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Australian Government
Department of Agriculture, Fisheries and Forestry
ABARES

Australian Government
Bureau of Meteorology

Queensland Government

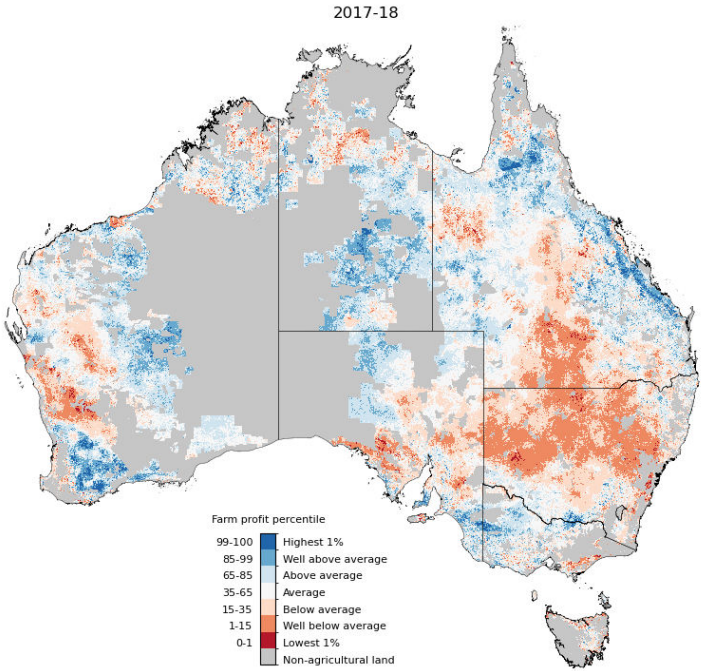
Long range impact-based forecasts for drought early warning in Australia

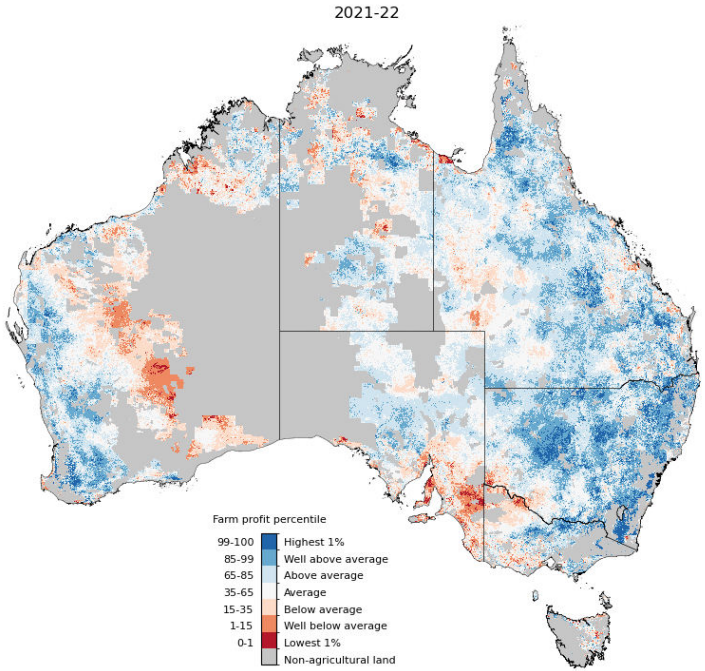
Andrew Schepen | Don Gaydon, Neal Hughes, Pat Mitchell, John Carter, Chris Sharman, Jonathan McComb and James Bennett

What is an agricultural drought early warning system?

