Can we forecast wheat yields and grain protein in Western Australia?

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Location: Floreat, Western Australia

Principal investigator

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The need

Large variability in the quantity and distribution of rainfall from season to season in Western Australia (WA), with no knowledge of the season ahead, makes management decisions in wheat farming a gamble with many uncertainties and risks. Forecasting of rainfall in the forthcoming season can enable wheat farmers to better mitigate the impacts of climatic variability and thus to improve profits. However, the additional value achieved from applying categorical forecast information in wheat systems of WA is as yet poorly quantified. Moreover, it is not known whether the skill of current operational forecasting systems is sufficient so that management decisions based on forecasts generate enhanced gross margins over strategies that do not consider forecast information.

How this project fits with MCV objectives

The project is aligned with the MCV objective of providing farmers with tools and services to manage climate risk.

Project objectives

The overall objective of the project is to mitigate the impacts of climate variability in wheat cropping systems of WA.

1. Review and test the forecasting skills of SOI (Southern Oscillation Index), SST (Sea Surface Temperature), mid-latitude forecasting indices, forecasts from GCMs and other emerging forecasting systems for the WA wheatbelt

2. Assess the value of forecasts for predicting wheat yield, grain protein, and gross margins from wheat cropping for WA

3. Discuss with WA farmers the practical value of seasonal forecasts for sowing and N management decisions

Methods

We collaborated with CSIRO-MAR in developing a software tool for testing the skill of seasonal forecasting systems.

We used the APSIM-Nwheat model and simulated effects of nitrogen (N) fertiliser management and sowing decisions (sowing vs not sowing wheat) for different categorical forecasts of seasonal rainfall (e.g. below/above median, rainfall terciles).

We calculated the value from using this forecast information in terms of additional gross margins achieved, over a strategy that does not consider forecast information.

We assessed the value from knowing the initial soil water content at sowing and compared this with the value of seasonal forecasts.

Desired outcomes

At the end of the project, we will have identified skillful seasonal forecasting systems and will know whether such skill translates to value by quantifying benchmarks that any forecasts must achieve to be useful in guiding N management and sowing decisions in wheat systems of WA.

Achievements to date

Results of the skill testing showed that the skill of most forecasting systems at the beginning of the season in May is low for south-west WA. Best performing was the experimental system GESS (Global ENSO Sequence System) of Dr David Stephens (DAWA), which is still under development. There is a potential benefit from conditional N management and sowing decisions on better water holding soils in the low rainfall regions of WA. The value of seasonal rainfall forecasts declines toward higher rainfall regions and on low water holding soils. For the application considered (N management, sowing decision), the skill of SOI and SST predictors was too low to be economically valuable.

What is left to do?

We are currently evaluating the financial value from knowing the initial soil water status at the time of sowing, and comparing this with the financial value from seasonal forecasts. The application will be for N management and sowing decisions in wheat systems.

We plan to discuss the results of our research with two farmer groups, one in the northern and one in the southern WA wheat belt.