

INVESTIGATING IF I HAVE AN ACID THROTTLE IN THE SOIL PROFILE?

Warwick Read has been working with Precision Agriculture for years to increase efficiencies and target the “1 per centers” to improve crop production targets on his mixed family farms in Victoria's western district near Beaufort.

Using intensive grid sampling strategies, Read Farming have collated a detailed history over the past 6 years from mapping pH and Colwell P across many paddocks. This has had a positive impact on yield and reduced variability in terms of soil pH as well as production.

However, following an extensive liming history, Warwick wanted to investigate potential variation in pH down through the soil profile that was being reported in research.

“I wanted to determine whether there were any acid throttles or sub-surface acidity that could not be identified through the traditional soil sampling practices.

“We commonly use lime top dressing without incorporation as part of our minimum tillage practices and we know that in combination with the slow movement of lime, we could have acidity issues at the 5-15 cm that are masked by 0-10cm sampling,” said Warwick.

WHAT WAS DONE

Kirsten Barlow from Precision Agriculture explained that paddocks were initially grid sampled (0-10cm) in 2017/18, followed by a Variable Rate (VR) lime application. The paddocks were then re-sampled (using the same GPS referenced locations) in 2019/20. These grid soil sampling results are summarised in the case study reducing acid soil variability using variable rate liming.

Additional sampling was undertaken to investigate potential acid throttles and sub-surface acidity.

“In autumn 2021, additional segmented samples were taken at 0-5cm, 5-10cm, 10-15cm and 15-20cm depths across three paddocks and two



Picture: Warwick Read farming enterprise in Western Victoria

FARM SNAPSHOT

Producer: Warwick Read

Location: Beaufort, Victoria

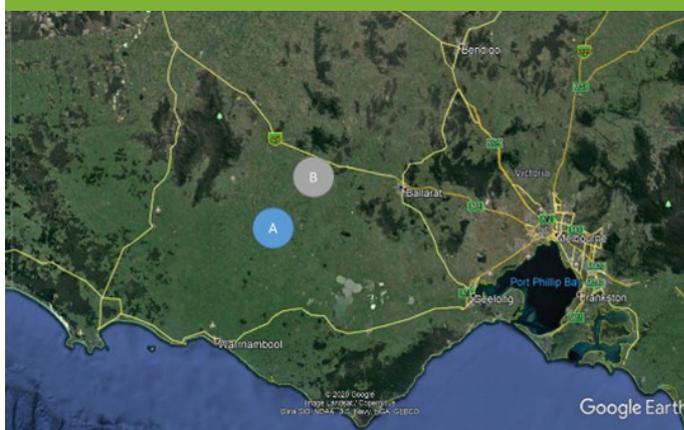
Annual Average Rainfall: 500mm

Soil Type:

A. Earlston Peak: Sodosols

B. St Marnocks: Mixture of Ferrosols, Chromosols and Sodosols

Enterprise: Mixed Farming



WHAT WAS DONE *continued...*

farms. These samples were tested for pH CaCl₂ and were strategically selected across the paddock

RESULTS EARLSTON PEAK

Earlston Peak consists of sodosols, which are strong texture contrast soils with sandy loam to clay loam surface soils. Segmented sampling was undertaken on one paddock (Conabar) which had an average pH for the grid sampling (0-10cm depth) of 5.2 in 2017/18 and 5.5-5.8 in 2019/20. The results were consistent with previous research.

"The pH in the 0-5cm segment is generally less acidic than the 5-15cm depths due to the surface application of lime and the accumulation of organic material. In the Conabar paddock the surface pH was above the target pH of 5.5 which is set to achieve lime movement.

based on the change in pH between samplings," said Kirsten.

The pH then declined in the 5-10cm and 10-15 cm layers, with 10-15cm generally being the most acidic depth. However, with the exception of one site, pH remained above a pH of 4.8 and is unlikely to be a significant constraint to root development to depth," said Kirsten. See Figure 1.

Warwick was relieved to know the sampling suggested that although pH was now lowest at 10-15cm, that the long-term lime history on the property was working and the surface applied lime is slowly moving beyond the surface 5cm into the 5-10cm layer.

