Project overview

MEAT & LIVESTOCK AUSTRALIA

AgScore - Assessing skill of seasonal climate forecasts and their value for on-farm decision making

Project code	B.CCH.2114
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Date published	09 December 2021
Published by	Meat & Livestock Australia Limited Locked Bag 991 NORTH SYDNEY NSW 2059
In partnership with	Grains Research & Development Corporation, AgriFutures, Sugar Research Australia, Cotton Research and Development Corporation

Meat & Livestock Australia acknowledges the matching funds provided by the Australian Government to support the research and development detailed in this publication.

Brief summary

Managed by Grains Research and Development Corporation (GRDC), this project made use of an innovative software tool providing robust comparison of seasonal climate models using agricultural relevant metrics to help primary producers assess seasonal forecasts for more profitable decision making and climate risk management.

AgScore is a cloud-based tool which executes the Agricultural Production Systems sIMulator (APSIM) with uploaded climate model data and analyses the results against identical APSIM simulations using baseline climatology for the same period. This is done to identify biases and weaknesses in climate models for predicting agriculturally relevant metrics for different industries, such as crop yield in grains. This approach was applied to multiple global climate models and different Australian agricultural industries with the results communicated at different levels to growers, advisors, extension specialists in the climate risk and broader climate science community.

Real-world case study farms were used to demonstrate the additional value a forecast might offer over a baseline management scenario that assumed average conditions. The case studies included grains enterprises across a range of climates and geographies, as well as cotton, sugar and rice. The grains case studies were focussed largely on sowing related decisions including crop species, variety, sowing density and nitrogen fertilisation.

MLA's investment in the project was through its contribution to the Managing Climate Variability Program.

Objectives

To model the economic value of using seasonal climate forecasts information to aid strategic on-farm decisions such as crop choice prior to sowing.

Project outcomes

Overall, only small differences (<5%) in gross margins between baseline scenarios were found in the case study farms that incorporated seasonal rainfall forecasts into their management choices. The limited potential of rainfall forecasts to improve profitability can be explained in part by conservative management responses to even more favourable conditions in the case study farms that were simulated.

Sowing decisions requiring rainfall forecasts during autumn remain inherently uncertain, whereas spring-based sowing of summer crops can realise yield benefits under some conditions. The sugar and rice case studies had no appreciable differences in baseline and forecast-based scenarios presumably because the management responses revolved around irrigation-related decisions that are uncoupled to on-farm rainfall patterns.

While there is a tendency to try and 'pick winners' when comparing forecasting performance, this study exposed some of the complexities of taking such a position. There are several models that provide skill for southern and eastern regions during winter and spring. The Bureau of Meteorology's model, the most widely used seasonal outlook in Australia, ranked highly among the top-performing models. It was anticipated that users would seek a consensus view on seasonal climate information that confirmed a particular signal produced by a single model.

Forecasts translated into yield or productivity-based predictions have obvious benefit to users in that they incorporate multiple climate drivers i.e. rainfall and temperature, and integrate seasonal trajectories of plant growth. However, results from this study indicate that the overall signal and the corresponding accuracy of the yield forecast may be similar to the rainfall forecast for the same time of year and location.

There is limited scope for forecasts to provide value for sowing decisions, however forecasts translated into yield or productivity-based predictions have obvious benefit to users in that they incorporate multiple climate drivers i.e., rainfall and temperature, and integrate seasonal trajectories of plant growth. The value of forecasts for management decisions depends on the risk appetite of farmers and the extent to which they may respond to a forecast that deviates from their default position. The study raises several questions around what might be an optimal set of management responses and whether these are adequately tuned to the shifts in forecast probabilities.

Benefits to industry

Forecasts translated into yield or productivity-based predictions have obvious benefit to users in that they incorporate multiple climate drivers i.e. rainfall and temperature, and integrate seasonal trajectories of plant growth. However, the results indicate that the overall signal and the corresponding accuracy of the yield forecast may be similar to the rainfall forecast for the same time of year and location.

Future research and recommendations

- Investigate the potential for incorporating other sources of local farm information that might strengthen predictions of yield or productivity when generating a forecast. For example, soil water estimates, particularly early in the season, might bolster forecasts of crop yield.
- Investigate the concept of a ‘perfect knowledge’ forecast as a means to gauge the extent to which management decisions might be optimised to the potential options available within a given enterprise.
- Explore the role of multi-week forecasts that might address decisions that have received less attention in the past. This may include spray planning, irrigation scheduling in response to temperature fluctuations and harvest logistics.