Resilient EP Project Final Review

Summary for CSIRO outcomes from research themes:

1. Optimising site location for new soil moisture probes across EP agricultural areas
2. Mapping soil water spatially and temporally across farms

The methodologies for each theme applied digital approaches that incorporated soil-landscape methods to predict soil attributes, whether to explore the occupation of soil types by existing soil moisture sensors on the Eyre Peninsula in order to optimise the position of new sensors in soils not already covered by soil probes (Theme 1), or to predict and map, using computer systems, the distribution of soil moisture across farms – in the is case the Jordie Wilksch and Dam Adams farms (Theme 2).

In terms of theme 1, a case study was worked through to locate an arbitrary 8 new soil moisture sensors within the existing distribution of 44 as of Aug 2020. The output showed 6 new probes could be located in the Far West EP where it is clear visually at least that gaps exist. The remaining 2 were directed near Cleve where a review of evidence suggests soil variability is quite high – so entirely possible that important soils have been missed. It is important to apply this type of quantitative approach to in-fill soil gaps when new probes are planned to increase return on investment by covering a greater range of soil types by probes than currently achieved, and so more farmers have the opportunity to benefit from the spread of probes.

The work in theme 2 demonstrated a workflow to extrapolate timeseries soil moisture data from probes on the Adams and Wilksch farms to map soil moisture at any time the probe is operating. The theme demonstrated a statistical clustering method to prioritise soil sampling to cover the farm soils as best as possible. The soil sampling was used to train machine learning digital soil mapping to estimate available water to 1 m depth across the farm landscapes. The mapping reliabilities were favourable (Adams: R^2 = 0.35, Lin's concordance = 0.55; Wilksch R^2 = 0.42, Lin's concordance = 0.58) although the reliability of mapped extrapolations of soil moisture at certain times validated against concurrent field measurements were variable; the Adams farm showed a R^2 of 0.19 whereas the Wilksch farm resulted in a R^2 of 0.6. The approach seems to show promise as a possible aid to dryland farming decision making in situations where soil moisture probes are available nearby, although more work is needed highlighted by some reliability results. The mapping ground resolution of ~30 m adds to the decision making utility.

All studies are described in the reports and presentation:

1. Optimising site location for new soil moisture probes across the agricultural areas of the Eyre Peninsula; Mark Thomas (Theme 1)
2. Mapping soil Available Water Capacity spatially and temporally across the Adams' farm near Ungarra, EP; Mark Thomas, Damian Mowat and Jacob Giles. (Theme 2)
3. Mapping soil Available Water Capacity spatially and temporally across Wilksch's farm, Yeelanna, EP; Mark Thomas, Damian Mowat and Jacob Giles. (Theme 2)
4. Resilient EP Project final review, Mark Thomas, PowerPoint recording (Themes 1 and 2).

Mark Thomas (mark.thomas@csiro.au)