

Agronomic strategies for water repellent soils in WA - mouldboard ploughing demonstration

Facey Group, DAFWA and GRDC

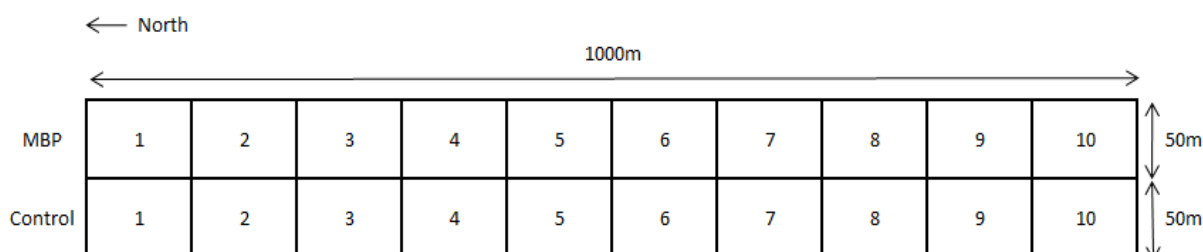
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AIM

Compare changes in soil characteristics, including non-wetting and crop growth and performance in a mouldboard ploughed area versus untreated (control) area using an on-farm large scale demonstration site.

TRIAL DETAILS



Property:	Graeme Manton
Plot size & replication:	50 m x 100 m – 10 replications (total size 100m x 1000m)
Soil type:	Sand over clay
Crop Variety:	LaTrobe Barley
Sowing Date:	13th May 2016
Seeding Rate:	57.5kg
Fertiliser (kg/ha):	90kg K Till, 70L Flexi N
Paddock rotation:	2013 Wheat, 2014 Barley, 2015 Lupins
Herbicides:	Velocity 670ml/ha
Insecticides:	Alpha Cypermethrin 120ml/ha
Fungicides:	Nil

METHODOLOGY

The trial was set up in 2014 as a farm scale paired comparison between a mouldboard plough strip and adjacent control (no cultivation), with similar soil characteristics. Germination counts were completed on 23rd June 2016 with 5 x 1m row counts throughout each of the ten zones in each treatment. Given the severity of frost in 2016 and the visual effect this had on the trial, Frost Induced Sterility (FIS) samples and harvest index samples were taken prior to harvest in each zone of both treatments for analysis. The trial was then harvested using a yield monitor.

RESULTS & DISCUSSION

The site was mouldboard ploughed in 2014 and the paddock is being monitored to see the impact of this treatment over time. Germination counts were completed on 23rd June 2016 with no obvious variation (Figure 1).

