Impact of rotary spading, one-way ploughing, deep ripping and incorporated nutrients on second year crop responses

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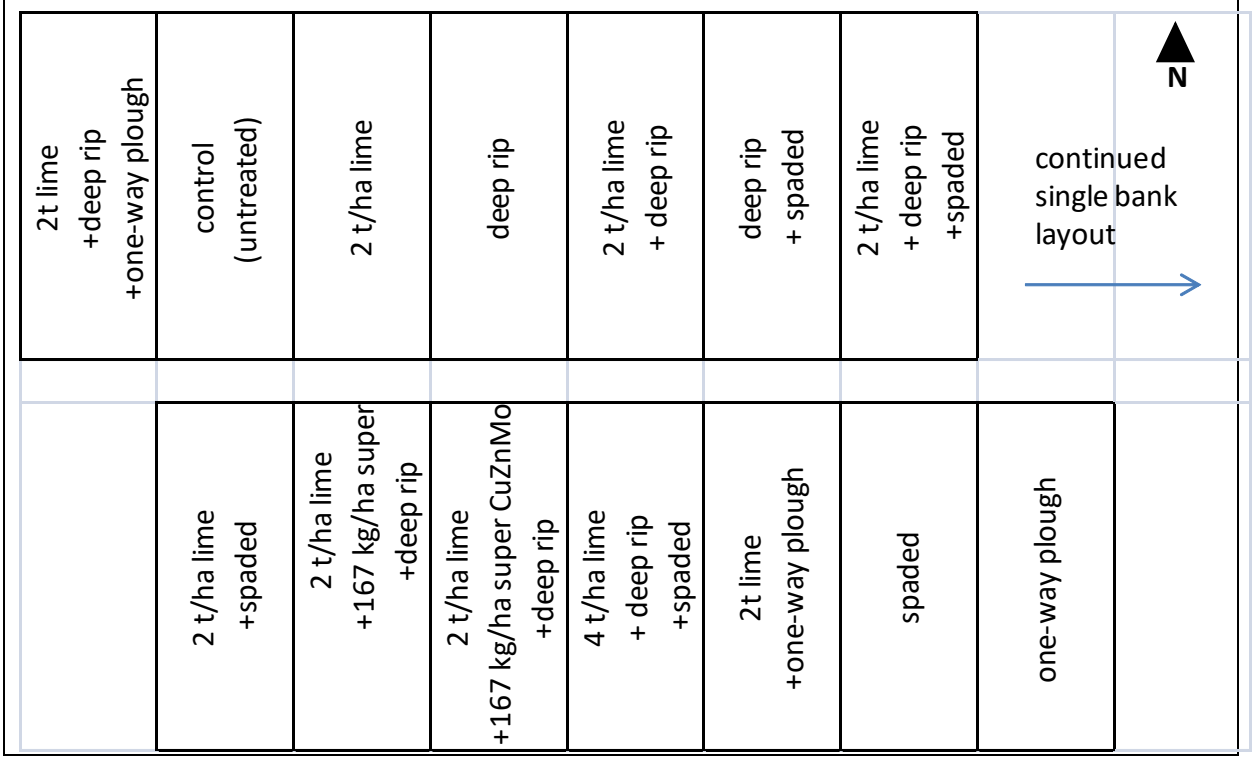
Purpose:	To investigate rotary spading and other soil amelioration techniques on yellow sandplain soils west of Moora
Location:	Rowes Road, Dandaragan (Tony and Judy Snell's property)
Soil Type:	Yellow sandplain (Original vegetation: blackbutt and sandplain pear)
Soil Test Results:	insert table or applicable soil test results
Rotation:	Grassy pasture 2009 & 2010, Wheat 2012
Growing Season Rainfall (April- October 2012):	254 mm

BACKGROUND SUMMARY

Over the past few years rotary spading is one of the techniques that have been used with great success to ameliorate non-wetting sandplain soils. This demonstration trial was put in to assess the value of spading on yellow sandplain and additional advantages that may come from the ability of spading to incorporate lime and nutrients into the subsoil. Deep ripping and one-way ploughing are included as alternative soil amelioration treatments.

