

## “Soil Mixing and Liming Trial, Kybybolite”

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### Key Outcomes:

- Spading or delving in lime lifted the soil pH to a depth of 20cm within one year.
- All other results are inconclusive at this stage; this may be due to seasonal conditions and/or crop variety.

**Trial Objective:** To improve the physical and chemical condition of an acidic loam over clay soil

**Trial Duration:** 2009-10

**Location:** Kybybolite

**Farmer Co-operator:** Peter Schinkel

**Soil Type:** Thick sandy clay loam over brown clay

**Paddock History:** Long-term cropping rotations

**Annual Rainfall:** 550mm

**Yield Limiting Factors:** 2009 November Heat wave

**Type of Trial:** Replicated Plot Trial

**Trial Design:** 10m x 15m plots; 3 replicates; 10 Treatments (randomly allocated)

### Treatments:

- Control; Managed to Landowner Practice
  - Nutralime; (CaCO<sub>3</sub>/CaOH product donated by Penrice Soda Products), surface spread at 8T/ha
  - Lime; Conventional Lime product donated by Henschke Industries, Naracoorte, surface spread @ 8T/ha
  - Yeomans plough; lime fed down behind the tyne at an unknown rate
  - Ripping (Grizzly ripper)
  - Clay Delving
  - Spading
- } All with +/- 8T/ha Lime being applied before mixing

### Additional Site Information:

2009 Crop sown was Barley, and managed to Landowner practice for all treatments.  
2010 Site was sown to Vetch and managed to Landowner practice for all treatments.

### **Trial Results:**

**Yield Data:** Plots were harvested at the end of each season (2009 and 2010) and other additional measurements were taken – as outlined in the tables below.

**Table 1: 2009 (Mid-October) Barley Dry matter (Tonnes DM/ha)**

Treatment	Avg DM (T/ha)	Std.Dev	% of control
Nutralime	8.1	2.4	86%
Control	9.4	1.5	100%
Surface Lime	9.7	2.2	104%
Ripper (+ Lime)	10.3	3.1	110%
Yeomans Plough	10.4	1.9	111%
Spader (+Lime)	10.6	1.7	113%
Delver (+Lime)	10.7	1.3	114%
Ripper	10.7	3.4	114%
Delver	11	1.1	117%
Spader	12	2.4	128%

Vegetative growth from the barley was cut and weighed to compare treatment effects on early plant growth. Treatment effects are shown in Table 1.

**Table 2: 2009 Barley Grain Yield (Kg/ha)**

Treatment	Avg Yield (Kg/ha)	Std.Dev.	% of control
Nutralime	4878.9	656.4	88%
Delver (+Lime)	5207	422.6	93%
Spader	5248.4	661.3	94%
Delver	5325.8	772.7	96%
Spader (+ Lime)	5478.1	687.2	98%
Control	5573.4	895.6	100%
Ripper (+ Lime)	5672.7	844.8	102%
Yeomans Plough	5692.2	569	102%
Ripper	5951.6	603.1	107%
Surface Lime	5963.3	417.7	107%

Grain yields from the barley in the first year of the Trial are given in Table 2. Most of the treatments are not significantly different from the control.

**Table 3: 2009 Barley Grain Quality**

Treatment	hl wt(g)	hl wt (kg/hl)	500grain	>2.8mm	2.5-2.8mm	2.2-2.5mm	<2.2mm	Protein
Spader	337.7	67.5	21.7	26.8	51.9	17.2	4.1	12
Spader (+ Lime)	339.7	67.9	22.4	31.5	50.9	14.8	2.7	11.3
Delver (+ Lime)	339.8	68	21.4	32.2	49	15.3	3.5	12.2
Control	339.7	67.9	22.2	32.5	51.7	13.8	1.9	11
Nutralime	337.5	67.5	21.7	33.1	50	14.2	2.6	11.7
Ripper (+ Lime)	341	68.2	22.1	34.1	51	13.3	1.6	11.2
Delver	339.9	68	21.8	36.1	50	11.9	2.1	10.9
Ripper	339.6	67.9	22.7	37.3	49.2	11.6	1.8	11.1

Surface Lime	342.3	68.5	22.2	37.5	50	11.1	1.3	11.2
Yeomans Plough	342	68.4	22.3	37.9	48.6	11.8	1.7	11.5

Table 4: 2010 Vetch Grain Yield (kg/ha)

Treatment	Avg Yield (Kg/ha)	Std.Dev	% of control
Ripper (+ Lime)	1302	169	84%
Delver (+Lime)	1331	254	86%
Yeomans Plough	1344	241	87%
Ripper	1381	146	89%
Spader	1484	130	96%
Spader (+ Lime)	1486	151	96%
Surface Lime	1487	104	96%
Control	1553	124	100%
Delver	1584	162	102%
Nutralime	1618	110	104%

Grain yields from the vetch in the second year of the trial are given in Table 4. Growth on both the trial site and the surrounding paddock appeared to be highly variable, and the treatment effects were generally not significant. Note that vetch is a moderately acid tolerant crop.

