Soil pH mapping in SA

RURAL SOLUTIONS SA
PIRSA

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GRDC
Grains Research & Development Corporation

ABA
ADVISORY BOARD OF AGRICULTURE
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PATHWAY TO IMPROVEMENT

Australian Government
Department of Agriculture

Government of South Australia

Soil pH mapping machines and maps

- Using pH machines to map and identify soil pH zones. Soil pH should be ≥5.5 ($CaCl_2$) for optimum plant growth.

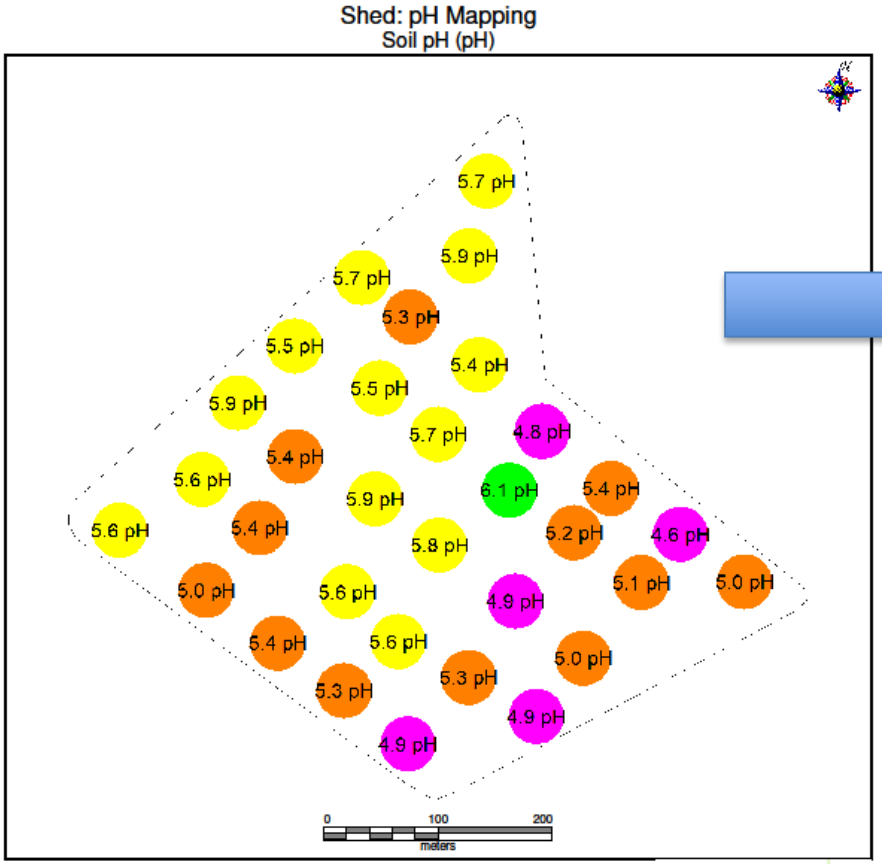
- Have been pH mapping since 2012 and have used two types of soil pH mapping machines. (Veris pH detector and Veris pH Manager/MSP).

