

AgScore – a skill test of Climate Models for Agriculture

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So your climate model can predict rainfall, but can it predict wheat yield?

- Climate model metrics are usually based around climate features such as Nino3.4, mean seasonal rainfall, and ensemble spread.
- As we begin to use climate model output in crop models we need to develop a new set of metrics related to crop growth.
- These metrics are not as simple as rainfall totals for a season.
- Outcomes will be highly sensitive to climate model calibration methods and we need to find an easy way to test the importance of these for agricultural production.

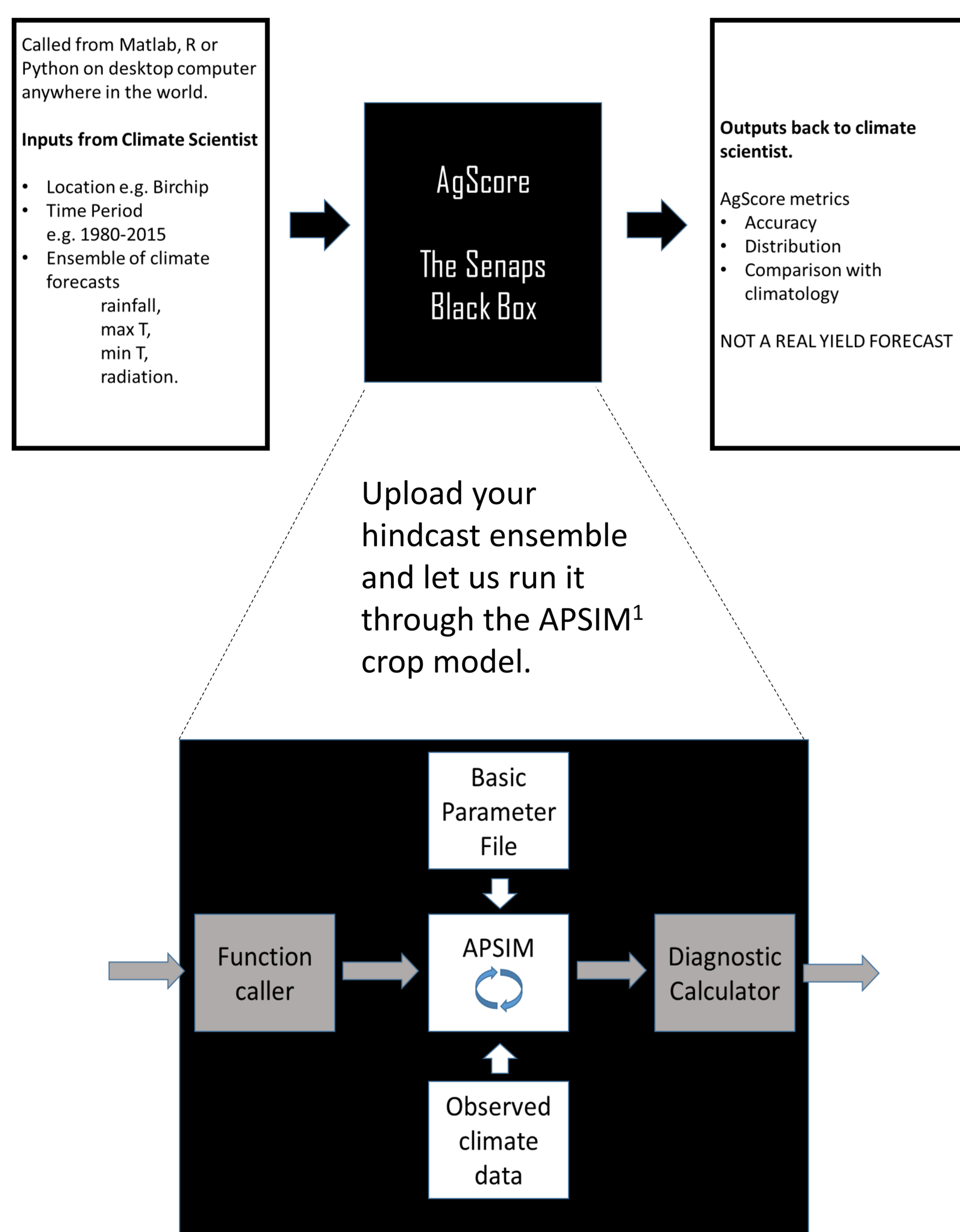
Rainfall and Potential Yield at Parkes, NSW.