### Soil Data

Initial soil pH measurements were taken, and then soil pH measurements were taken 12 months after treatments were applied. Results are outlined below;

Figure 1: Soil pH in early 2009

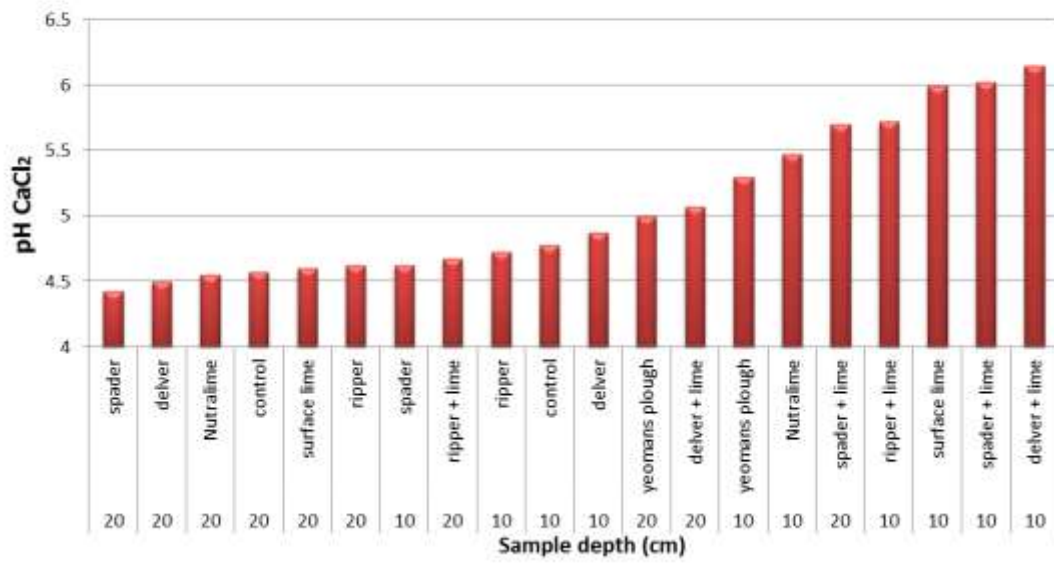
Depth	pH H <sub>2</sub> O	pH <sub>2</sub> CaCl <sub>2</sub>	Org C%	Al mg/kg
0-10cm	5.6	4.9	2.1	2.1
10-20cm	5.4	4.5	0.77	5.5

The initial pHs of soil samples taken from the site prior to establishing the trial at depths of 0-10cm and 10-20cm are given in Figure 1. The target pH for the soil is pH (measured in calcium chloride solution) of 5.

Effects of the treatments on the soil pH from soil samples taken from 0-10cm and 10-20cm are given in Figure 2.

Figure 2: Soil pH in May 2010 (12 months after treatments applied)

Soil pH by treatment in surface (0-10cms) and sub-surface (10-20cms)



### **Comments:**

The liming treatments all altered the soil pH in a positive way.

The spading and delving treatments (with the addition of lime) increased the soil pH in the top 20cm to levels above the pH target (pH CaCl<sub>2</sub> of 5.0) within one year.

The Nutralime may have depressed yield in the first year due to the very high rate of surface application.

Early growth of the barley in the first year was enhanced by all the soil mixing treatments. However, the lime treatments seemed to have no early impact. The sharp finish with the heat wave in October 2009 is thought to have impacted on the yields of some treatments. It had been noted that some treatments (the delved treatments) appeared to be ripening later than the control treatments.

The 2010 yields showed no significant treatment effects.

### **Conclusion and into the paddock:**

Delving or spading in lime will lift soil pH very rapidly, but yield responses may not be seen even on acid sites in the short term.

The soil mixing and liming treatments have not shown a significant improvement at this point. However, the treatments are intended to have a very long term impact, and further measurements are required before any firm conclusions can be made.

The establishment of acid sensitive crops may be useful for showing the future effects of the liming. It should be noted that the site comprised a high quality soil which, apart from the strong acidity, exhibited few physical or nutritional limitations.



### **Acknowledgements:**

Peter Schinkel and family for outstanding co-operation and inputs into the trial establishment and management.

Penrice Soda Products for donating the Nutralime.

Henschke Industries for donating the lime.

Andrew Shepherd for volunteering his time to undertake the spading.