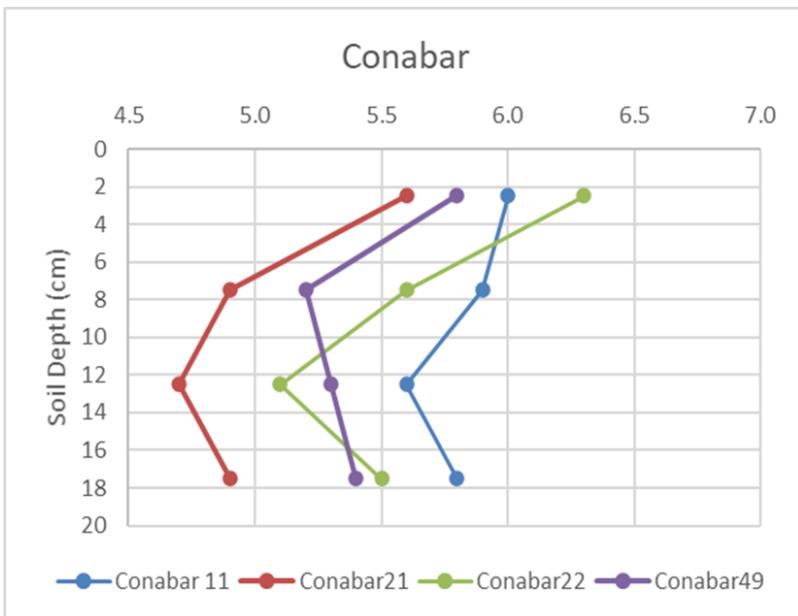


Figure 1: Soil pH changes down the soil profile

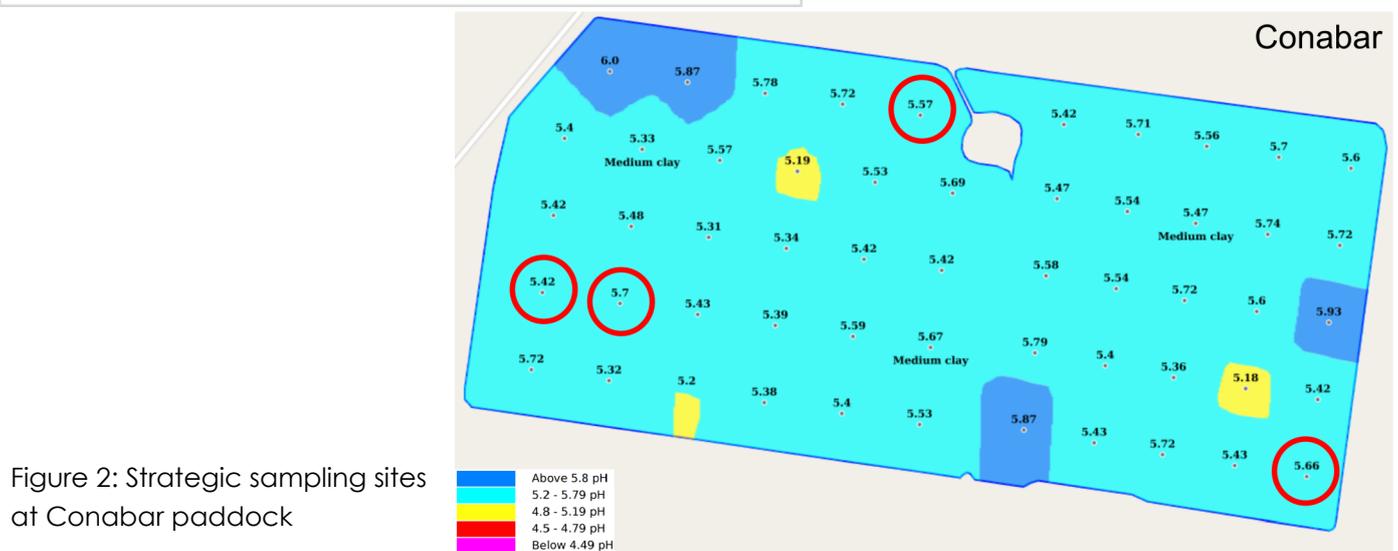


Figure 2: Strategic sampling sites at Conabar paddock

RESULTS ST MARNOCKS

St Marnocks had a greater variety of soils across the property, with a mix of ferrosols, chromosols, vertosols and sodosols. Segmented sampling was undertaken on two paddocks (Pines and Lewis) which had an average pH for the grid sampling (0-10cm depth) of 5.3 and 5.1 respectively in 2017/18 and 5.7 in 2019/20.

“Like the first property the 0-5cm depth was the least acidic with a pH greater than 5.8 at all of the sampling locations which is above targeted levels but in both the paddocks pH progressively decreased with 15-20cm depths being the most

acidic in most samples. Lime hadn’t got to this depth and was on average 0.7 units below the 0-5cm segment,” said Warrick. See Figures 3-6.

Kirsten explained further that the Pines paddock had two sites where pH dropped by 1 pH unit from the surface to sub-surface layers, while the remaining two sites had a higher surface pH and less decline with depth suggesting that different soil types are likely to be at play, affecting soil pH buffering capacity across the paddock.

