Seasonal forecasting: a simple analysis of various statistical and weather model forecasts for Queensland

Dorine Bruget [A], *John Carter* [AB], *Baisen Zhang* [A], *Grant Stone* [A], *Grant Fraser* [A]
[A]Queensland Department of the Environment Tourism, Science and Innovation. Ecosciences Precinct, Dutton Park, Queensland, Australia.

Introduction

Seasonal forecast systems have been used for many years to assist agricultural sector decision-making in Queensland, however, these systems lack easy to understand performance evaluation. This study presents an experimental analysis of these forecasts averaged across Queensland, by examining how often the 'forecast' tercile rainfall matches the 'measured' tercile rainfall (see example analysis; Fig. 1), while applying a simple weighting metric that accounts for successes and major failures.

Methods

For each forecast system, rainfall forecasts (hindcasts derived from median of analogue years or median of ensemble members from weather models), were converted to a tercile ranking against historical rainfall (base 1980 to forecast year). Gridded datasets for the outlook period (e.g. rolling 3-month periods) were extracted from the SILO database and converted to a tercile rank using the same base period. The percentage of grid pixels in each forecast category was calculated, as was the percentage of correctly forecast terciles. A weighting factor was used to discount the worst forecasts (i.e. predicted top tercile, observed bottom tercile; and predicted bottom tercile, observed top tercile). Systems tested were ACCESS-S1 and ACCESS-S2, AADI, (ACCESS-S2 with improved bias correction and downscaling through the AADI project), SOI phase, SPOTA, SOI/IPO, SST index and persistence (i.e. rain received was same as previous year)**.**

Model results

Seasonal forecasting of correct tercile rainfall generally exceeded random chance (i.e. 33.3% correct for matching forecast/observation outcomes, but the best 'in-use' system [SOI Phase] is only 43% correct; Fig. 2, green bar). When adjusted for critical forecast failures, ACCESS-S1 and ACCESS-S2 performance substantially declined, however, the AADI downscaling / bias correction method improved. Considering rainfall alone, the statistical methods SOI phase and IPO/SOI are marginally better than downscaled model estimates.

FORECASTS	Example of SOI Phase		
Top Tercile	Ruin 2.3 Weight -2.0	4.2 Weight 0.0	Correct 8.6 Weight 1.0
Middle tercile	22.7 Weight 0.0	Correct 27.1 Weight 1.0	23.7 Weight 0.0
Bottom tercile	Correct 6.4 Weight 1.0	3.2 Weight 0.0	Lost Chance 2.1 Weight -1.5
	Bottom tercile	Middle tercile	Top Tercile
	OBSERVATIONS (percent correct)		

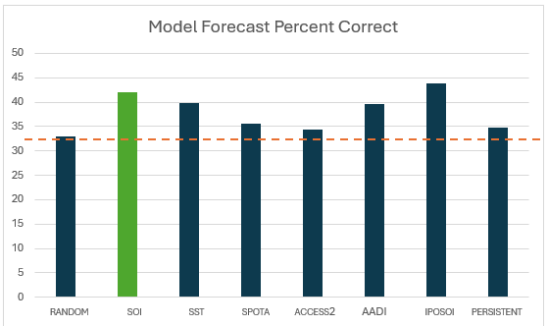

Fig. 1. Forecast and observed tercile rainfall. Fig. 2. Performance of various forecast systems.

Discussion and Conclusion

Model skill, such as presented here, is only part of the assessment process. Issues, such as ease of forecast production, clarity of outcomes to the user, forecast impact on bio-economic outcomes, week-to-week changeability of forecast, and forecast skill at monthly (as opposed to seasonal scale) are all important factors in providing and communicating a workable/acceptable seasonal forecast to assist agricultural sector decision-making. The tercile matrix concept shown here provides a simple way for non-scientific users to objectively evaluate forecast skill.

[B] Corresponding author: John.carter1@qld.gov.au