

Mouldboard Plough Demonstration – Buntine

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Australian Government



Key Messages

- This is the 3rd wheat crop where there has been no benefit in yield or quality due to mouldboard ploughing.

Aim

To determine if there are any benefits to increased productivity and carbon cycling on a yellow sandplain soil through mechanical incorporation.

Background

Mouldboard ploughing involves a one-off inversion of the topsoil. In this trial the plough was able to invert the top 30cm, larger ploughs can get deeper. Mouldboard ploughing can help in the control of weeds, burying water repellent topsoil and incorporating lime at depth. Cost of the operation is approximately \$100-120/ha (Davies et al, 2012).

The trial was mouldboard ploughed on the 17th June 2012, after receiving 55mm of rain in the previous week. This allowed the soil profile to fill up at least the top 30cm of soil, which is required for best inversion.

The deep ripping treatment also conducted in 2012 was included to take into account the ripping effect of mouldboard ploughing and if that was the reason a yield improvement was produced. The whole paddock was last deep ripped in 2009, therefore it was predicted that there wouldn't be a significant difference in yield between deep ripped and control plots.

2014 Trial Details

Property	Michael & Narelle Dodd, west Buntine
Plot size & replication	100m x 18m x 2 replications
Soil type	Yellow sand
Soil pH (CaCl₂)	0-10cm: 6.2 10-20cm: 4.8 20-40cm: 5.0
EC (dS/m)	0.045
Sowing date	27/5/14
Seeding rate	80 kg/ha Corack
Paddock rotation	2013: wheat 2012: wheat 2011: pasture
Fertiliser	27/05/14: 55kg/ha Agstar Extra, 15 kg/ha MOP, 30 L/ha Flexi-N, 10 L/ha Calsap, 20 L/ha Flexi-N
Herbicides & pesticides	18/05/14: 1.5 L/ha Roundup, 0.25% LI700, 100 mL/ha Goal 27/05/14: 1 L/ha Spray.Seed, 1.8 L/ha Treflan 14/07/14: 680 mL/ha Velocity
Growing Season Rainfall	187mm

Results

Over the life of the trial 2012-2014 there has been no significant crop response to the deep ripping or the mouldboard ploughing in terms of yield and quality. This is the third wheat crop since tillage occurred in June 2012.

Table 1: Wheat yield, quality and grade 28 months after mouldboard ploughing and deep ripping occurred on yellow sand at Buntine. The trial was set up with a no tillage plot termed “Control” next to each tillage treatment to act as a comparison point for this non replicated demonstration.

Treatment	Yield (t/ha)	Nearest neighbour control (%)	Protein (%)	Screenings (%)	Hectolitre weight (%)	Grade
Control	2.30	100	13.3	2.60	81.28	AGP1
Deep ripped	2.60	113	12.0	1.13	82.68	APW1
Mouldboard	2.28	102	12.6	2.27	81.89	APW1
Control	2.22	100	12.3	2.04	82.72	AGP1
Deep ripped	2.28	102	12.1	2.05	82.45	AGP1
Mouldboard	1.85	95	12.5	4.40	80.44	AGP1
Control	1.93	100	12.0	3.45	80.84	AGP1

Note: There was a very high amount of speargrass in the downgraded wheat samples.

This paddock has issues with hard pans and compaction in the depth of 15-50cm (Hollamby and Davies, 2014). The deep ripping did remove the compaction where the tyne passed through.

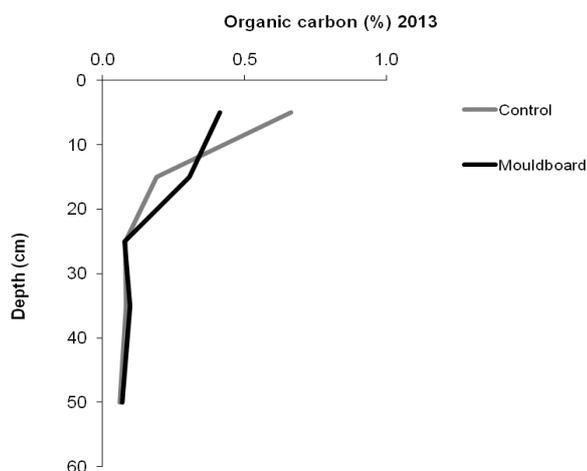


Figure 1: Soil organic carbon as a percentage of soil after cereal rye has been incorporated by ploughing (grey line) compared to no ploughing (black line), Buntine, May 2013. Ploughing occurred in 2012.

