the decisionmakers) tomorrow. How can we educate them about the risks that they may be unknowingly creating for others?

Summary

ENSO has become recognized as an important large-scale natural phenomenon that results in significant impacts worldwide. Along with this recognition has come an urgent desire to predict its occurrence in order to reduce or mitigate some of its most severe consequences. In famine-prone areas, uncovering the linkages between ENSO and rainfall tendencies would certainly facilitate the provision of advanced warnings so that some initial steps could be taken to buffer society against potential food supply shortfalls.

An ENSO forecast may be only one of many forecasts incorporated in a *fews*. It is important to recognize that an ENSO forecast could be a critical link in a successful *fews*; however, it is only one part of a forecast chain, each component having some degree of uncertainty. In addition, the success of a *fews* is determined by not only the inputs to that system but also by the outputs-actions or responses that emanate from the issuance of a famine forecast. A forecast is not a guarantee; it is only a forecast. All forecasters should strive for greater reliability in forecasts, but ultimately the success of a *fews* is determined by scores of factors. However, given the slow-onset nature of the famine process, a reliable and timely ENSO forecast, coupled with an adequate understanding of the forecast by users, could significantly reduce the severity of the event or alter if not eradicate famine occurrence.

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