

Soil Management Strategies for Improving pH on Red Loam

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Key Messages

- As in 2014, there was a significant difference in yield, in response to the cultivation treatments but not between the lime treatments.
- Screenings in 2015 were much higher in the mouldboard and spaded plots than any other treatments. The percentage of screenings in these treatments increased with the increasing rate of lime.

Aim

Investigate the impact of soil management techniques and the application of different rates of lime over a five year period on soil pH.

Background

The purpose of the trial is to assess the benefits associated with lime application and incorporation, and the impact of different tillage systems on soil health and crop yield, 2015 is year two of this trial.

This trial contains twenty four combinations of lime rates and tillage systems. Extensive soil sampling was conducted to establish the base soil characteristics at this site and identify any variability between plots.

Trial Details

Property	JH & VI Rowe & family, Wongoondy, Mullewa
Plot size & replication	30m x 40m x 4 replications
Soil type	Red loam
Soil pH (CaCl₂)	0-10cm: 4.410-20cm: 4.4 20-30cm: 4.6 30-40cm: 4.8 40-50cm: 5.0
Sowing date	21/05/2015
Seeding rate	50 kg/ha Corack wheat
Incorporation	See Table 1
Lime History	See Table 1
Paddock rotation	2010 lupin, 2011 wheat, 2012 wheat, 2013 lupin, 2014 wheat
Fertiliser	Pre seeding: 50 kg/ha Amsul 21/05/2015: 50 kg/ha DAPSCZ 17/06/2015: 40 kg/ha Urea
Herbicides & Insecticides	Knockdown: 1.5 L/ha RoundUp, 100 mL/ha Ecopar, 100 mL/ha Garlon, 0.25% wetter, 1% Amsul Pre-emergent: 2 L/ha RoundUp, 1.6 L/ha Treflan, 35 g/ha Logran, 6 g/ha Ally, 1% Amsul, 0.2% wetter Post emergent: 750 mL/ha Jaguar, 600 mL/ha MCPA LVE 100 mL/ha Lorsban
Growing season rainfall	172mm, total annual rainfall: 299mm

Results

Table 1: Yield and quality results at Wongoondy, 2015.

Lime Rates	Cultivation	Lime Yield (t/ha)	Cultivation Yield (t/ha)	Interaction Yield (t/ha)	Protein (%)	Hectolitre Weight (kg/hL)	Screenings (%)
0 t/ha	Nil	1.68	1.81 ^a	1.74	11.4	74.9	7.97
	Offset Disc		1.54 ^b	1.75	12.2	74.8	8.28
	Mouldboard		1.22 ^c	1.31	13.6	68.4	18.6
	One way Plough		1.88 ^a	1.81	10.5	77.9	5.09
	Spader		1.40 ^b	1.53	11.9	73.6	11.5
	Deep Digger		1.96 ^a	1.90	11.1	76.5	7.97
3 t/ha	Nil	1.57		1.74	13.2	73.9	10.0
	Offset Disc			1.42	13.9	71.0	15.5
	Mouldboard			1.00	16.1	64.2	28.0
	One way Plough			1.96	12.1	74.9	8.56
	Spader			1.34	13.9	70.8	22.9
	Deep Digger			1.97	11.8	75.6	7.66
6 t/ha	Nil	1.68		1.96	13.0	74.0	8.59
	Offset Disc			1.43	12.5	73.0	12.1
	Mouldboard			1.19	14.8	68.2	22.4
	One way Plough			2.17	11.7	77.3	5.11
	Spader			1.39	14.4	68.9	21.0
	Deep Digger			1.92	12.2	74.3	9.81
12 t/ha	Nil	1.68		1.86	11.9	74.3	9.83
	Offset Disc			1.53	11.8	73.9	9.67
	Mouldboard			1.47	12.9	72.3	12.6
	One way Plough			1.69	12.6	73.0	12.1
	Spader			1.42	14.3	68.5	25.2
	Deep Digger			2.13	12.1	76.5	6.84
<i>P value</i>		0.324	<0.001	0.433			
<i>LSD (0.05)</i>		NS (0.15)	0.17	0.38			
<i>CV (%)</i>			16.3				

