

Mouldboard Plough Weed Control Demonstration

Nadine Hollamby, Project Coordinator, Liebe Group



Australian Government



Key Messages

- Mouldboard ploughing did provide a good integrated weed management tool, although spraytopping lupins also had a positive impact on weed numbers.
- Despite poor crop establishment the mouldboard plough area yielded 0.8 t/ha higher than the unploughed areas.

Aim

To evaluate the weed control efficacy of mouldboard ploughing on an area with a high weed burden.

Background

Mouldboard ploughing involves 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 compaction removal (deep ripping) effect. Cost of the operation is approximately \$100-120/ha (Davies et al, 2012).

In this demonstration problem weeds were predominantly brome grass, ryegrass and patches of wild oats. The site was ploughed on the 13th June 2012 after receiving 31mm of rain in the previous three days. This trial was presented to growers at the 2013 Liebe Group Spring Field Day will be monitored until 2015, to observe the long term implications of this practice.

Trial Details

| | |
|------------------------------------|---|
| Property | G & H Pearse Pty Ltd, west Wubin |
| Plot size & replication | 100m x 15.3m x 2 replications |
| Soil type | Pale yellow sand |
| Soil pH (CaCl₂) | 0-10cm: 5.3 10-20cm: 4.6 20-40cm: 4.4 |
| EC (dS/m) | 0.110 |
| Sowing date | 28/05/13 |
| Seeding rate | 70 kg/ha Mace |
| Soil amelioration | 20/03/12: 1 t/ha lime 20/04/13: 1 t/ha lime |
| Fertiliser | 28/05/13: 80 kg/ha Macro Pro Extra 28/06/13: 80kg/ha Urea |
| Paddock rotation | 2010: canola, 2011: wheat: 2012: lupins |
| Herbicides | 28/05/13: 2 L/ha Treflan, 1.2 L/ha Roundup Attack, 2% Ammonium Sulphate 28/06/13: 1 L/ha Jaguar, 0.5 L/ha LVE-MCPA |
| Growing season rainfall | 228mm |

Results

18 months after the soil was ploughed the wheat yielded 0.8 t/ha better than the unploughed control. Grain quality was not altered by the tillage with both areas having an average protein of 11%, hectolitre weight of 81 kg/hL and screenings of 2%.

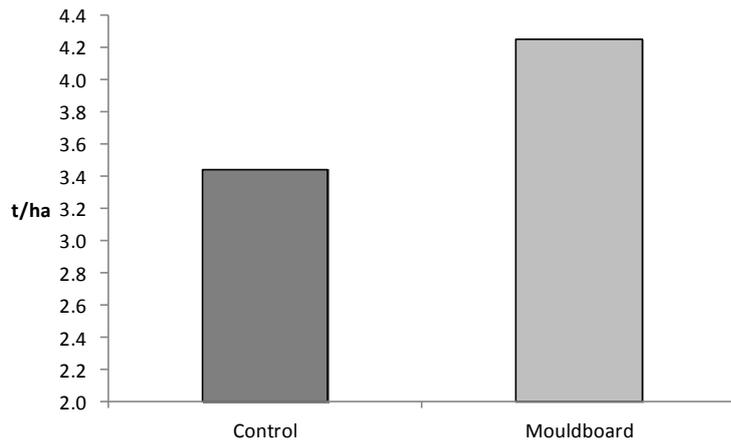
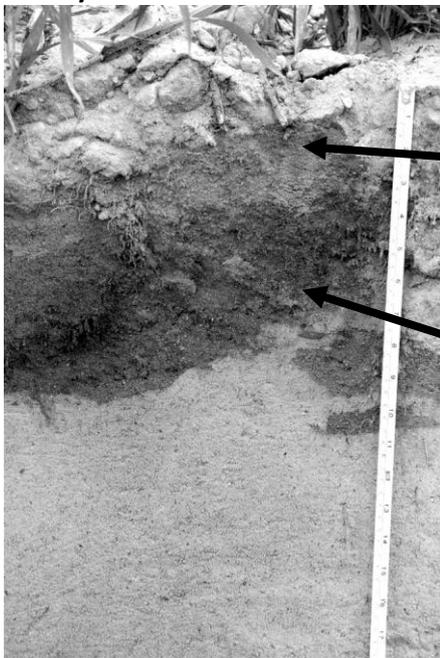


Figure 1: Average wheat yield 18 months after soil was mouldboard ploughed compared to no tillage, west Wubin in 2013. Area was ploughed in June 2012.

Acidity



Acidic subsoil has been brought to the surface by the plough.

Limesand which was originally applied to the surface has been buried by the plough and is neutralising surrounding soil.

Figure 2: A side view of soil after being mouldboard ploughed 18 months previously. Universal pH indicator has been applied to highlight changes in pH. The darker area shows soil that has been neutralised and has a higher soil pH as a result of incorporation of limesand.

Compaction

A soil pit was dug at the trial site for the Spring Field Day which highlighted a layer of compacted soil at a depth of 15-30cm. Mouldboard ploughing removes this hardpan however, ploughed soil can quickly re-compact forming a new hardpan that could be even more of a problem. Measures to avoid re-compaction such as implementation of a controlled traffic farming system are advised.



