A precision agriculture journey to ameliorate soil constraints, increase productivity and protect swamps in high rainfall farming systems.

Executive Summary

The Glenelg Hopkins region is a productive, high rainfall cropping region in a landscape of wetlands, many of which are not permanently wet. As a result of this fluctuating nature, over time many of these seasonal wetlands are progressively degrading or being lost entirely. This project aims to spread awareness of the types of wetlands present in our communities, and utilise available resources, such as precision agriculture technologies, to learn to farm cohesively with wetlands.

Background:

Soils are the foundation of our farming systems and while we have traditionally managed them at the paddock scale, we know that the soils of western Victoria are highly variable. The variation in soils characteristics is a function of long-term soil formation processes, including rivers and wetlands, as well as both short- and long-term management and production. Understanding the variability of soils across paddocks and farms can be an important first step in optimizing production and identifying areas such as ephemeral wetlands, which may not always be obvious within the landscape.

This project worked with 4 landholders in Skipton, Lake Bolac, Nerrin Nerrin and Minninera, all of which had multiple wetlands on their properties. Of the 4 landholders, 2 had a five year history of working with Precision Ag to enhance their soil management practices and 2 landholders are in the introductory stage of utilizing precision agriculture within their businesses. This project was able to demonstrate how precision agriculture can be utilised, regardless of history.

The PA Journey:

For most producers in Western Victoria, the first step in their precision agriculture journey is to understand the variability of their surface soils. This entry step for all our landholders involved a grid soil sampling program, which enabled the landholders and their consultants to understand the nutrient levels of the topsoil of the project paddocks. This suite of data is spatially represented and the maps were able to be assessed in relation to other data sets, such as the State Governments Wetlands GIS layer that identifies all the wetlands in the region, historical yield data if that was available and satellite imagery.

Figure 1: Picture of saltwater wetlands at Lake Bolac that surround the trial paddock.

The nutrient maps comprise of pH (CaCl2), Phosphorus (Colwell) and Exchangeable Cations (Ca, K, Mg, Na, CEC). Phosphorus Buffer Index (PBI) is also tested at strategic sites. This suite of data creates the base from which most variable rate applications are formed, such as variable rate lime, gypsum, MAP or potash, for example. This methodology allows for the strategic placement of product at an appropriate rate, thereby reducing the potential run-off into waterways and application in wetlands.

Figure 2: example of the field technicians at work; grid soil sampling (left) and about to conduct an EM38 survey (right)

For the more experienced participants, this grid-based sampling is part of their annual program, with paddocks sampling on rotation every 3-4 years based on their cropping cycle. For the 2 landholders who had been using Precision Ag for over 5 years, this was an important step in the project as we were able to compare grid soil mapping results and generate a conversation to review management decision over the previous 3 or 4 years. This provided some valuable insights for the other 2 project participants as well as those that attended the field day around the precision agriculture journey.

As a part of the project two participants commenced the process of mapping their soil variability through an EM38 survey as the first step to investigating potential sub-soil constraints. The EM38 survey helps to identify variability in soil types across the paddock, with the EM38 map on one property matching the variability in crop yields in 2023. Ground truthing of the surveys

through strategic soil sampling to depth is important in understanding the variability and potential constraints.

Field day:

A successful field day was held on the 14th June on two of the properties in Lake Bolac and Nerrin Nerrin. Project results were presented along with some great insights on wetlands in the region and the cost benefit analysis of managing wetlands. With approximately 35 in attendance, the day promoted some interesting discussions around wetlands, the value of these areas from both an environmental and production perspective.



The project areas included several stand-alone seasonal herbaceous wetlands that have been continuously cropped, with both landholders and community discussing the challenges for recovery and the need to be able to prioritise wetlands in terms of regenerative potential, thus encouraging landholders and the community to place greater value on the preservation and conservation of other wetland areas.

The day highlighted the ability of precision agriculture to identify and help in the management of these areas, especially the ephemeral and often hard to identify areas.

Figure 4: wetland area in Nerrin Nerrin trial paddock that was cropped. Picture taken 28th November, 2023 with windrowed canola. Variable Rate technologies will prevent future applications occurring in this paddock region.

Final comments:

The project has highlighted the nature of the precision agriculture journey, that includes a lot of continual review and analysis and that there is no singular fixed goal. The project has also highlighted that the extent in which wetlands effect arable area, with many of the project paddocks having permanent as well as ephemeral wetlands, with some of the seasonal or fluctuating outer reaches of those wetlands being partially cropped.

It is hoped that we can continue to follow the precision agriculture journey of the landholders as they progress from surface soil management to understanding sub-soil constraints and targeting management around wetlands on their property.

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