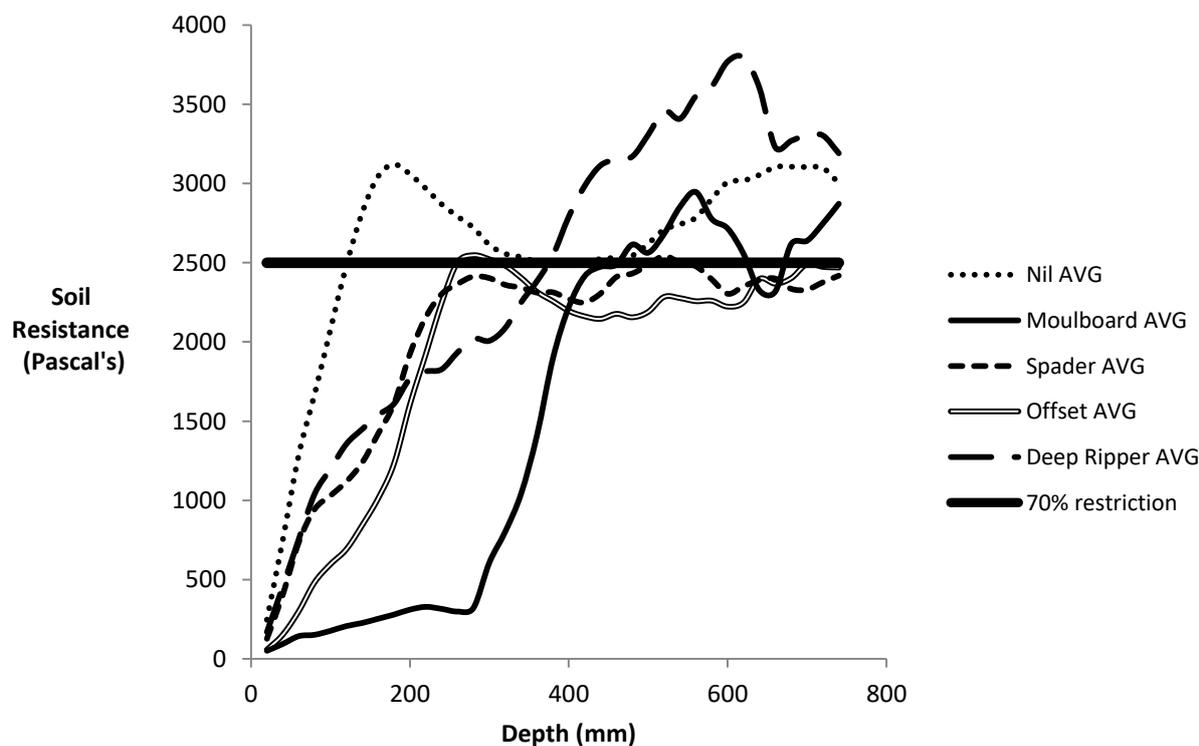


Figure 1: Compaction under Different Tillage Systems on Red Loam, June 2014.

Table 2: Treatment costs and returns \$/ha for 2014 and 2015 at Wongoondy.

Lime Rates	Cultivation	Treatment	2014		2015		Total Net Return (\$/ha)
		Cost (\$/ha)	Grade	Returns (\$/ha)	Grade	Returns (\$/ha)	
0 t/ha	Nil	0	AUW1	401	AGP1	474	875
	Offset Disc	45	AUW1	453	AGP1	477	885
	Mouldboard	120	AUW1	433	AUW1	327	640
	One way Plough	45	AUH2	498	APW1	541	994
	Spader	150	AUH2	452	AUW1	381	683
	Deep Digger	60	AUH2	480	AGP1	518	938
	3 t/ha	Nil	63	AUW1	398	AUW1	432
Offset Disc		108	AUW1	412	AUW1	355	659
Mouldboard		183	AUW1	428	FED1	221	466
One way Plough		108	AUH2	512	AGP1	533	937
Spader		213	AUH2	495	AUW1	334	616
Deep Digger		123	AUH2	509	AGP1	537	923
6 t/ha Lime		Nil	126	AUH2	471	AGP1	534
	Offset Disc	171	AUW1	431	AUW1	356	616
	Mouldboard	246	AUW1	404	AUW1	296	454
	One way Plough	171	AUH2	521	APW1	647	997
	Spader	276	AUH2	489	AUW1	346	559
	Deep Digger	186	AUH2	495	AGP1	521	830
	12 t/ha Lime	Nil	252	AUW1	397	AGP1	507
Offset Disc		297	AUW1	454	AGP1	415	572
Mouldboard		372	AUW1	422	AUW1	365	415
One way Plough		297	AUH2	504	AUW1	420	627
Spader		402	AUH2	536	AUW1	353	487
Deep Digger		312	AUH2	477	AGP1	579	744

Notes: All prices net delivered Geraldton and GST Exclusive.

Comments

Soil pH measurements were taken prior to treatment application on the site in 2014. The mouldboard plough treatments had the least compaction of all treatments to a depth of 30cm but below this depth the offset disc treatment measured the least soil resistance in 2014, Figure 1. The one way plough treatment with 6 t/ha lime applied, returned the highest \$/ha to date due to low treatment cost and a high yield result in 2015. In 2015 the mouldboard plough and spaded treatments resulted in increased screenings. There was a trend towards increased screenings in both of these cultivation treatments with increased rates of lime.

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Further reading

Soil acidity management, Liebe Lime Calculator and the full report on "Soil acidity management strategies throughout Western Australia"

<http://www.mig.org.au/lime-calculator/>

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