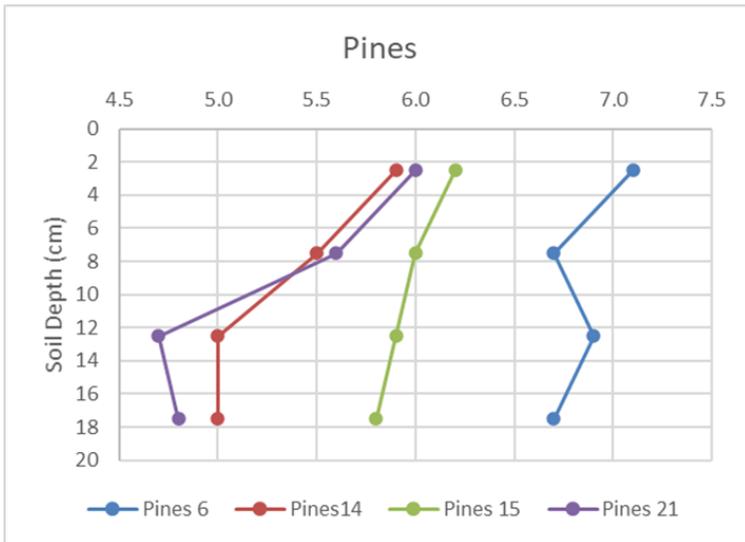


Figure 3 : Soil pH changes down through the profile

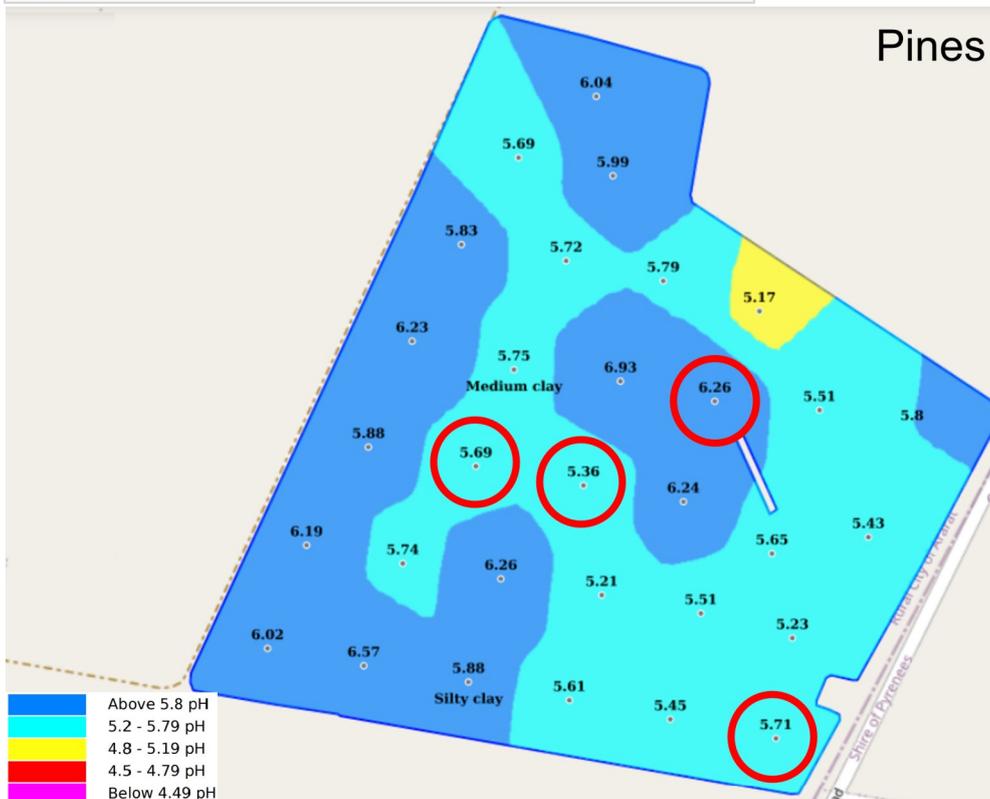


Figure 4: Strategic sampling sites at the Pines paddock

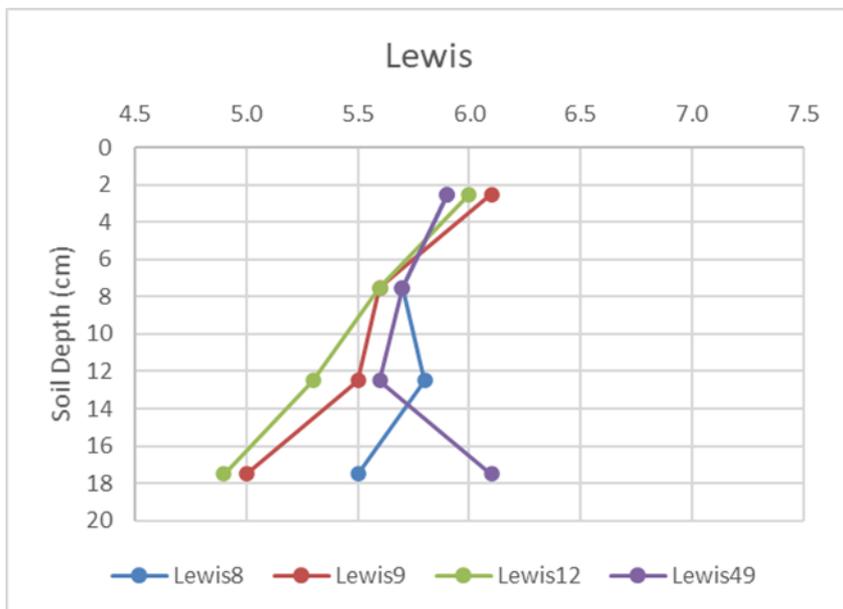


Figure 5: Soil pH changes down through the soil profile

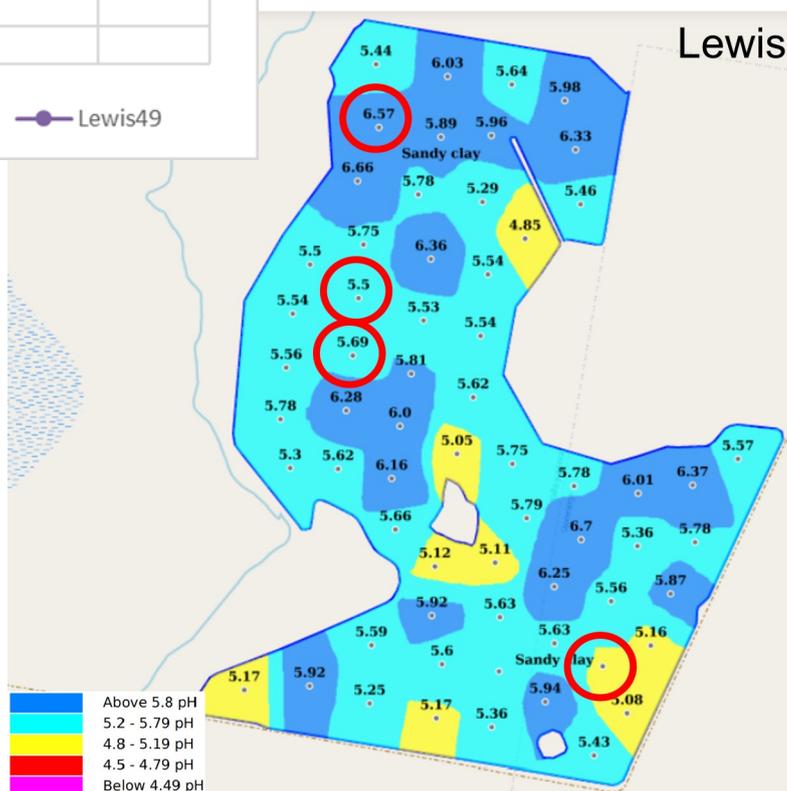


Figure 6: Lewis grid sampling

WHERE TO NEXT & CONCLUSIONS

Kirsten said Warrick's findings were consistent with research.

"The strategic sampling shows increased acidity with depth especially in the 5-15cm layers. This acidity is often averaged out by 0-10cm soil sampling and can mask problem acidic areas. But, both properties, despite the varying soil types are fortunate in not having a strong acid throttle which can significantly restrict root growth and crop development.

"The results also highlight soils are acidifying beyond the topsoil, in line with earlier research, and that it is important to maintain a surface soil (0-10cm) pH above 5.5 to ensure that over time, in either a filled

or no-filled farming systems, there is downward movement of lime," said Kirsten.

Understanding the pH through the profile is important in identifying appropriate management strategies. The process of segmented sampling down to 20cm depth has informed Warwick and his consultants, of the acidity status through the critical root zone for his crops, particularly with the inclusion of acid sensitive crops, such as faba beans.

"While the results won't change our current management, it certainly works to endorse our current practices in managing soil acidity, as well as establishing a benchmark that we can continue to monitor pH well into the future," said Warrick.