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Communicating and Using Seasonal Climate Forecasts: a Challenge Crossing National, Organizational, and Disciplinary Boundaries

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The papers in this special issue come from a project funded by the Australian Centre for International Agricultural Research (ACIAR) titled "Bridging the gap between seasonal climate forecasts (SCFs) and agricultural decisionmakers in the Philippines and Australia." The affiliations of the authors show that the project involved a range of organisations. The Philippine project partners were the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA), Philippine Institute for Development Studies (PIDS), and Visayas State University (VSU) while the Australian partners included the South Australian Research and Development Institute (SARDI), New South Wales Department of Primary Industries, and Charles Sturt University.

In addition to national and organizational boundaries, this project also crossed disciplinary boundaries, with the project researchers having backgrounds in climate science and meteorology, statistics, agricultural science, social sciences specializing in communication and adoption, farm management economics, and policy economics. And while it was the most challenging, the interaction between disciplines also proved to be the most rewarding and important ingredient for success.

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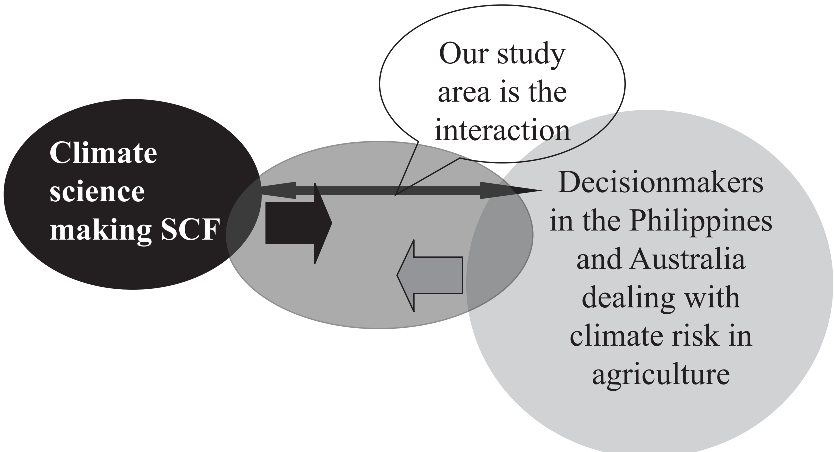
Figure 1 shows the focus of the project and this special issue which deals with the gap between decisionmaking and SCFs. As indicated in Figure 1, there is a large amount of human effort and activity in producing and delivering SCFs and an even larger level of activity in decisionmaking at the farm, regional, industry, and policy levels. These activities have been the subject of considerable academic study, the science of SCFs, and an even longer history of studying the process of decisionmaking at the farm and policy levels. The papers in this issue focus on the smaller but growing field on the interface between climate forecasts and decisionmaking. This raises questions of how to make science useful for societal goals (Jacobs 2003) and how to measure whether this interaction has been successful or not.

Figure 1. Simple graphic identifying the focus and study area of the project



The science of seasonal climate forecasts (SCFs)

Seasonal climate forecasts are a subsection of the larger area of climate science. As noted by Predo et al. (2008), climate is often confused with weather forecasts. The distinction is more than semantics and is important in terms of the nature of the forecasts. If weather is a "snapshot" of the atmosphere at a particular time, a weather forecast is therefore a forecast of the state of the atmosphere in the coming days from which the temperature and amount of rain at a location can be determined. It thus uses the current state of the atmosphere to predict a future state of the atmosphere. A climate forecast, on the other hand, commonly uses the slower moving variables of ocean temperature patterns to forecast whether the season ahead (3–6 months) is likely to be wetter or drier, warmer or hotter than average.

The Philippines is a country that is greatly affected by the El Niño Southern Oscillation (ENSO) phenomenon. Although being under the influence of ENSO leads a region to being buffeted by high year-to-year variability, there is also an increased capacity to predict some of the interannual variability in seasonal rainfall. The science of drivers of climate has benefited from a better understanding of the ENSO in the tropical Pacific; some of this understanding has been driven by the large interest in modelling global climate for climate change studies. The understanding and modelling has been improved by a vast investment in monitoring and reporting the tropical oceans, including the subsurface, the atmospheric pressure, the winds, and outgoing long wave radiation.

