

SCF lime efficiency trial – East Tenterden

KEY MESSAGES

- Significant lime responses occurred in the third (2016) and sixth (2019) years of the initial six years of the trial. Lime responses occurred in seasons with a dry spring and not in seasons with a wet spring.
- Sub soil acidity can be addressed with lime incorporation to depth.

Introduction

The site had severe sub soil acidity and soil tests by SCF and Precision Soil Tech (PST) have confirmed that the trial area was relatively uniform in sub soil acidity. The purpose of the trial is to determine how best to ameliorate subsoil acidity.

Trial Results

This is a longer-term trial and the initial benchmark soil testing from 2014/15 was critical for interpreting the harvest results through 6 seasons. Testing by PST in 2014 confirmed the same pH values as site testing done in Feb 2013 by Greg Mengler and SCF. Sub soil pH's were all in low 4's from the different testing laboratories.

Further soil testing with SCF and Map IQ was undertaken in 2017 + 2019 and showed that the sub soil acidification in control plots was continuing. In the lime top-dressed treatment plots there is only limited movement of lime down the profile (even at high rates of surface applied lime). (Fig 2)

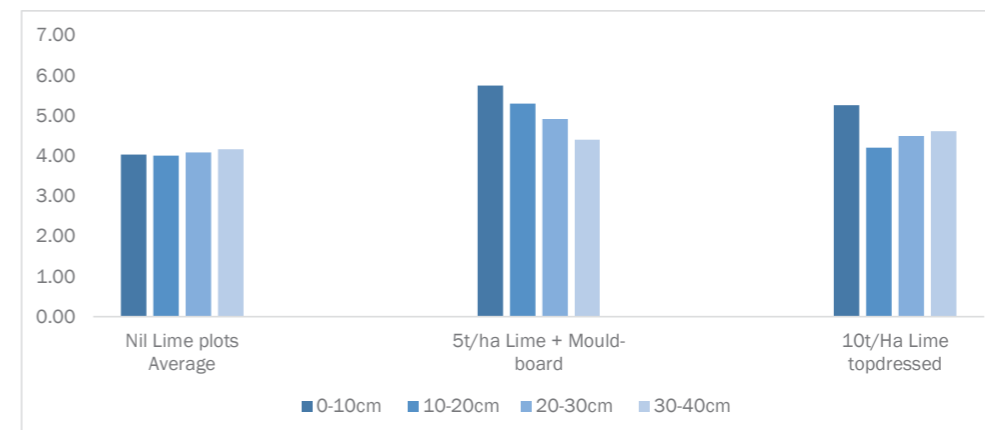


FIGURE 2. Soil pH profiles at the East Tenterden lime trial two and three years after lime application.

*Main lime treatments applied March 2014 and Lime plus Mould-board applied March 2015.

Lime incorporation was measured to a depth of 40cm (depth of Mould-boarding) but surface application of lime only still show limited downward movement after four years. Further monitoring is required.

2019 Canola Harvest results

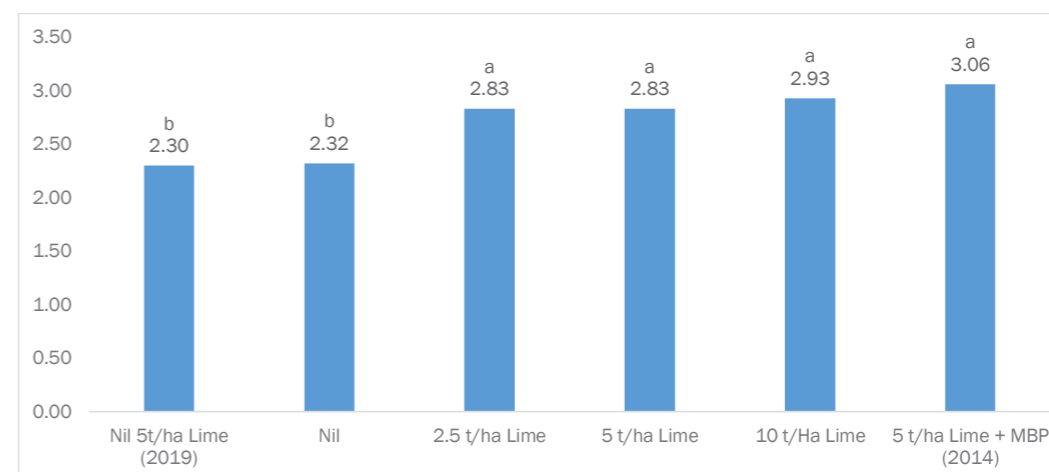


FIGURE 3. Canola yields (tonnes/hectare) in 2019 season. Means followed by same letter or symbol do not significantly differ (P=.05, LSD).