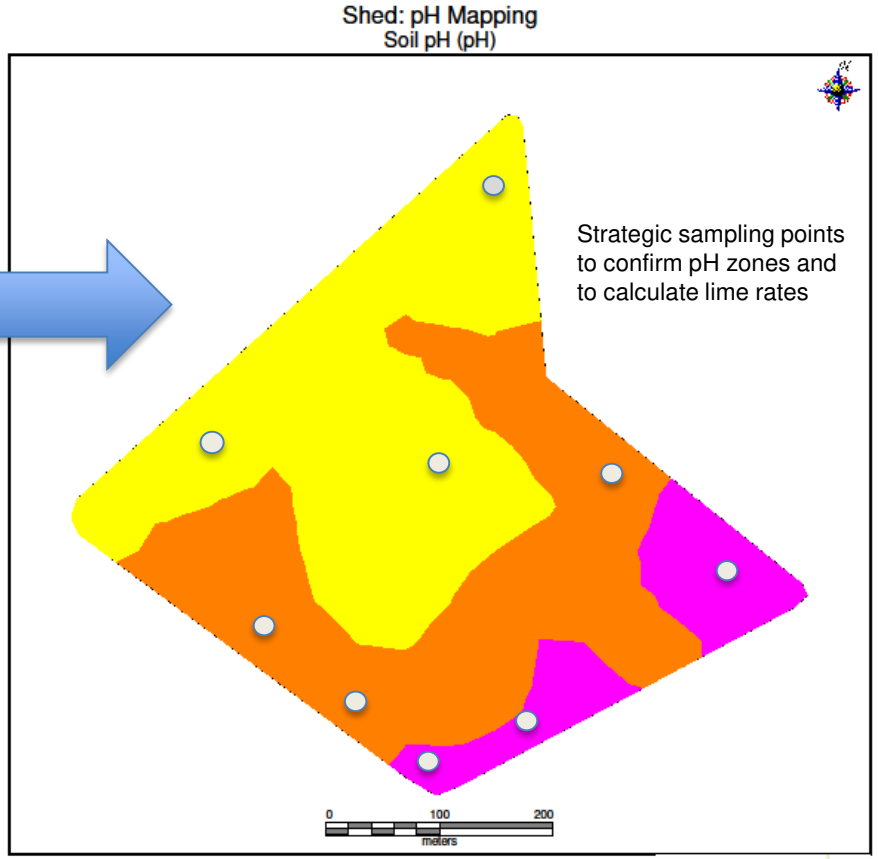
- With this information we can determine the pH zones and at what rate lime should be applied.

Veris pH detector


pH Detector

Point data source and contoured map





precision agriculture.com.au

Above 7.9 pH	0 pts.
7.5 - 7.9 pH	0 pts.
7.0 - 7.4 pH	0 pts.
6.5 - 6.9 pH	0 pts.
6.0 - 6.4 pH	1 pts.
5.5 - 5.9 pH	14 pts.
5.0 - 5.4 pH	12 pts.
4.5 - 4.9 pH	5 pts.
Below 4.5 pH	0 pts.

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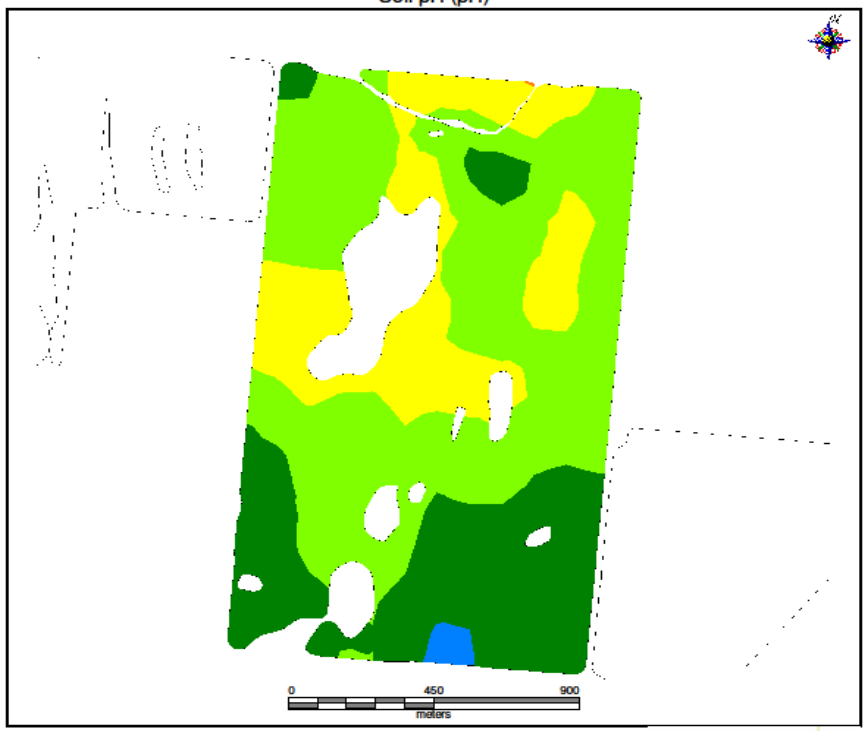
Above 7.9 pH	0.00 ha
7.5 - 7.9 pH	0.00 ha
7.0 - 7.4 pH	0.00 ha
6.5 - 6.9 pH	0.00 ha
6.0 - 6.4 pH	0.00 ha
5.5 - 5.9 pH	8.92 ha
5.0 - 5.4 pH	7.69 ha
4.5 - 4.9 pH	2.28 ha
Below 4.5 pH	0.00 ha

Veris pH Manager

- Is an on-the-go pH machine.
- Samples soil pH every 25 metres (12 km /hr).
  At 36 metres wide – 10 to 12 samples per hectare.
- Sample and map approximately 250 hectares / day.