Figure 3: A side view of soil which has not been ploughed showing signs of a hard pan (circled) created by compaction from machinery over time.

Weed Control

Weed observations on July 12th 2012 showed 83 weeds/m² in the unploughed area while the mouldboard plough managed to bury the majority of the seeds leaving an average of 1.4 weeds/m². This represents a 98% weed control. This result is consistent with other research findings where good soil inversion has been achieved. The 2012 lupin crop was spraytopped with paraquat in October. The spray topping and pre emergent herbicide control has seen excellent weed control with numbers in the control plots reduced from 83 weeds/m² in 2012 to 2 weeds/m² in 2013.

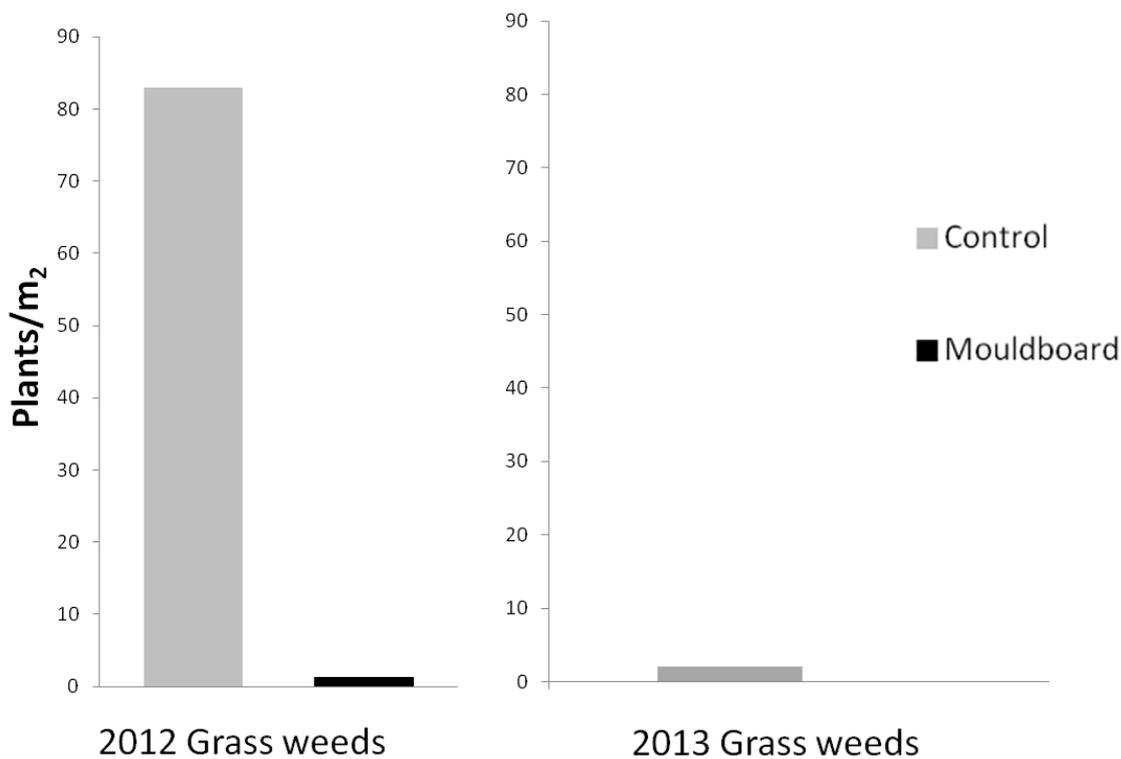


Figure 4: Average ryegrass and brome grass populations per m² in July 2012 lupin crop and July 2013 wheat crop.

Comments

Crop establishment was patchy across both treatments. Plant counts were done on 9th of July at early tillering. The mouldboard ploughed area had 40 plants/m² and the unploughed area ranged from 20-60 plants/m². However host farmer Graham Pearse observed more plants germinate with rain events in mid July. Despite the lower plant numbers the ploughed areas yielded well and it is likely (but was not measured) that the plants in the mouldboard section tillered more and had larger heads than the control.

The yield response to mouldboard ploughing was much higher than expected at this site given that it did not appear to have a severe limitation such as soil water repellence or high weed burden. Soil was acidic and compaction was present although the paddock was still yielding well with an average of 3.5 t/ha. The yield response from ploughing is likely to be a combination of deep placement of lime, removing compaction and better access to nutrients which, once buried, remain wetter for longer periods in a dry season and thus are more available to the plant than dry topsoil nutrition.

Acknowledgements

Thank you to Jeff Pearse for conducting and managing the trial. Dr Stephen Davies from Department of Agriculture and Food WA for advice, assistance and presenting the trial at Spring Field Day. Department of Agriculture and Food WA for the use of the mouldboard plough and Colin Cail for use of the tractor. This trial is funded by the Australian Government.

Paper reviewed by: Dr Stephen Davies, DAFWA