NB: The first bar treatment was an untreated control until the 2019 season. In March 2019, 5t/ha lime was applied on the surface before sowing.

All lime treatments gave significant responses in canola in 2019 season apart from the former Nil treatment that had 5t/Ha applied in March 2019. Differences between 5t/Ha Lime with and without incorporation were not significantly different (0.25 t/Ha canola).

The 2019 average yield increase of 0.6 t/Ha of canola for all lime treatments represents a 26% increase over controls (the 2016 response was 25% in increased wheat yields). However, in wet springs the lime treatments have given nil response (see discussion below).

Soil pH	Plot 10		Plot 9		Plot 8		Plot 7		Plot 6		Plot 5		Plot 4		Plot 3		Plot 2		Plot 1	
	2015	2019	2015	2019	2015	2019	2015	2019	2015	2019	2015	2019	2015	2019	2015	2019	2015	2019	2015	2019
0-10	4.87	4.80	5.90	6.20	4.63	5.10	5.40	5.50	4.60	4.60	5.73	6.50	4.63	5.60	5.73	5.70	4.43	4.50	5.10	4.50
10-20	4.03	4.51	4.63	5.01	4.27	4.76	4.27	5.35	4.73	4.24	4.50	4.65	4.03	4.60	4.40	4.69	3.93	4.48	4.10	4.57
20-30	4.20	4.73	4.27	5.25	4.30	4.82	4.20	5.19	5.27	4.35	4.40	4.72	4.07	4.75	4.40	4.73	3.97	4.80	4.17	4.66
30-40	4.43	4.78	4.13	5.33	4.43	4.87	4.40	4.48	4.57	4.78	4.23	4.80	4.07	4.66	4.33	4.89	4.03	5.17	3.83	4.67
	Nil- before 5.0t/ha Lime 2015		5.0t/ha Lime 2015		Nil-control		2.5t/ha Lime 2015		Nil-control		10.0t/ha Lime 2015		5.0t/ha Lime 2015 + MBP		5.0t/ha Lime 2015		Nil-control		2.5t/ha Lime 2015	

FIGURE 1. The average soil pH (CaCl₂) for each plot tested in 2015 and 2019. Each plot was tested at three separate locations (not shown).



TABLE 1. Growing season effects on lime response. Note the lack of response to lime in the highlighted wet springs (dark blue).

Year	Crop type	Autumn Winter rainfall	Spring Rainfall (mm)*			Yield potential and biomass <u>at start</u> of Spring	Lime Response
			Sept	Oct			
2014	Wheat	Average	44	83*	Wet Spring	Good Yield potential -high Biomass	NS
2015	Canola	Below Average	42	28	Dry Spring	Below average yield potential -lower biomass	not harvested
2016	Wheat	Above Average	42	34	Dry Spring	Wettest day in Sept only 7mm - but higher biomass	25%
2017	Canola	Below Average	82*	23	Wet Spring	Below average yield potential -lower biomass	NS
2018	Wheat	Below Average	20	21	Dry Spring	Below average yield potential -lower biomass	NS
2019	Canola	Average	29	26	Dry Spring	Good Yield potential but dry spring and higher Biomass	26%

Discussion

SEASONAL ANALYSIS

Over the six years of the trial, the seasons that have recorded a yield response to lime application are when good biomass has been produced early but the crop subsequently suffers a dry finish. This would be consistent with having better root growth in the subsoil in limed plots with incorporation to depth compared to lime just top-dressed on the surface. A deeper root system will result in an improved ability to access moisture and nutrients from deeper in the soil profile when the topsoil dries out due to the dry finish. In this broadscale trial the differences between methods of lime application are not significant (at P .05 level) but more intensive small plot trials in other regions have been more able to show this.

Conclusions

The trial gave an average of a 0.6 t/ha yield response (26%) to lime in the 2019 canola crop. Because only two years in five seasons gave a measurable response, a long-term benefit over the range of seasons could be assumed to be about a 10% average.

There was a significant lime response in third year and sixth after application of lime. Lime responses could continue to be seasonally dependent, and crop type dependent and the trial will be continued to monitor lime value for each phase of the rotation.

Subsoil acidity can be addressed with lime incorporation, but mould-board ploughing may not be the most cost-effective and practical treatment. This requires further seasons of testing. Other methods of lime incorporation may also be tested at the SCF lime sources trial at another site (Red Gum Farm, Iain Mackie).

Acknowledgements

The Lime Efficiency trial was initiated with Greg Mengler at Tenderden East in 2014 with initial NLP funding from South Coast NRM. The trial is now hosted by Chris Tomlinson. The growers have ensured high quality management of this long-term trial.



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