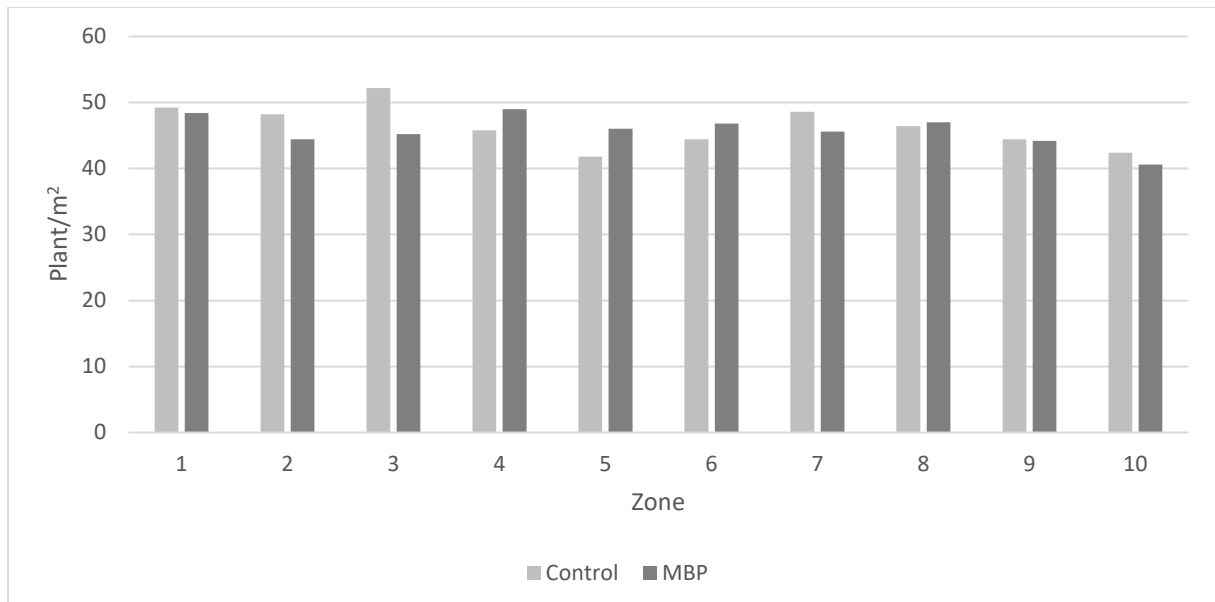


Figure 1: Crop establishment counts from zones 1-10 in Mouldboard (MBP) and Untreated (Control) plots

In late October, the site had a very visual distinction between the mouldboard and the control treatments after numerous frosts (Figure 2). FIS samples were taken to analyse the damage between each treatment. The results from this show that the control treatment had a significantly higher floret sterility percentage and greater variance than the mouldboard treatment (Figure 3).



Figure 2: Visual frost damage line on LaTrobe barley between the mouldboard treatment (foreground) and control (background)

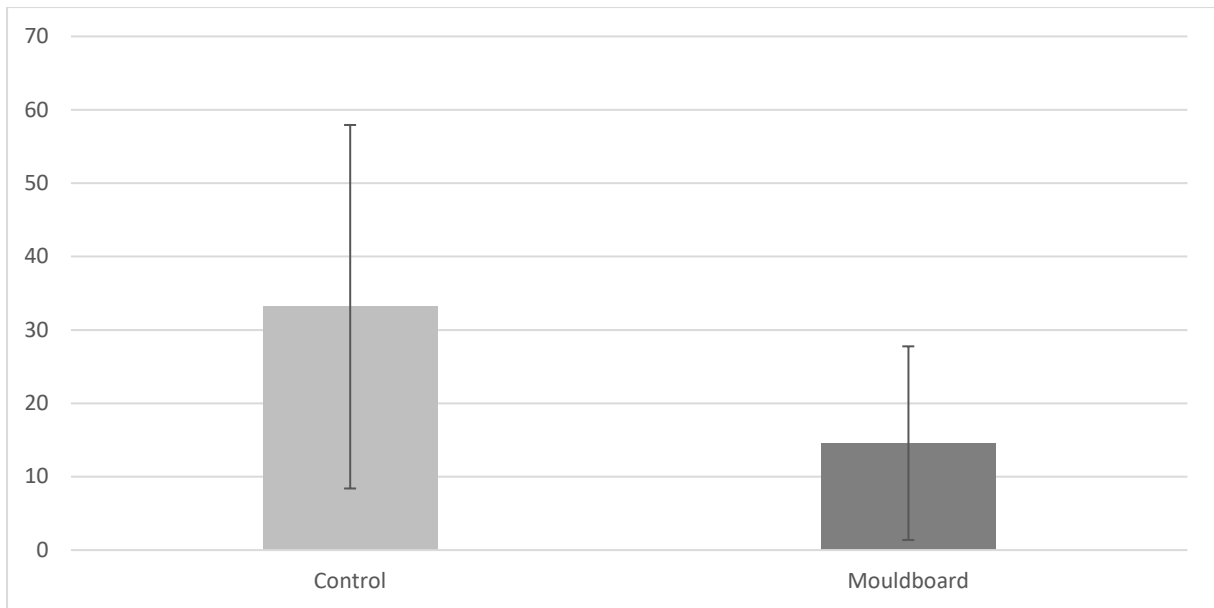


Figure 3: Average Frost Induced Sterility % (with standard deviation)

On the 9th November, harvest index cuts were taken, with 3 samples in each zone for each treatment. These were sent to Living Farm for processing and the results will be released to the Facey Group members as they become available.

