

Mouldboard Plough Demonstration

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Aim

To determine the effects of mouldboarding and deep ripping on a Wongan Hills yellow sand when varying lime and nutrient inputs.

Background

In 2012 this trial was implemented looking at the effects of mouldboarding, a one-off inversion of the topsoil. The plough in this trial was able to invert the top 30cm of soil. Mouldboard ploughing can help in the control of weeds, burying water repellent topsoil, incorporating lime at depth as well as having a deep ripping effect. Cost of the operation is approximately \$100-120/ha (Davies et al, 2012).

Building on the trial in 2013, a deep ripping treatment was added to compare the ripping effect to the mouldboarding. This trial looks to determine what impacts crop yield; soil modification, increasing nutrients and/or lime application.

Trial Details

Property	Wongan Hills Research Station			
Plot size & replication	10m x 10m x 3 replicates			
Soil type	Yellow sand			
Soil pH (CaCl ₂)	0-10cm: 5.2	10-20cm: 4.3	20-30cm: 4.3	30-40cm: 4.8
Paddock rotation	2010: wheat, 2011: wheat, 2012: wheat			
Seeding rate	80 kg/ha Wyalkatchem			
Seeding date	16/05/13			
Soil amelioration	As per protocol			
Fertiliser	80 kg/ha Macro Pro Plus			
Herbicides	15/05/13: 2 L/ha Spray.Seed, 118 g/ha Sakura 11/06/13: 300 mL/ha Axial, 0.5% Adigor 28/06/13: 670 mL/ha Velocity, 1% Hasten			
Growing Season Rainfall	256mm			

Trial Layout

Table 1: Treatments testing the response to mouldboarding, lime and extra nitrogen applications at Wongan Hills.

Treatment Number	Cultivation	Lime	Nitrogen
1	Mouldboard 2012	no lime	
2	Mouldboard 2012	no lime	*50 kg/ha Urea Topdressed
3	Mouldboard 2012	2012: 2 t/ha Lime	
4	Mouldboard 2012	2012: 2 t/ha Lime	*50 kg/ha Urea Topdressed
5	Control	no lime	
6	Control	no lime	*50 kg/ha Urea Topdressed
7	Control	2012: 2 t/ha Lime	
8	Control	2012: 2 t/ha Lime	*50 kg/ha Urea Topdressed
9	Control	no lime	
10	Control	no lime	*50 kg/ha Urea Topdressed
11	Deep Ripped 2013	no lime	
12	Deep Ripped 2013	no lime	*50 kg/ha Urea Topdressed

*Top dressed N treatments taken out of 2013 plan due to low rainfall.

**Treatments 1-8 implemented in 2012, 9-12 additional treatments for 2013.

Results

Table 2: Average grain yield and quality results of Wyalkatchem wheat grown in 2013 at the Wongan Hills Research Station. Yields with different superscript letters are significantly different.

Treatment	Cultivation Method	Lime	Yield (t/ha)	Protein (%)	Hectolitre Weight (kg/hl)	Screenings (%)
1	Mouldboard	Nil	0.74 ^a	12.07	74.07	10.73
2	Mouldboard	Nil	0.80 ^{ab}	12.07	76.11	10.73
3	Mouldboard	2 t/ha in 2012	0.80 ^{ab}	12.13	75.61	10.20
4	Mouldboard	2 t/ha in 2012	0.90 ^a	12.70	74.38	12.37
5	Nil	Nil	1.03 ^b	12.03	75.10	9.42
6	Nil	Nil	1.11 ^{bc}	12.00	75.16	8.41
7	Nil	2 t/ha in 2012	0.95 ^a	11.67	75.06	8.38
8	Nil	2 t/ha in 2012	1.08 ^{bc}	11.80	76.41	8.90
9	Nil	Nil	1.25 ^{bc}	12.53	73.77	10.76
11	Deep Ripped	Nil	1.32 ^c	12.70	74.58	14.87
Probability (Cultivation)			0.003			
Probability (Lime)			0.543			
Probability (Cultivation*Lime)			0.016			
LSD (p=0.05)			0.28 t/ha			

Comments

- The 50 kg/ha of topdressed Urea treatments were not implemented in the 2013 trial due to insufficient rainfall.
- Four additional treatments (Treatments 9-12) were implemented in 2013 to encompass spading into the trial however, treatments 10 and 12 of these treatments became replicates of treatments 9 and 11, respectively, due to not including 50 kg/ha of topdressed Urea.
- In 2012 the mouldboard treatment was rolled post mouldboarding in an effort to create a better seed bed, however;
 - o Low pH (4.3) and aluminium was brought to the surface by the mouldboarding treatment.
 - o The soil had a higher than expected clay content.
 - o This combination of soil characteristics with the compaction from rolling resulted in hostile, crusted topsoil, which in turn produced poor crop germination and vigour.
- This trial serves as a reminder to ensure soil samples are taken prior to ploughing to determine characteristics of the subsoil, particularly pH and clay content.

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