- Impact-based approach → agricultural and economic indicators
- Forward-looking: based on real-time seasonal climate forecasts
- Informative for drought analysts and policy-makers

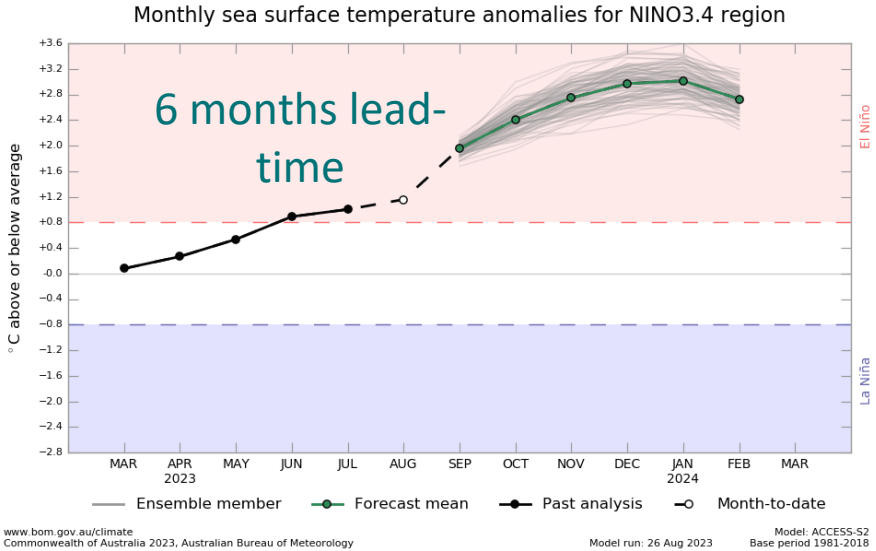
Historical farm profit indicators

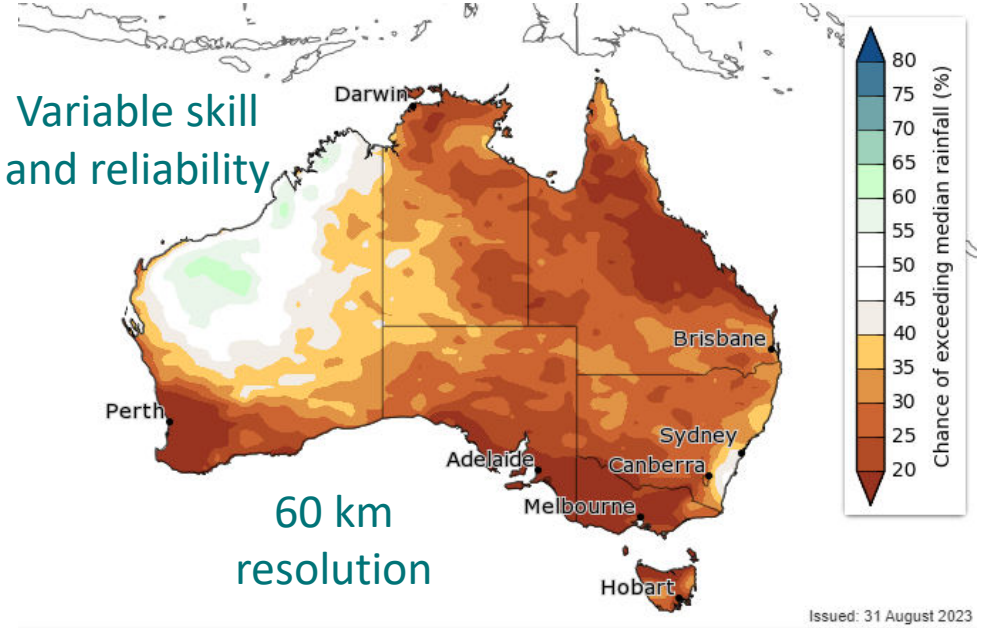




Source: ABARES / *farmpredict*

GCM-based seasonal climate forecasting





Source: Bureau of Meteorology / ACCESS-S2

Climate-driven agricultural models

- Models require rainfall, temperature, solar radiation, vapour pressure and potential evaporation
- Daily time step at least 12 months ahead
- 5 km spatial resolution
- Target obs datasets: AGCD and Silo