The trial was harvested on the 24th November using the growers machinery and a yield monitor. The results show that the yield in the mouldboard treatment was significantly higher than that of the control treatment (Figure 4). This is likely due to the frost damage impacting on the final yields.

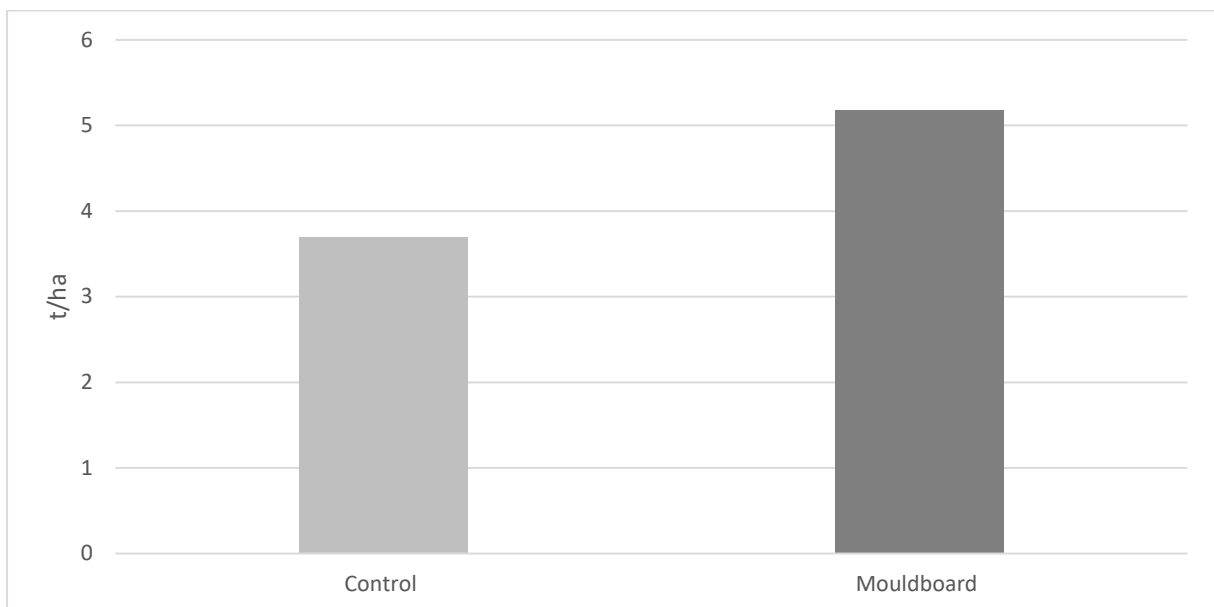


Figure 4: Average grain yield of LaTrobe barley in 2016 (t/ha)

Grain samples were taken from each treatment at harvest to assess the grain quality and grade for each. Both treatments made the LaTrobe Malt grade but only just. Protein was acceptable for both treatments (Figure 5) though the control treatment only just achieved the minimum hectolitre weight (Figure 6) and the mouldboard treatment had high screenings (Figure 7).

