Resilient EP Field Trial and Demonstration Program summary

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Water is the biggest limiting factor in our production system. Can we collect information on water availability in soils at any time and in any place in the landscape and use that to make more profitable decisions? The field trial and demonstration program within the Resilient EP project aimed to provide answers to this question. This article will summarise the 24 field trials and demonstrations that were deployed through the Resilient EP project, highlight the management strategies that were investigated and their key learnings.

There are several points in the calendar year where management strategies can be refined through an improved understanding of the plant available water status of the soil. These were examined to varying degrees as part of the trial and demonstration program conducted as part of the Resilient Project.

Pre-sowing

Summer Weed Control

Information collected from the Regional Innovators Group (RIG) and discussion groups highlighted a very strong awareness to the value of controlling summer weeds across Eyre Peninsula as a method of conserving moisture for use in the growing season. This was able to be conveyed visually in several situations where, for a range of reasons, growers with soil moisture probes were slow to control summer weeds and moisture summer rainfall quickly disappeared quickly with the presence of summer weeds.

A demonstration strip run at Pinkawillinie over the 2020/21 summer was able to show that through one application of herbicide, 26mm of plant available water was able to be conserved for the following crop equating to over 0.5t/ha of higher wheat potential.

Crop Choice

For much of the low rainfall zone on Eyre Peninsula, being able to grow crops such as canola profitably requires additional water beyond that falling in the growing season. Conversely in the medium rainfall zone, having a full moisture profile at the start of the growing season can increase the chance of losing crops such lentils to waterlogging. The use of information produced by soil water moisture probes backed up with soil characterisation, both supported by the Resilient EP project, has improved confidence in decisions related to crop choice.

Discussions held as part of post-harvest meetings centred on how the amount of stored soil moisture could affect crop choice for the upcoming year.

Evaluating the benefits of soil amelioration.

Ameliorating soils (processes such as deep ripping, spading, delving and clay spreading) have the potential to reduce soil constraints such as soil compaction, and non-wetting soil, and to increase the plant available water holding capacity of the soil and improve water use efficiency.

Monitoring of two trials established as part of another project, located in the focus paddocks at Cootra and Mount Dutton, were continued by the Resilient EP project. In these cases, there was no benefit from a suite of amelioration processes trialled and highlighted gaps in knowledge around understanding the responses to amelioration in different soil types found on Eyre Peninsula.

Sowing

Time of sowing

One of the key drivers of yield improvement over the past decade has been timely establishment of crops to enable flowering in a window that minimises frost and heat risk. This has generally seen earlier sown crops (wheat sown early May) outyielding crops sown in the 2nd half of May.

Work conducted in 2022, a well above rainfall year, growing with above average cloud cover demonstrated that later sown crops don't always yield lower. The 2022 situation could be explained by the lower photo-thermal quotient (PTQ) experienced in that year. Further modelling of PTQ and its impact in the Eyre Peninsula environment needs further investigation to determine the frequency this occurs and the impact it could have on grower practice.

Long Coleoptile Varieties

One of the limitations to early sowing across an environment such as Eyre Peninsula is having to wait for season opening rainfall to create a germination event. The timing of germination events is likely to become more sporadic with a changing climate. One option to help reduce reliance on season opening rainfall is to place seed deeper into stored soil moisture. However, to do this, mechanisms such as longer coleoptile varieties are needed.

The Resilient EP project trialled longer coleoptile wheat genetics and determined these varieties will establish better from seeding deeper than modern shorter coleoptile varieties. For growers to fully adopt these varieties, they will need to yield similarly to current shorter coleoptile varieties and a have access to management system that is able to manage issues such as weed control and phosphorous nutrition requirements.

In crop management

Adjusting Nitrogen rates during the growing season

Much of the trial work conducted as part of the Resilient EP project centred around the application of nitrogen to match seasonal conditions. This work was able to demonstrate that having accurate measurements including start of season soil nitrogen and soil moisture, soil characterisation (how much plant available water a soil can hold) and some insights into what was driving yield variability across paddocks, helped improve the accuracy and understanding of how to derive a potential yield, it's probability and how to fertilise to achieve it. By having accurate measurements to base calculations helped create confidence in other tools such as Yield Prophet and soil moisture probes and help provided some applicable value in harvest yield maps. Other tools including the use of protein mapping and in season soil nitrogen testing were also shown to help create value in better targeting N inputs.

The quantity of Plant Available Water Capacity (PAWC) of a particular soil gave some insight into the probability of being able to effectively re-act to seasonal conditions with additional N fertiliser. Soils with smaller PAWC (or bucket size) (say around 70mm or lower) wet up and dried down very quickly and were hard to effectively adjust fertiliser strategy in the growing season. These soils benefited from having higher starting soil N values, so little additional fertiliser was required to capitalise on good seasons (it should be noted that yield potential is generally lower on these soils, so don't have the N requirement). Soils with larger PAWC values were able to be more easily managed in season N

management and were able to respond to N application in situations when plant available water was high in winter.

Conclusions

For growers and advisors understanding soil moisture, and how that relates to the soil they have can add value and confidence to decisions being made through-out the calendar year.

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