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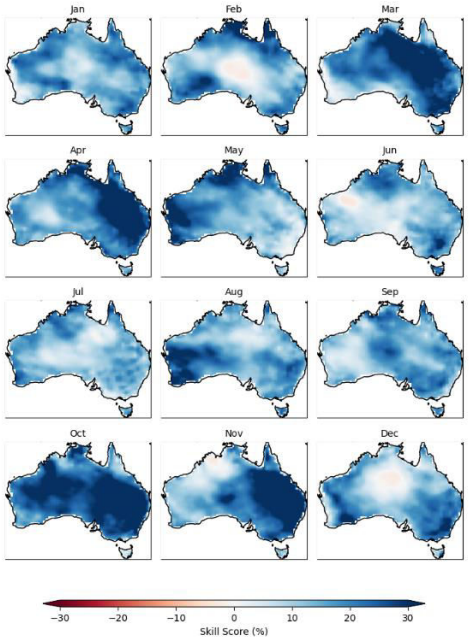
Statistical forecast calibration and downscaling

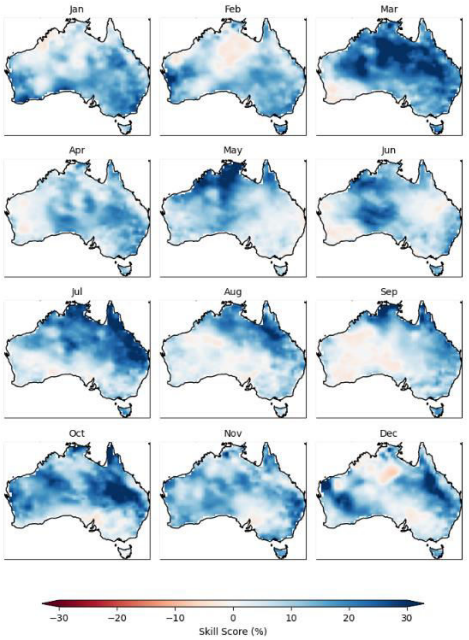
- Bayesian Joint Probability calibration at 60 km/monthly resolution
  - Model output statistics – transformed multivariate normal
  - Draw 99 ensemble members
  - Augment forecasts to 12 months
- Schaake Shuffle to establish spatial, temporal and inter-variable patterns
- Nearest-neighbour disaggregation to 5km/daily resolution