The first paper in this issue by Hilario et al. shows that there has been a long history of examining the impacts of ENSO on the Philippines. The impact differs from event to event but the overall impact is one of drier conditions in an El Niño with weaker monsoonal activity and less tropical cyclones whereas La Niña tends to be associated with wetter conditions, an earlier onset of the rainy season, stronger monsoonal activity, and more tropical cyclones in the Philippine region. As outlined by Hilario et al., although each ENSO event is unique, there is a pattern in terms of time (impacts are generally in the fourth quarter of the year when ENSO develops and continues to the first quarter of the following year). There is also a pattern of the spatial impact of ENSO in terms of what parts of the archipelago are affected at different times. It is encouraging that this can be explained in terms of prevailing weather systems. Hilario et al. also review the recent research from Lyon et al. (2006) which shows an ENSO reversal whereby during the summer period (July to September) in the early stages of ENSO developing, it is often wetter than normal in El Niño years and drier than normal in La Niña years.

A range of decisions influenced by SCF

Decisionmakers in agriculture have always sought ways to know whether the coming season will start earlier or later and be drier or wetter than normal. Although far from perfect, there are operational SCFs and the challenge is how to use them. The other papers in this special issue focus on decisionmakers such as farmers, farm households, advisers, and policy analysts. Although in different contexts, all are making decisions under uncertainty where climate risk is a significant (but not exclusive) contributor to the uncertainty and SCFs have the potential to reduce the uncertainty.

All these papers provide good reasoning for a case study approach especially for a situation as complex as applying SCFs. Not only can case studies serve as representative farm models for which estimates of the potential value of SCFs can be made, they also provide information about how farmers and other decisionmakers use SCFs to make real decisions. Furthermore, case studies provide sources for extension material as has been effectively done through this project by the PIDS with the issuance, among others, of the *SCF Folio* which compiles information gathered through the lifetime of the project including perceptions of farmers, local communities, and decisionmakers in the case study sites on the role of climate information and forecasts in their production operations, how such information have reached them, and how SCFs have been used in the study areas. At the same time, the *Folio* documents the estimates of both the potential and actual values of the forecasts to farm decisions in the Philippines and Australia, and highlights the reasons for a divergence between the two valuations for farmers as evidenced from the case study findings.

Decisionmakers are not interested in rainfall and temperature per se but on the impact of these parameters on what matters for them—the yield of corn, the yield of rice, or appropriate rice import levels. The impact of climate on agricultural systems is complex. In their paper on SCF and corn production in Isabela, Reyes et al. describe how they use climate data, simulation modelling, and decision trees to assess the value of SCF on the decision to plant corn or continue the fallow. This paper covers statistical testing of the skill of the forecast.

The paper by Patindol et al. focuses on the specific decision of the time of planting of corn in Matalom, Leyte. The authors used simulation modelling and long-term climate records to find planting times that were "risk efficient" under different ENSO states. A risk-efficient solution can be one that has a higher mean return or less dispersion around the mean. This case study relied heavily on mathematical analysis but it highlights the challenge for small-holder farmers in a world where increased food production is needed—how to increase average returns and not see a dramatic increase in the risk.

On the other hand, in their paper, Borines et al. report a highly innovative approach that was used with two focus group studies in northern Mindanao where farmers were presented with a video of a seasonal climate forecast and asked what their response might be. The video was especially prepared for this study by staff and students in the communication faculty of the VSU. Farmers were able to identify a wide range of decisions that they might take; quite importantly, many of these are at a farm livelihood level rather than a single crop and field level. In response to a forecast of drier than average conditions, farmers will plant a small portion of their land and minimize inputs on what they do plant. They will also increase their backyard gardening as an immediate source of food for their family, raise farm animals such as chickens, goats, cows, and pigs to have alternative sources of income, and look for work in towns and cities as a means of earning income. In response to a forecast of wetter conditions, many resource-poor farmers would make few changes. Decisions relating to sequences such as corn-corn, corn-rice, corn-vegetables, corn-sweet potato, and corn-fallow have whole farm implications not only in terms of livestock (e.g., grazing a fallow) but also in terms of labor and capital.