Observed rainfall (SILO) and the corresponding potential yield from APSIM (1981-2015) Same for all ensemble members from POAMA hindcast.³

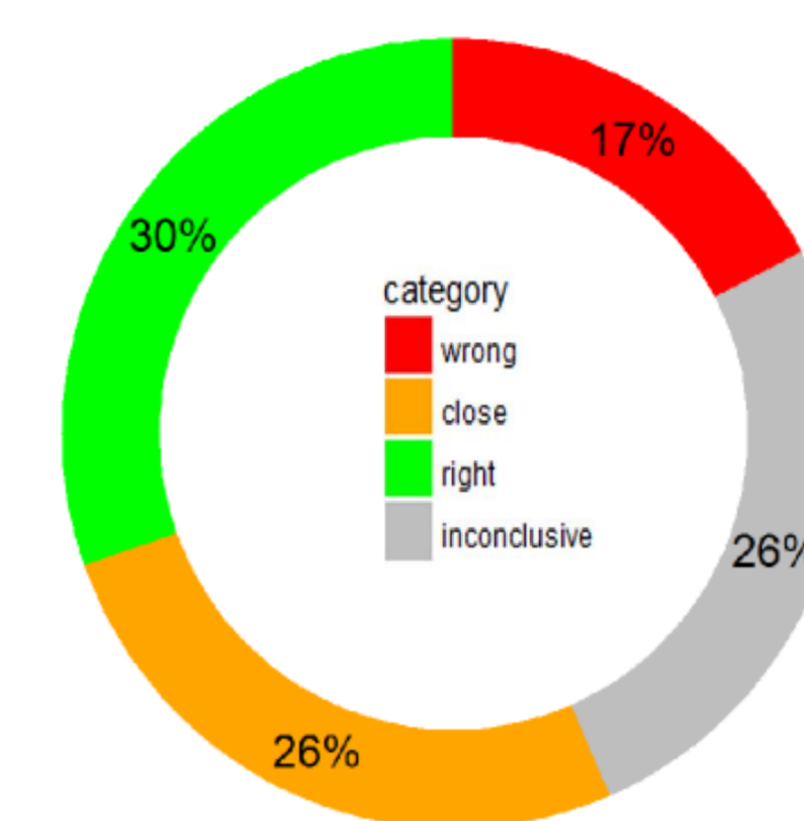
The problem: Despite POAMA simulating monthly rainfall well in eastern Australia, when each ensemble member was analysed and run through APSIM, some rainfall totals were nearly double what had been observed and wheat predictions had a low yield bias. Why is this happening?

What is your AgScore?