BJP post-processed ACCESS-S2 skill – first month

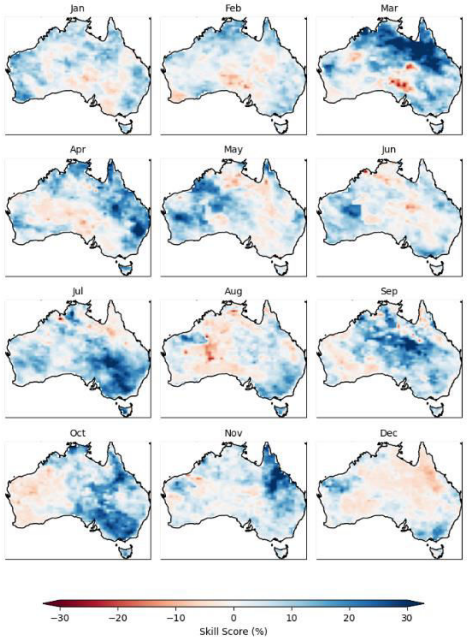
Tmax



Tmin



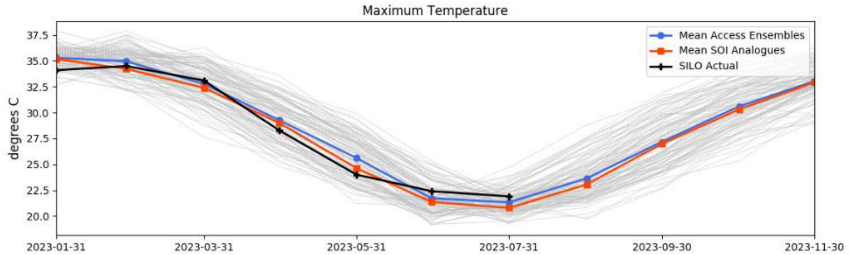
Rain

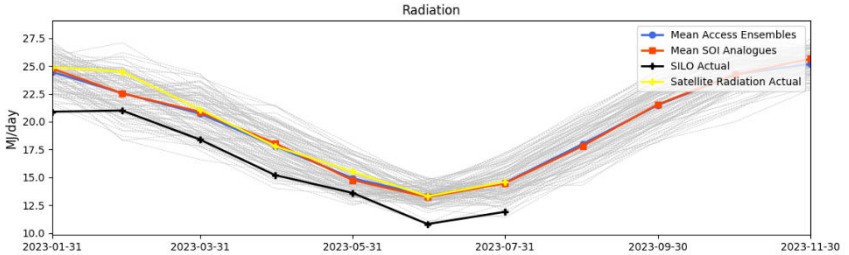


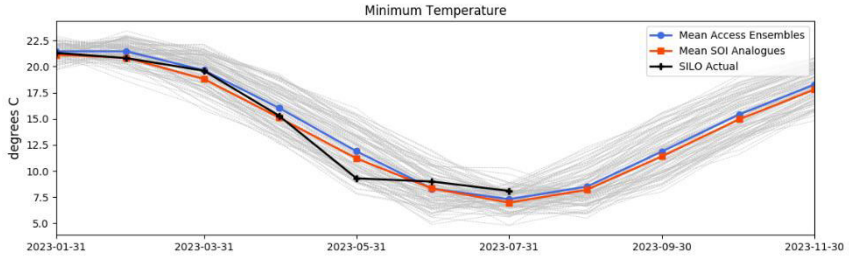
CRPS_SS relative to climatology

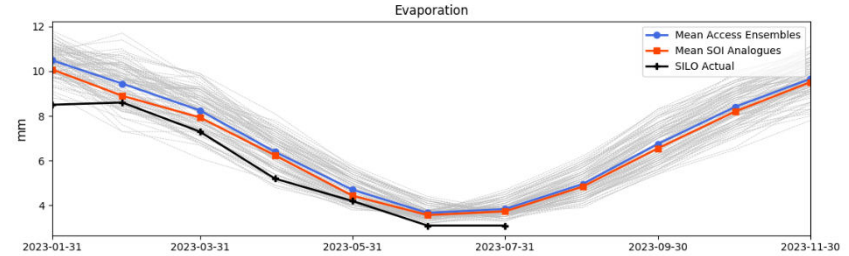
Real-time post-processed climate forecasts