Veris pH Manager

New England: pH Mapping
Soil pH (pH)



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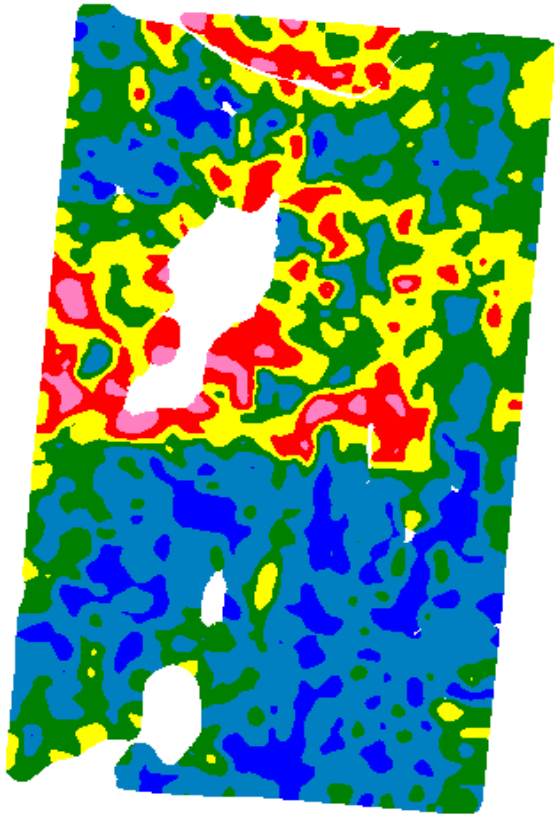
7.0 - 7.3 pH	1.82 ha	
6.5 - 6.9 pH	54.54 ha	
6.0 - 6.4 pH	103.56 ha	
5.5 - 5.9 pH	41.97 ha	
5.2 - 5.4 pH	0.02 ha	



Veris MSP-3

- Purchased by PIRSA from the USA in 2015.
- MSP measure and map the spatial variation of soil pH and EC (OM sensor can be fitted).
- Can map 30 ha/hour – for soil pH 10-12 samples per hectare.
- Charge-out rate on a cost –recovery basis about $12-16/ha + travel. Depending on area and option.


Veris
MOBILE SENSOR PLATFORM
Veris
MSP3
S356·TQA
SA GOVERNMENT
EC Surveyor 3150
GTSHAM
S299·AQU
SA GOVERNMENT

Veris MSP-3


Veris
256 TQA

Validation of soil pH machines

- Under controlled conditions the machines are highly correlated with lab data (R_2 >0.90).
- Field validation (R_2 0.7 to 0.8).
- The pH machines are reading between pH (water) and pH ($CaCl_2$).
- Need to reduce the pH by 0.3 to 0.4 pH unit to bring it in line with $CaCl_2$ levels.

Economics of liming

- Each paddock and property will be different.
- Case studies have shown that the cost-savings of applying lime can be substantial. Of 16 paddocks on the EP there was an average cost saving of $2,242 (41%) with mapping vs uniform rate of lime.
- In some cases the same amount of lime may be required but redistributed within the paddock.
- In other cases more lime may be required in more acidic areas but the cost should be out-weighed by the improvement in productivity.

Economics of liming

Economics of liming	
Cost of lime (Nutrilime)	$21/t
Application	2.5 t/ha
Frieght $0.12/km/t Say 100 km	$12/t
Spreading	$8/t
Total cost / tonne	$41
Total cost / hectare	**$102.50**
Before mapping 113 hectares $11,582	After mapping 45 hectares $4,612
Cost of mapping say $12 x 113 ha $1,356	**Savings $5,614**
48% cost savings	

Summary

- The use of soil pH mapping is increasing in SA.
- Best conducted when the soils have good soil moisture.
- Soil pH mapping and the identification of soil pH zones enables more accurate targeting of lime and in most cases saves cost.
- pH zones can be used in the decision support tools.