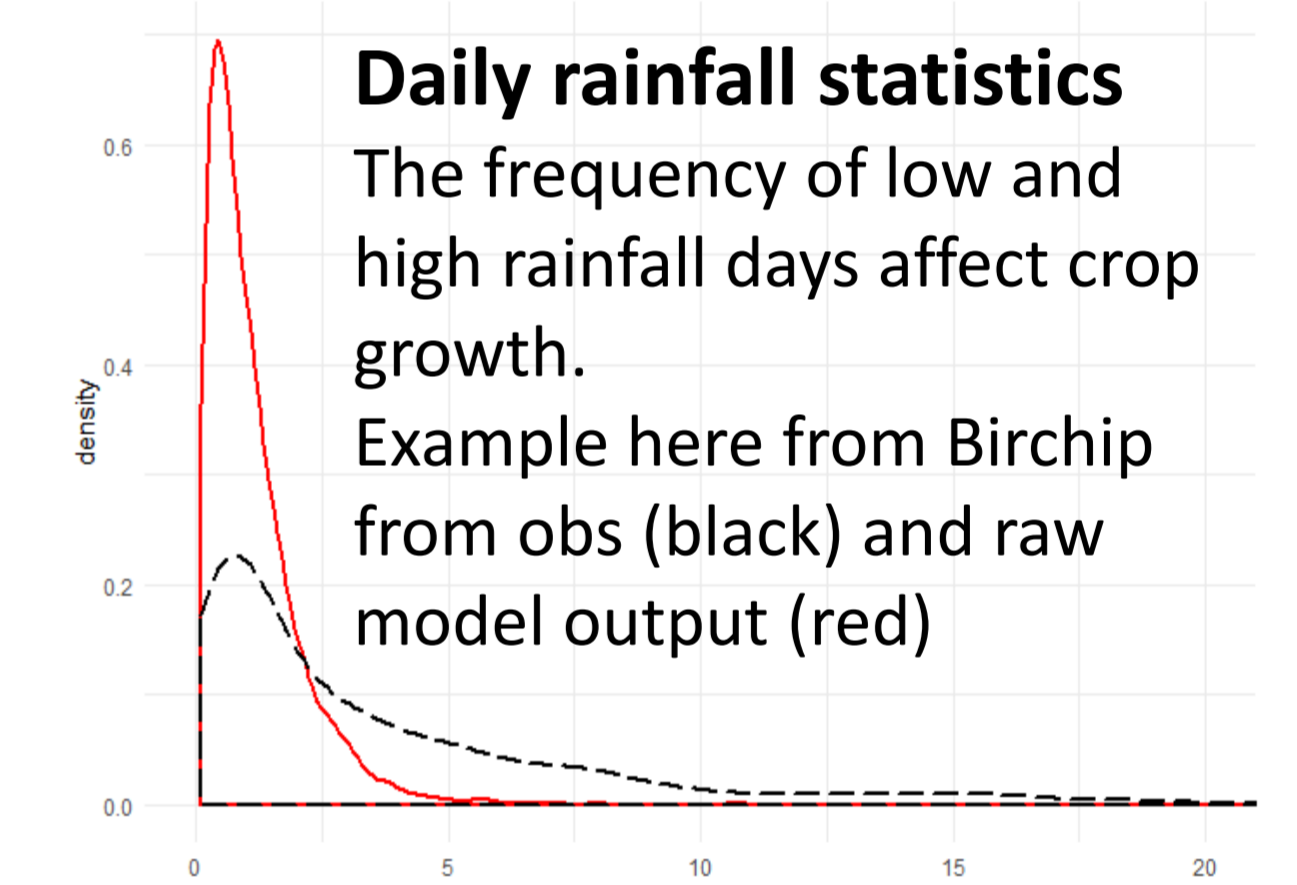


Upload your hindcast ensemble and let us run it through the APSIM¹ crop model.

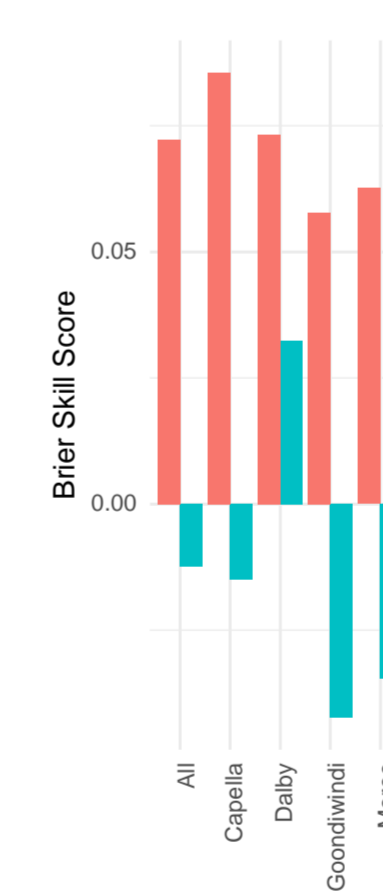
Rainfall forecast skill



ACCESS-S 3 month rainfall forecast from 1st March at Birchip, Vic. Skill is based on ability to predict the 'correct' tercile.⁴