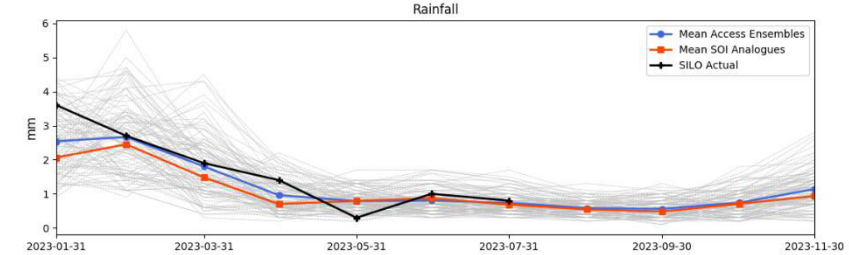
AUS 202301

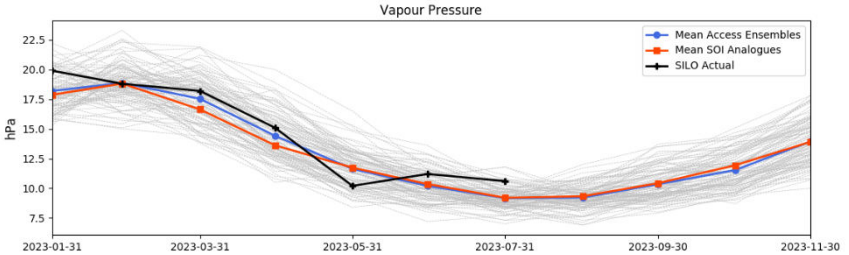






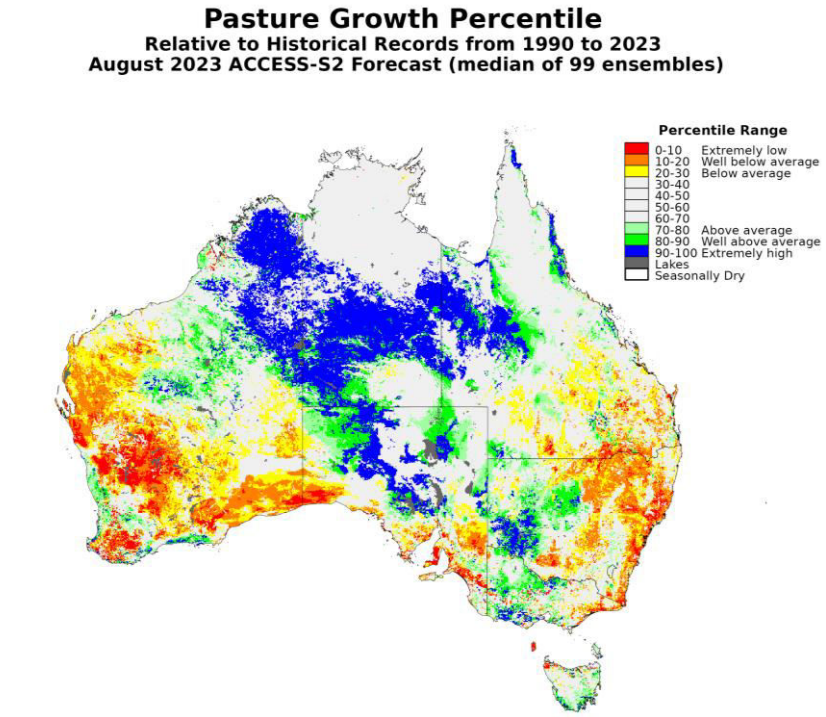


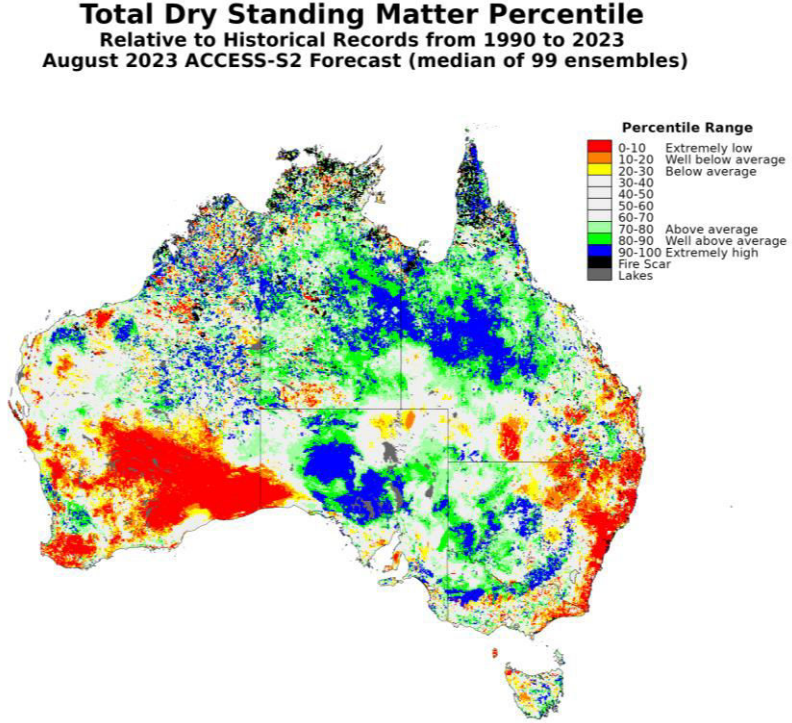




Source: Queensland Government / SILO

Drought indicators for August 2023





Take home messages

- We are building a drought early warning system for Australia based on crop yield, pasture growth and farm profit indicators

- Probabilistic forecasts are made 12+ months ahead with multivariate post-processing of ACCESS-S2 adding skill for 1-3 months

- The forecasts will inform government drought policy and agricultural preparedness, but hindcast testing is still required

Thank you

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