Brendan Torpy, PrecisionAgriculture.com.au demonstrates use of Veris pH detector. June 2015

pH mapping to target lime applications

(photo Brett Masters).

As part of the 'Managing acid soil for improved production' Wilksch Agriculture provided a case study paddock with pH mapping confirming pH variability across their paddock and supporting their decision to manage to soil type.

Farm details

Location: Yeelanna and Karkoo, South Australia

Farm size: 3,650 hectares (comprising of owned and leased land)

Rainfall: annual 410mm, growing season 320mm

Soils: red brown earths comprising of clay loams over clay and acidic sandy loam over red/yellow sodic clay which is high in iron stone.

Enterprises: continuous cropping enterprise consisting of grain legume, canola and cereal rotation depending upon soil type.

Randall and Jordan Wilksch and their families, and their parents Max and Julie, are partners in Wilksch Agriculture.

The Wilksch family, who is passionate about improving their soils and crop production, were keen to provide a paddock as part of a precision pH mapping exercise.

Containing two distinct soil types; acidic ironstone gravelly sand ('gravel ground') on the eastern side of the paddock) and alkaline red brown earth ('clay ground') on the rising ground, this 68 ha paddock has historically been managed according to soil type.

As faba beans are sensitive to soil acidity with poor root nodulation and growth on soils with low pH, Wilksch Agriculture has only sown them on the alkaline clay ground in the past and have sown lupins which are more acid tolerant on the gravel ground. However, Randall states that "with much higher returns from beans compared to lupins in recent years, they have begun to question whether by increasing soil pH they could increase the area where beans could be grown profitably".

At a 'Managing acid soil for improved production' workshop Randall was surprised to learn that on soils prone to acidification more than 80kg of lime should be applied for every 100kg of urea applied. "I knew that that agricultural production can accelerate soil acidification but

Figure 1 pH mapping. Brendan Torpy, Precision Agriculture.com.au; Andrew Harding PIRSA Rural Solutions SA and Jordan Wilksch.

didn't realise that it was occurring at quite that scale. Following this workshop I was keen to get a handle on the extent of soil acidity across our properties" said Randall.

In June 2015, the case study paddock was pH mapped by PrecisonAgriculture.com.au. pH readings were taken from 1 point per ha using a Veris pH probe mounted to a Can-Am. Farmworks software was used to convert this data into a pH map for the paddock.

The pH mapping confirmed that there was a large spatial variation in soil pH across the paddock and identified that 10.5ha or 15% of the total paddock area has a surface pH currently below the target pH of 5.5 ($CaCl_2$) (Figure 2).

If the Wilkschs' were to apply a uniform application of 2t/ha of lime across the whole 68ha paddock, 136 tonnes of lime would be required. Including application, this would be a cost of cost of $4,352 (Table 1). However, by using the pH mapping data the Wilkschs' can target applications to the 10.5ha that are below pH 5.5, reducing the lime requirement to only 11 tonnes. If the cost of mapping is added the total cost for liming the 10.5ha would be $1,032, thus reducing the cost of the liming operation by $3,320 (Table 1).

Opportunities

The pH mapping has provided the Wilksch family with a more complete

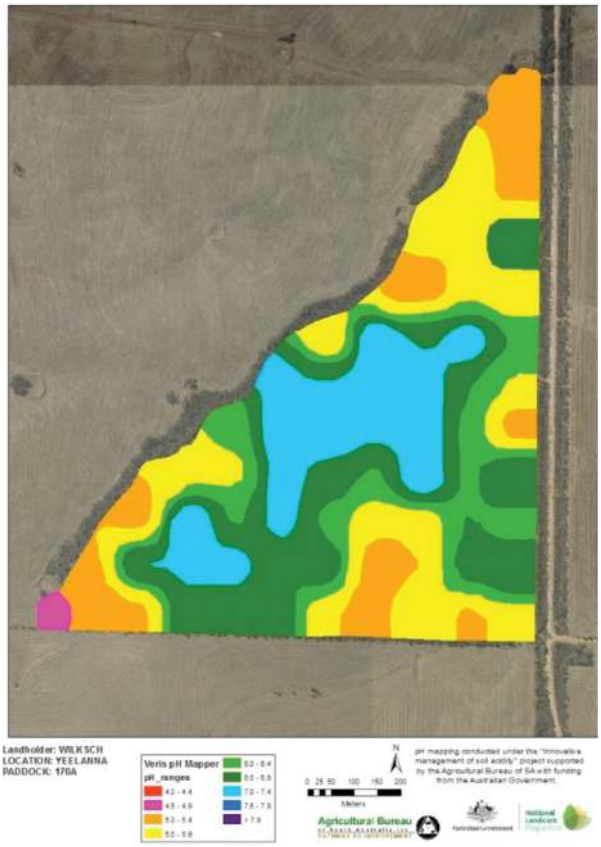

Figure 2 pH map of site. June 2015. Only the purple and orange areas require lime.

understanding of the variation and spatial distribution of soil acidity in this paddock.

This map added an extra layer of information to the site delineating the variation in soil types. Jordan remarked that he was surprised by the magnitude of pH variation across the paddock.

'80kg of lime is required for every100kg of urea applied to acid soil.'

Randall estimates that there are several hundred hectares in the south western corner of this property which contain soils that could have similar pH levels. He also considers that there are large areas on other Wilksch Agriculture properties where soil acidification has been accelerated due to agricultural practices, however given the heavier textured soils perhaps not at the same rate.

This single paddock demonstration has shown them the value that pH mapping could add to their soil management in the future. The paddock will not be limed in 2016 but the Wilkschs' plan to monitor soil pH on the site and apply lime in the next couple of years.

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Table 1 Cost of lime application.

	Uniform paddock rate 2.0t/ha	Targeted lime application based on pH mapping
Area requiring lime (ha)	68ha	10.5ha
t/lime required	136t	11t
Cost lime ($12/t)	$1,632	$132
Cost freight and spreading ($20/t)	$2,720	$220
Cost of Mapping ($10/ha)	-	$680
Total cost	$4,352	$1,032
Saving ($= cost blanket rate - cost of mapping - adjusted cost)		**$3,320**

Figure 3 Jordan inspects bean nodulation on site. June 2015.