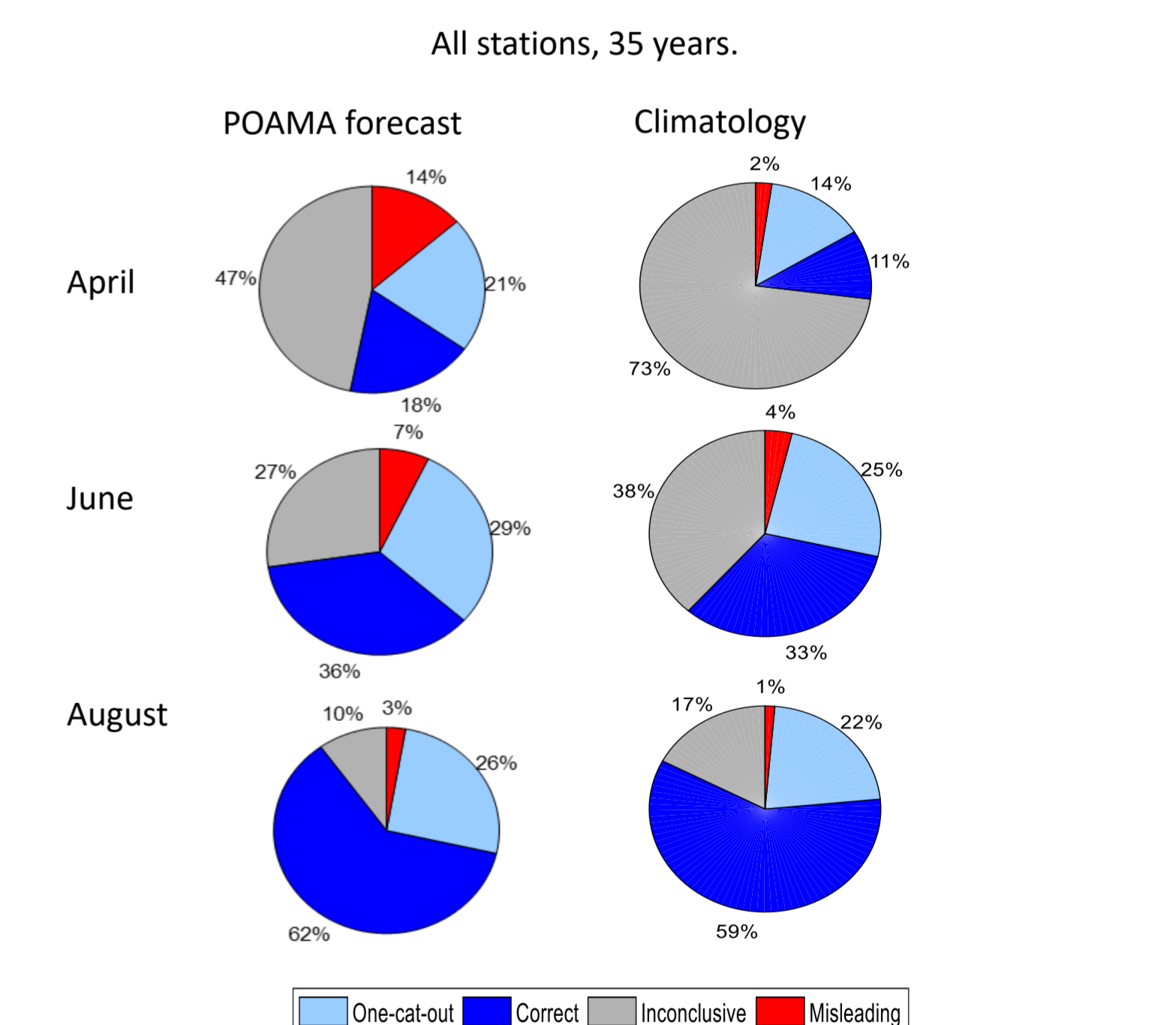


Daily rainfall statistics
The frequency of low and high rainfall days affect crop growth. Example here from Birchip from obs (black) and raw model output (red)



