

## Gunning Gap CWFS Site -Lime Response On A Sandy Acid Soil

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### Key Points

- The application of lime to this sandy acidic soil has had provided little benefit over the last 4 years (ie. 2000 - 2003).

### Background

This trial is a long-term soil amelioration trial established at the Gunning Gap CWFS regional site. Below is a summary of the last four years of results.

### Methods

*Location:* Gunning Gap

*Co-operator:* Graham Coombs

*Trial History:*

Date spread: 16 May 2000

Lime source: Bagged agricultural lime

Sowing: 2000 6<sup>th</sup> June, 45 kg/ha Dollarbird, 75 kg/ha DAP

2001 7<sup>th</sup> June, 45 kg/ha Diamondbird, 80 kg/ha DAP

2002 7<sup>th</sup> June, 45 kg/ha Janz, 80 kg/ha DAP, 42 units Big N

2003 (28 April)

2004 25<sup>th</sup> July, 40 kg/ha Tilga, 70 kg/ha DAP (undersown with pasture)

*Trial Design:*

This trial is based on a randomised block design with four treatments consisting of a nil and three lime rates (1.5, 3.0 and 4.5 t/ha) with two replicates.

*Rainfall (2003)*

Monthly Rainfall (mm)												Total (mm)
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
15	25.5	15	9.5	1.5	23	48.5	50	5	21.5	29	14	257.5
Fallow Rainfall (Jan - Mar)												55.5
Growing Season Rainfall (Apr - Oct)												159

## Results

*Soil Test Summary:***Incitec (May 2000)**

pH (CaCl <sub>2</sub> )	P (Colwell) ppm	S (MCP) ppm	CEC meq/100g	Ca:Mg Ratio	Al Saturation %	Magnesium meq/100g
4.8	18	3	2.07	4.8	1.6	0.29

*Yield and Economic Results:***Table 1. Acid soil amelioration trial results 2000 to 2003**

Lime Rate Applied 2000 (t/ha)	<i>Analysis of Trial Results</i>							
	<b>2000 - Wheat</b>		<b>2001 - Wheat</b>		<b>2002 - Wheat</b>		<b>2003 - Barley</b>	
	Yield (t/ha)	% Nil	Yield	% Nil	Yield (t/ha)	% Nil	Yield (t/ha)	% Nil
Nil	1.43	100%	2.42	100%	0.44	100%	0.20	100%
1.5	1.41	99%	2.50	103%	0.44	101%	0.19	97%
3.0	1.44	101%	2.57	106%	0.44	101%	0.22	113%
4.5	1.56	109%	2.87	119%	<b>0.60</b>	136%	0.21	108%
LSD (5%)			0.52	21%	0.01	<b>2%</b>	0.10	49%
CV%			10.0%		<b>0.6%</b>		14.8%	
Significance <sup>1</sup>			No		Yes		No	

1 - Significant results shown in *bold-italics*.

**Table 2. Economic analysis of Acid soil amelioration trial results 2000 to 2003**

Lime Rate Applied 2000 (t/ha)	<i>Economic Analysis</i> Totals-2000 to 2003		
	Extra Income (\$/ha)	Lime Costs (\$/ha)	Net Benefit (\$/ha)
Nil			
1.5	\$12	\$75	-\$63
3.0	\$35	\$150	-\$115
4.5	\$160	\$225	-\$65

## Discussion

This site was affected by rhizoctonia root rot in 2000. The root rot combined with a period of severe moisture stress in late September accounted for the poor yield in that year and may have reduced any potential responses to lime.

The trial site was deep cultivated just prior to sowing in 2001. The yield results improved greatly in 2001, with trends toward higher yields with higher lime rates, however no significant responses to lime were recorded.

Yields were very low in 2002 due to drought conditions. However a

significant yield response was recorded in the 4.5 t/ha lime treatment. However response to lime in the 1.5 t/ha and 3 t/ha treatments was still not apparent.

It has been suggested that the low magnesium (Mg) levels at this site maybe limited the response to increasing soil pH. A Mg level of 0.29 meq/100g is considered low, but not critical. Fenton and Conyers (2002) state that Mg deficiency has been recorded in seedling crops and pastures where there was less than 0.2 meq/100g exchangeable Mg in the top 10cm of soil. Mg deficiency is rare in established crops and pastures because the subsoil usually contains an ample supply of Mg which is accessed when the roots develop. In soils with low Mg, Dolomitic lime is often recommended over normal lime. No obvious Mg deficiency symptoms have been observed in this trial site.

Research from NSW Agriculture at Wagga Wagga and Condobolin has

shown that in general lime applications do not provide significant yield responses unless the aluminium (Al) saturation % is >5% (Evans *personal communication*, 2004). Aluminium becomes toxic to plants at levels >5%. Since this soil has an Al saturation % of 1.6, it should not be expected that significant yield increases will occur with the use of lime.

The economic analysis indicates that the application of lime has not had any positive net benefit (\$/ha). This economic result is expected as yield responses to lime have not been significant over the past 4 years, except in 2002 in the 4.5 t/ha treatment. As a result of this significant response in the 4.5 t/ha treatment the net benefit figure has moved towards the black.

This trial site- was sown to pasture in 2003. The pasture will be observed for signs of response to lime.

## References

Fenton, G. and Conyers, M. (2002). Interpreting soil tests for calcium, magnesium and Ca:Mg ratios. Acid Soil Action. Leaflet No 7.

## Acknowledgments

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