

Automated pH testing has increased the density of samples from one to 10. This has increased Kym and Katie l'Anson's confidence in the location of the zone boundaries and has reduced the areas that require high rate of lime.

Variable rate soil amendments

(photo Andrew Harding)

Farm details

Location: Marrabel, South Australia

Farm size: 1,700 hectares – two blocks 900 and 800 hectares

Rainfall: growing season rainfall 400mm and 320mm

Soils: acid, sodic red brown clay loam, acid grey shale, neutral black soil. Sandy loam soils ranging from acid to neutral pH.

Enterprises: continuous cropping – wheat, canola, oat hay, faba beans

Over ten years of targeting lime and gypsum rates to soil type is clearly showing benefits.

Kym and Katie l'Anson's philosophy is to grow healthy profitable crops but to do this they need to overcome soil constraints and match inputs to potential production.

On their properties near Marrabel soil acidity had been a primary constraint to production on some of their soil types. Over the past 10 years, the l'Ansons have implemented an intensive soil sampling and variable rate liming program. Now they struggle to find any substantial areas of low pH soil.

In this period they have recorded an average increase in water use efficiency from 8 to 17kg/mm/

ha. Managing soil variation has been central to achieving this improvement.

Soils vary across the farm. The main soil is a red brown clay loam that suffers from sodicity and acidity (pH 4.4 to 5.5 CaCl_2). However, across virtually every paddock there are patches of less acidic, non sodic grey shale, which is mainly on the ridges, and deep black cracking soils that are slightly acidic.

"Our target was to raise the average soil pH to 6 (CaCl_2), while an increase in snail numbers since using high rates of lime has made us cautious the average soil pH is now 6.3(CaCl_2)."

Variable rate lime and gypsum

Kym knew the addition of lime for acid soils and gypsum on sodic areas would help improve his soils but applying a blanket rate would be wasteful and not financially possible.

Together Kym and Katie embarked on an intensive soil sampling and characterisation program.

Paddock maps were loaded into the *Farmworks* software program and a grid was drawn across the paddocks. Sampling points

were located using the grid and with changes in soil colour, soil samples were taken at about one per hectare across the farm. The soil test results were used to create lime and gypsum application zones.

The mapping established the location and proportion of each soil type on the home farm. About 70 per cent of the land is a red brown clay loam, which is acidic and sodic and prone to water logging. A further 20 per cent of soil is acidic grey shale, located on the ridge tops, while the remaining 10 per cent is cracking black soils.

In the past 10 years, two to three 2.5t/ha applications of Nutrilime® (ENV 104%) have been spread on the red brown clay loam, together with 3t/ha of Hi-Ag gypsum (purity 92%), while the grey shale has received one to two applications of lime and the black soils none.

“These rates are dry equivalents as the volume of water in the product can affect the actual rate required.”

Targeting lime rather than applying a blanket rate has allowed the l’Ansons to afford these high rates.

Kym has calculated that using a blanket rate over the last 10 years would have resulted in wasting over 2,400 tonnes of lime and 1,600 tonnes of gypsum.

Having purchased more land the l’Ansons applied the same approach to identifying and mapping soil types before remediation. However, this time the sampling was automated by the use of a Veris on-the-go pH machine.

After considerable modifications to make the machine more



Figure 1 Kym l’Anson with the Veris on-the-go soil pH machine.

suited to Australian conditions Kym has been gathering pH and electromagnetic (EM) soil data in a single pass.

The EM data is gathered between the discs that penetrate into the moist soil, while the pH is tested in soil sample gathered from the top 10cm.

‘We now struggle to find any substantial areas of low pH soil.’

Running on the controlled traffic tracks, samples were taken at 36m intervals across the paddock with a sample taken about every 25m when driven at 10km per hour.

“We aim for 10-12 samples per hectare; this is determined by driving speed with samples taken further apart at higher speeds.”

Approximately every 25m the unit lowers a small trough which collects soil over about a metre as the machine moves forward. The sample is raised to the pH electrodes and the result is logged automatically.

From this data Kym and Katie created four pH zones pH 4.4-4.9, 5.0-5.4, 5.5-5.9 and +6.0.

“Using automated testing increased the density of samples per hectare from one to up to 12 per hectare. In turn this increased our confidence in the location of the zone boundaries and reduced the areas that required high rates of lime by 25 per cent.”