TRIAL LAYOUT



TRIAL DESIGN

Plot size: 11m x 30m (to fit in with conventional grower machinery)

Machinery: Western Ripper, Chamberlain one-way plough, rubber tyred roller and ProFarmer 4500 spader in 2011; DBS seeder 2011 & 2012

Repetitions: Unreplicated demonstration

Crop, seeding rate and date: Wyalkatchem wheat at 100 kg/ha on 10th June; seed treated Dividend 260 mL/ha

Fertiliser rates and dates: 100 kg K-Till extra at seeding; Flexi-NS 70 L/ha (4-5 leaf); Flexi-NS 60 L/ha (~ first node).

Soil pH (untreated): West end: 0-10 cm = 5.6; 10-20 cm = 5.1; 20-30 cm = 5.6

East end: 0-10 cm = 5.9; 10-20 cm = 4.7; 20-30 cm = 4.5

RESULTS

In 2012, the second year after the treatments were applied, rotary spading still had the biggest impact on grain yield in this trial (Fig. 1). Treatments that included rotary spading had yields between 1.75-1.94 t/ha while those treatments that did not include spading yielded between 1.14 and 1.61 t/ha (Fig. 1). The average grain yield of the spaded treatments was 1.85 t/ha. The grain yield increase was 710 kg/ha; a 62% yield increase compared with the untreated control.

In 2011, the first year the treatments were applied, average grain yield of the spaded treatments was 2.09 t/ha; an increase of 850 kg/ha (69% increase) compared to the untreated control which yielded 1.24 t/ha.

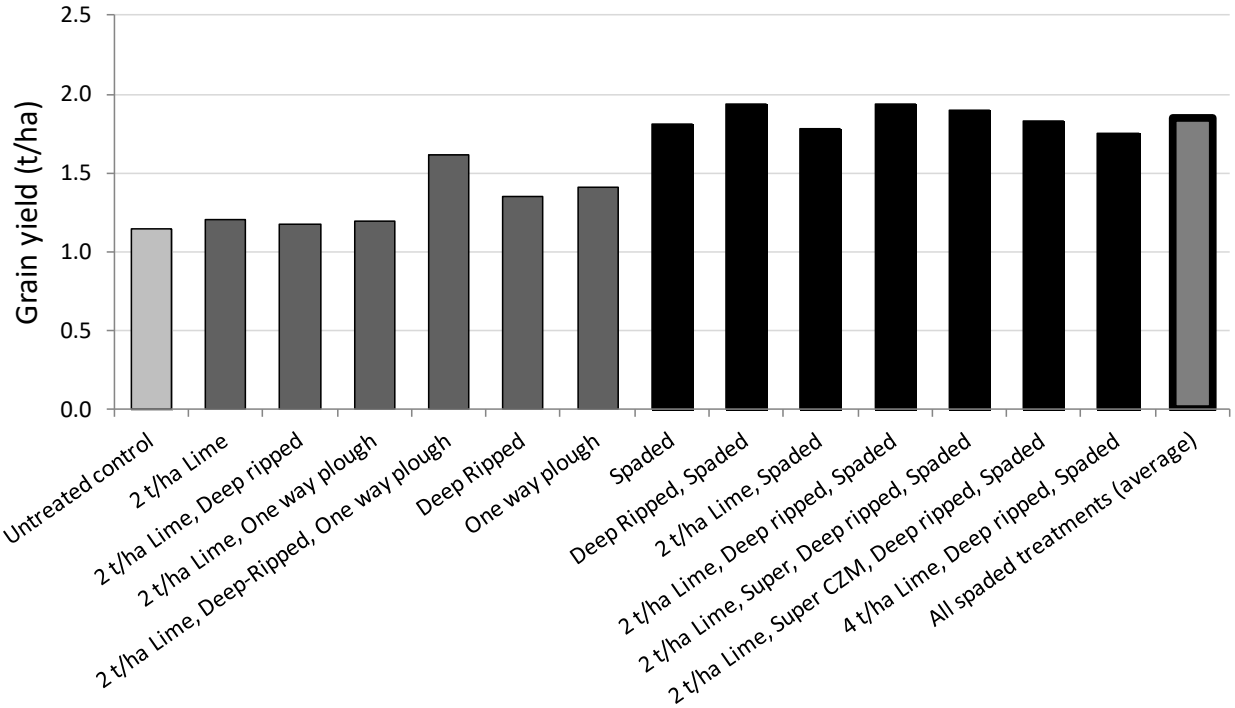


Figure 1. Grain yield of Wyalkatchem wheat in 2012 in response to range of soil amelioration treatments applied in 2011 on yellow sand, Rowes road, Dandaragan.

