A Sustainable Dryland Community Achieved Through Proactive Research on Effective Management of the Soil Resource (Liebe Group Soil Health Project)

Aim: Amelioration of subsoil acidity through topdressing higher rates of lime and combining lime with gypsum.

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Company: Liebe Group

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Location: Latham

Background: Subsoil acidity is one of the major issues facing grain farmers in WA. This demonstration was designed to investigate the best method to ameliorate acidity. As lime $CaCO_3$ isn't readily soluble, the higher rates and addition of gypsum were to help the lime progress through the soil profile.

Trial Details:

Plot size and replication	8 plots of 14m x 150m, lime only plots replicated.
Soil type	Acidic sand
Sowing date	27th May 2003
Conditions at sowing	Moist
Machinery	FlexiCoil, Marshall Multi Spreader
Seeding rate	70 kg/ha Arrino
Fertiliser	60 kg/ha MAPSZC, 50 kg/ha Urea
Herbicides and Insecticides	1.4 L/ha Glyphosate, 0.25 L/ha Ester
Paddock History	2002 = Failed lupins, 2001 = Wheat.

Treatments:

1. 0.75 t/ha gypsum with 1 t/ha lime
2. 1.5 t/ha gypsum with 1 t/ha lime
3. 2.0 t/ha gypsum with 1 t/ha lime
4. 1 t/ha lime (3 reps)
5. 2 t/ha lime
6. 4 t/ha lime
7. Controls (2) taken from spaces between reps

The treatments were applied with a Multi Spreader on the 2nd April.

Results:

The pH was 5.81 and 5.85 respectively, with the addition of 1 and 2 tonnes/ha of lime. The pH after 1 tonne/ha lime was 4.25 at the 10-30 cm depth, however the pH was 3.84 below 30 cm.

Table 1: Yield and quality measurements (G=gypsum, L=lime)

Treatment	Yield (t/ha)	Protein (%)	Hectolitre Weight (kg/hl)	Screenings (%)	Return ($/ha)
2G/1L	1.57	14.3	74.06	4.86	ASW-353
1.5G/1L	1.57	14.1	74.72	3.44	ASW-361
0.75G/1L	1.43	14.3	74.06	4.86	ASW-322
Control 1	1.51	14.2	74.82	4.34	ASW-341
1L	n/h	n/h	n/h	n/h	n/h
2L	1.27	15.1	73.98	4.56	GP-279
4L	1.28	15.5	73.16	4.56	GP-281
Control 2	1.11	15.4	73.22	5.08	GP-244

Table 2: pH and moisture measurements

Treatment	Depth	pH	Moisture (%)
2G/1L	0 to 10	**4.95**	**0.68**
2G/1L	10 to 30	**4.22**	**2.73**
2G/1L	30 to 60	**3.89**	**5.05**
1.5G/1L	0 to 10	**5.1**	**0.49**
1.5G/1L	10 to 30	**4.08**	**2.98**
1.5G/1L	30 to 60	**3.91**	**4.36**
0.75G/1L	0 to 10	**4.66**	**0.88**
0.75G/1L	10 to 30	**4.11**	**3.04**
0.75G/1L	30 to 60	**3.87**	**5.01**
Control 1	0 to 10	**5.01**	**0.46**
Control 1	10 to 30	**4.09**	**3.06**
Control 1	30 to 60	**4.06**	**4.44**
1L	0 to 10	**5.81**	**1.32**
1L	10 to 30	**4.25**	**4.03**
1L	30 to 60	**3.84**	**5.00**
2L	0 to 10	**5.85**	**1.41**
2L	10 to 30	**4.04**	**4.12**
2L	30 to 60	**3.8**	**6.21**
4L	0 to 10	**5.19**	**1.53**
4L	10 to 30	**4.08**	**3.59**
4L	30 to 60	**4.01**	**6.22**
Control 2	0 to 10	**4.51**	**1.47**
Control 2	10 to 30	**3.95**	**4.39**
Control 2	30 to 60	**3.76**	**6.98**

Applying 1.5 t/ha or 2 t/ha of gypsum and 1 t/ha of lime gave the greatest yield benefit. The 1.5 t/ha gypsum and 1 t/ha lime sample had less screenings, therefore the greater return per hectare.

The higher rates of lime did yield slightly better than Control 2, however possibly due to a toxicity effect from the excess lime or a poorer soil type, the wheat was slightly underweight.

Adding lime and gypsum at these rates is expensive and it has not been paid for this year. After the lime has progressed down the soil profile, the returns may be there.

Control 1 should be compared to the gypsum+lime treatments as it was taken adjacent to the gypsum+lime treatments. Control 2 should be compared with the lime treatments.

The 4 tonne/ha lime treatment was the only treatment to increase pH below 30cm to above 4.0, which indicates that some of the lime may have progressed down the soil profile.

The moisture measurements show that there is still water left underneath that the plant could be utilising, assuming the plant can extract it. If you compare these figures to the graveyard trial (pg 69) from the same paddock, there is much more water being left behind in these plots than in the graveyard plots.

Summary:

- Yield increases were small in the first year of this demonstration. Bigger increases may be expected in subsequent years.
- The pH was changed the most in the top 10 cm after the addition of 1 and 2 tonnes/ha of lime.
- The 4 t/ha lime treatment increased pH to above 4.0 at depth 30-60 cm.
- Moisture measurements indicate that there may be unused water in the soil profile from 10-60 cm.
- This is only a demonstration and subsequent measurements will indicate whether there is value in these treatments. Ideally, a similar replicated and randomised trial would be required before adopting these treatments.

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