On-going monitoring

Kym and Katie have an on-going pH monitoring program. With the

automated pH machine, Kym has remapped several paddocks to see how pH has changed after liming.

Figure 2 illustrates this change for a 200ha paddock. This was originally two paddocks. The lower part of the paddock was part of the original property and limed while the upper part was only purchased recently. From the maps it can be seen where the old fence line was.

The left hand map is from 2012 prior to liming. Lime was applied to the upper part of the paddock in 2013.

The right hand map was mapped several years after liming and shows a substantial reduction in area with a pH less than pH 6.

In the upper part of the paddock there is 113 hectares however,

Soil pH before and after liming

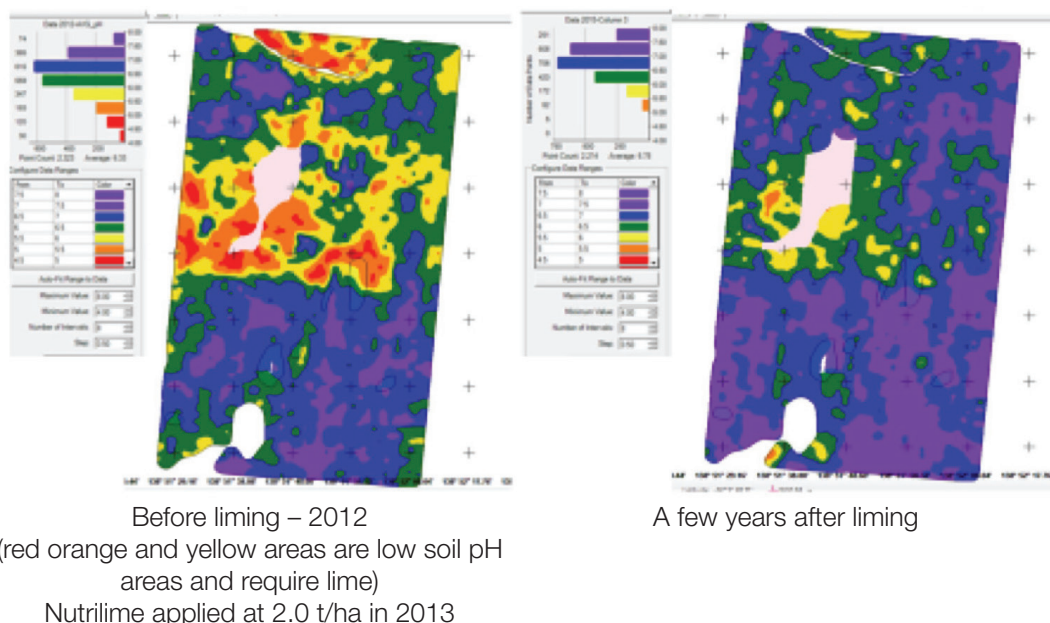


Figure 2 Soil pH map before and after liming.

after mapping it was found that only 45 hectares of this required lime. By only applying lime on the 45 hectares there was a cost saving of \$3,630 (Table 1).

Using their pH maps they have also selected two on-going monitoring points in each zone present in a paddock. These are used to ground truth the mapped data.

Samples are taken to their on-farm laboratory and tested using a pH meter in a calcium chloride solution rather than water, as this method is much less variable across soil types and is less influenced by soil salts and ions.

“We will re-lime anything that has a pH less than 5.4 immediately; anything between 5.5 and 6.0 will be re-limed in higher income years.”

Kym will also use follow-up maps to gauge how fast their cropping system is causing the soil to acidify.

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Acknowledgments:

Emma Leonard AgriKnowHow
and Andrew Harding PIRSA
Rural Solutions SA

Table 1 Saving in liming between a blanket and targeted lime application on the upper part of the paddock in Figure 1.

	Uniform paddock rate 2t/ha	2t/ha only applied to area less than pH 6.
Area requiring lime (ha)	113ha	45ha
Tonnes lime required	226t	90t
Cost lime (\$15/t)	\$3,390	\$1,350
Cost of freight and spreading (\$20/t)	\$4,520	\$1,800
Cost of mapping (\$10/ha)	-	\$1,130
Total cost	\$7,910	\$4,280
SAVING	\$3,630	