Meanwhile, the Reyes et al. paper on rice import policy is notable because most of the work on SCF have focused on the farm and paddock level. Reyes et al., however, worked closely with policymakers to develop a stochastic model of rice imports and stocks which could be used to explore the value of SCF in this complex and dynamic situation.

Finally, Reyes et al., in another paper on policy options for rice and corn farmers in the Philippines in the face of seasonal climate variability, present options that could help enhance the delivery of agricultural services integrated in the special risk management programs implemented by the Philippine government to help farmers cope with climate variability. The options are based on the risk mitigation tools that are most preferred by farmers for their production decisions in response to SCFs. Among these are agricultural credit, crop insurance, and special assistance programs such as irrigation and seed subsidies.

Challenges for bridging the gap

The value of information lies in its use. This is recognised by the World Meteorological Organization's (WMO) commission for agricultural meteorology which points to support systems for agricultural decisionmaking such as SCFs as potentially of great value but would serve no purpose unless connecting with users (WMO 2006). The WMO points to insufficient education and training of user communities (including farm advisory services) and a lack of meaningful interaction between the institutions delivering the information and those using the information.

At the launch of the project in July 2005, Dr. Josef Yap, president of the Philippine Institute for Development Studies, introduced the communication and decisionmaking challenge by observing that SCFs were "too good to ignore, but not good enough to rely on." In work associated with this ACIAR project in South Australia, a leading farmer made the comment, "the problem with climate forecasts is that you tend to pay too much attention to them." It is sobering to note that an overconfident use of SCFs can lead to a situation where decisionmakers become worse risk managers than if they had not used the forecast. If the essence of risk management is the acceptance of multiple futures, then it can be said that in the absence of a forecast, a decisionmaker is likely to make a choice that has an acceptable outcome no matter what the season ahead would be. In the presence of a forecast but where it is misunderstood, it could cause the person to plan for a single outcome. Seasonal climate forecasts are therefore best understood as a revised probability distribution of rainfall for the season ahead. As discussed in more detail below, the difficulties in communicating and using probabilistic forecasts in decisionmaking are substantial.

In the minds of some, the challenge of bridging the gap between SCF and decisionmaking is simply one of better communication. Under this linear view of information, climate science develops the forecast but there is the need for suitable software, pamphlets, media campaign, and extension workers to transfer the information to decisionmakers. But while better extension material is indeed necessary, it, however, needs to be backed-up with a good working knowledge of the use of probabilistic seasonal forecasts in decisionmaking. As outlined by Gibbons et al. (1994), complex contextual issues such as managing climate risk are unlikely to be 'solved' by traditional, hard, empirical reductionist science referred to as Mode 1 science. Rather, this sort of issues requires a shift to Mode 2 science which is science in the context of its application. This is a shift in terms of communication from knowledge transfer to knowledge brokering. In this case, knowledge brokers are people who work to ensure that knowledge is used and that knowledge flows from climate science to decisionmakers and from decisionmakers to climate science. In the context of SCFs for decisionmakers, this is made even more challenging when including the interaction with indigenous forecast methods as raised in the paper by Borines et al.

There is no doubt that communicating and using seasonal climate forecasts in real world decisionmaking is not easy. However, given the challenges of producing more food in a variable and changing climate, risk management has never been more important. The papers in this issue detail the basis of SCF in the Philippines and a range of processes whereby this information can be used to work with decisionmakers to improve their risk management. Success will only happen when climate information is incorporated into the risk management of policymakers and farmers rather than being seen to replacing it.

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