Deep-ripping prior to rotary spading appears to be beneficial giving a greater yield than spading alone (Fig. 1 and Table 1) and it was visually observed that during transient drought periods throughout the season that the crop in the treatments that included deep ripping were much less stressed.

Deep-ripping or one-way ploughing alone appeared to increase the yield by 210-270 kg/ha compared with the untreated control (Fig. 1). The 2 t/ha of lime followed by deep-ripping and one-way ploughing treatment performed well with a 470 kg/ha yield increase over the control (Fig. 1) however there was little evidence of a lime response in the other limed treatments in 2012. Given that the topsoil (0-10 cm) pH tends to be in excess of 5.5 and the subsurface and subsoil pH's 4.5 or more it is perhaps not surprising that there is not a lime response in the trial yet.

FINANCIAL ANALYSIS OF RESULTS

Using the measured yield changes and estimated costs for each of the treatments applied in 2011 we have determined the net financial benefit for the 2 years the trial has been running (Table 1). Overall spading with and without 2 t/ha lime and deep ripping + spading with or without 2 t/ha lime have given significant net benefit well in excess of $200/ha (Table 1). Deep ripping alone has also given a very good net benefit (Table 1). Incorporation of nutrients is quite costly but there is still a positive net return and these may provide additional benefits in the future.

Table 1. Yield response of Wyalkatchem wheat grown in 2011 and 2012 and 2-year net financial benefit in response to 2011 soil amelioration treatments compared with an untreated control on yellow sand, Rowes road, Dandaragan. Grain price for 2011 $230/t APW and for 2012 $280/t APW.

Treatments	Yield change vs. control (t/ha)		2011 Treatment Cost** ($/ha)	2-year Net Benefit ($/ha)	2-year change in net benefit vs. control ($/ha)
	2011	2012			
2 t/ha Lime	0.28	0.06	$68	$594	-$10
2 t/ha Lime, Deep-ripped	0.74	0.03	$118	$642	$38
2 t/ha Lime, One way plough	0.09	0.05	$98	$517	-$87
2 t/ha Lime, Deep-ripped, One way plough	0.49	0.47	$148	$679	$75
Deep-ripped	0.69	0.21	$50	$750	$146
One way plough	0.18	0.27	$30	$669	$65
Spaded	0.69	0.67	$100	$830	$226
Deep-ripped, Spaded	1.16	0.80	$150	$925	$321
2 t/ha Lime, Spaded	1.25	0.64	$168	$880	$276
2 t/ha Lime, Deep-ripped, Spaded	1.19	0.80	$218	$862	$258
2 t/ha Lime, 167 kg/ha Super, Deep-ripped, Spaded	0.90	0.76	$275	$727	$123
2 t/ha Lime, 167 kg/ha Super CuZnMo, Deep-ripped, Spaded	0.87	0.69	$300	$675	$71
4 t/ha Lime, Deep-ripped, Spaded	0.60	0.61	$286	$606	$2

CONCLUSION

Grower adoption of rotary spading and mouldboard ploughing in the West Midlands has been steadily increasing. This trial demonstrates the productivity and financial benefits that can arise from implementing rotary spading and indicates that the practice of deep ripping prior to spading appears to be worthwhile as not only does it remove obstacles and make spading easier it also appears to be a benefit to crop growth and productivity particularly in times of drought. Soil compaction was a significant constraint on this site and deep ripping alone has shown an advantage. Ideally controlled traffic system should be implemented after deep tillage to prevent re-compaction and loss of these benefits.

PEER REVIEW: Anne Wilkins (EO WMG)

ACKNOWLEDGEMENTS

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