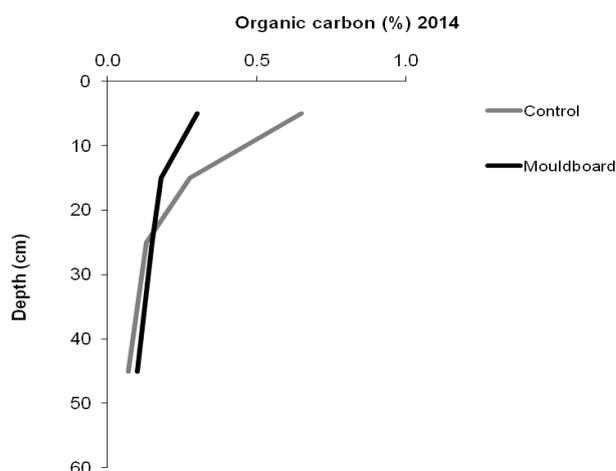


Figure 2: Soil organic carbon as a percentage of soil after cereal rye has been incorporated by ploughing (grey line) compared to no ploughing (black line), Buntine, December 2014. Ploughing occurred in 2012.

In 2014 the mouldboard ploughing decreased the topsoil organic carbon % from 0.41% in 2013 to 0.3% in 2014, see Figure 1 & 2. The soil organic carbon % in the control treatment has remained relatively the same from the 2013 and 2014 results in the topsoil but is increasing in the subsoils, moving from 0.19% in 2013 to 0.275% in 2014 in the 10-20cm depth and from 0.08% to 0.13% in the 20-30cm level.

Economic Analysis

Over the course of the trial to date the most economically profitable treatment has been the control with a cumulative gross margin for 2012 & 2013 of \$870/ha. However, this year the deep ripped treatment has returned the highest cumulative gross margin for the three years at \$1204/ha. This is the first year that the implementation cost (\$50/ha) of the deep ripping treatment has begun to be repaid. The mouldboard treatment has yet to repay the cost of implementation (\$125/ha).

Table 2: Gross margins of mouldboard ploughing compared to deep ripping and control (minimum tillage) on deep yellow sand at Buntine. Determined by grain income minus cost of production, fixed costs are not included in this analysis. The cost of deep ripping \$50/ha and mouldboard ploughing \$125/ha was incurred in 2012 only.

Treatment	Gross Margin (\$/ha)			Cumulative Total
	2014	2013	2012	
Control	318	350	520	1188
Deep ripped	394	340	470	1204
Mouldboard plough	295	370	340	1005

Grain price used were: 2012 season - \$340/t, 2013 - \$300/t, 2014 - \$295/t.

Comments

This is not a fully replicated trial but a farmer demonstration that has nearest neighbour controls. This is the first year of the trial in which the control treatment has had a lower cumulative gross margin than one of the cultivation treatments; this means that the cultivation treatment (deep ripping) is finally beginning to return dividends to the farmer in the third year since the cultivation occurred.

The farmer has noted that this site was seeded and sprayed as per normal program. This was somewhat detrimental to the mouldboard site as the seed depth and establishment was compromised due to the softness of the top soil. Another factor to consider was that the normal rates of chemical, Trifluralin in particular, almost became toxic due to the low organic matter created by the mouldboard treatment. This also contributed to the mouldboard plots poor performance.

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References

Hollamby, N. and Davies, S. 2014. 'Compaction after mouldboard ploughing', *Local Research and Development Results – Results from 2013 season, Liebe Group*.

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