Brier skill score for exceeding median rainfall compared to climatology at 4 QLD cropping locations.²

Wheat Yield Forecasts for WA.

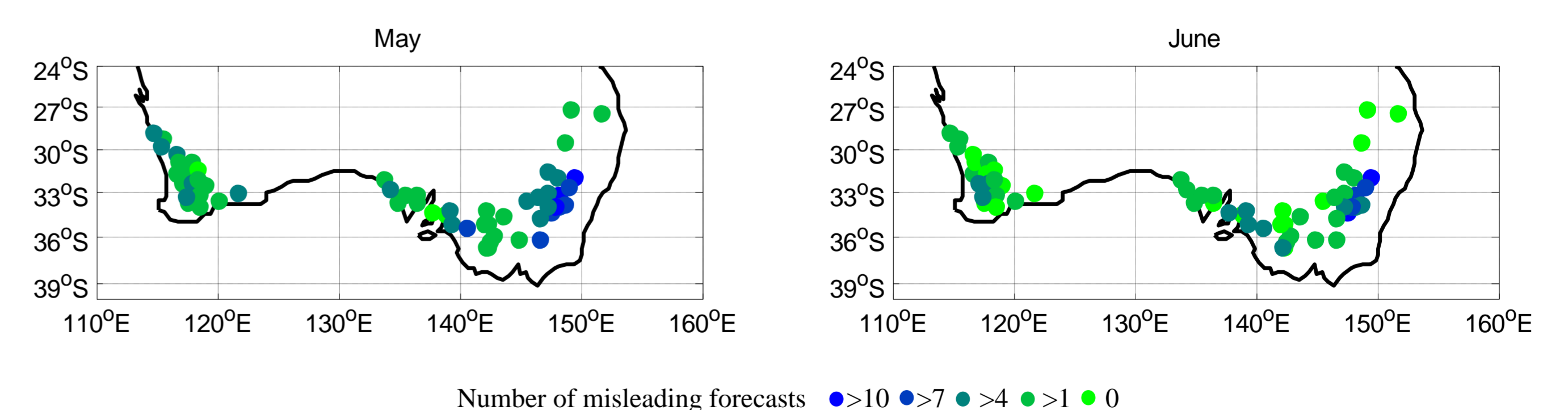


Comparison of POAMA with Climatology for predicting wheat yield over 1981-2015 in a tercile forecast system.³

What sort of metrics would help you?

<https://research.csiro.au/agscore/>

How often is the Yield forecast 'wrong'?



Wheat potential yield predictions from May and June across Australia's major cropping zones. Colours indicate the number of 'misleading forecast years' out of a total of 35 being a prediction of the highest (lowest) tercile when the lowest (highest) actually occurred.³

FOR FURTHER INFORMATION

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REFERENCES

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2. Rodriguez, D., DeVoil, P., Hudson, D., Brown, J.N., Hayman, P., Marrou, H., Meinke, H., 2018. Predicting optimum Crop Designs Using Crop Models and Seasonal Climate Forecasts. *Nature Scientific Reports*.

3. Brown, J.N., Hochman, Z., Holzworth, D., Horan, H. 2018 Seasonal climate forecasts provide more definitive and accurate crop yield predictions. *Ag. For. Met.* 260-261, 247-254.

4. Mitchell and Brown (2019) Providing seasonal forecasts to Australian grain producers with easily interpretable skill metrics. Submitted to *Ag. For. Met.*