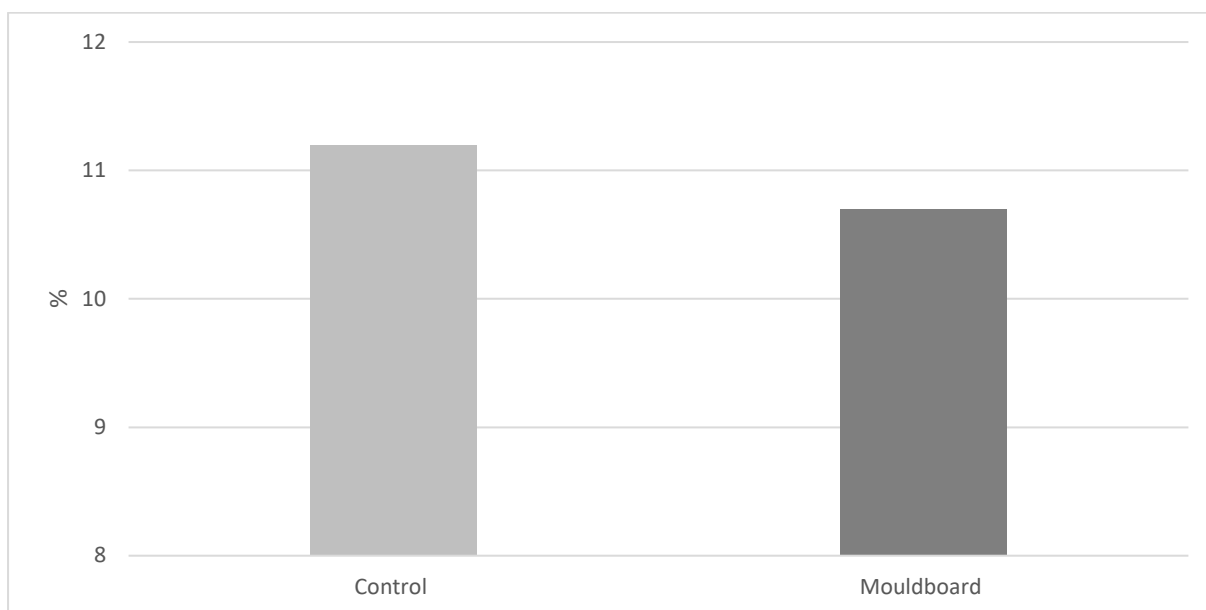


Figure 5: Average grain protein % of LaTrobe barley, 2016.

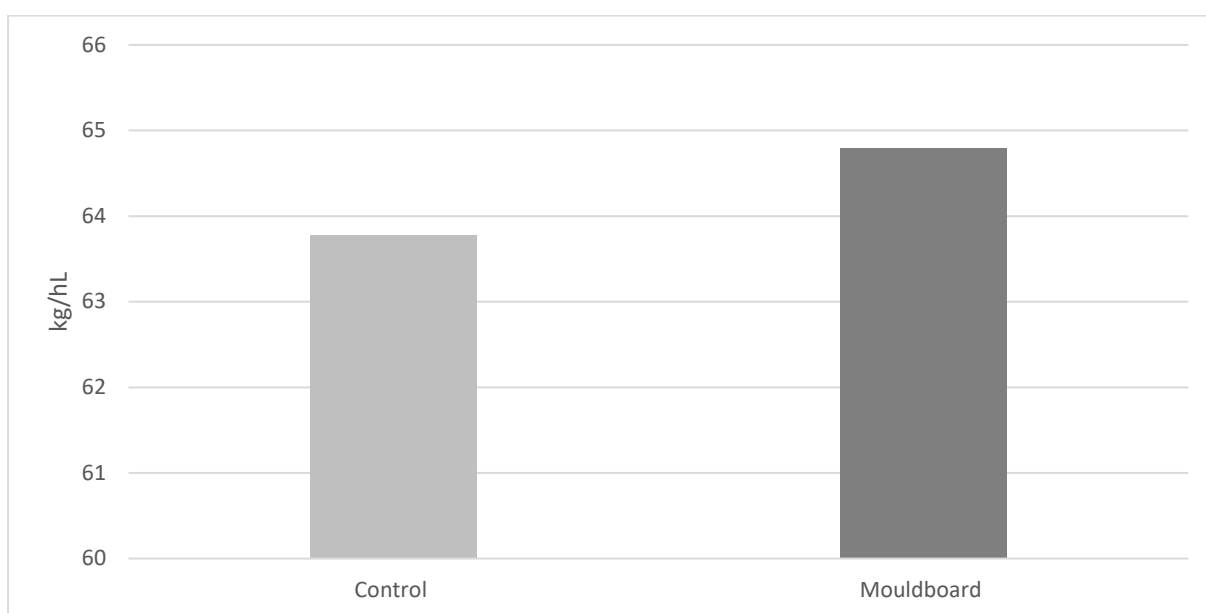


Figure 6: Average hectolitre (kg/hL) weight of LaTrobe barley, 2016.

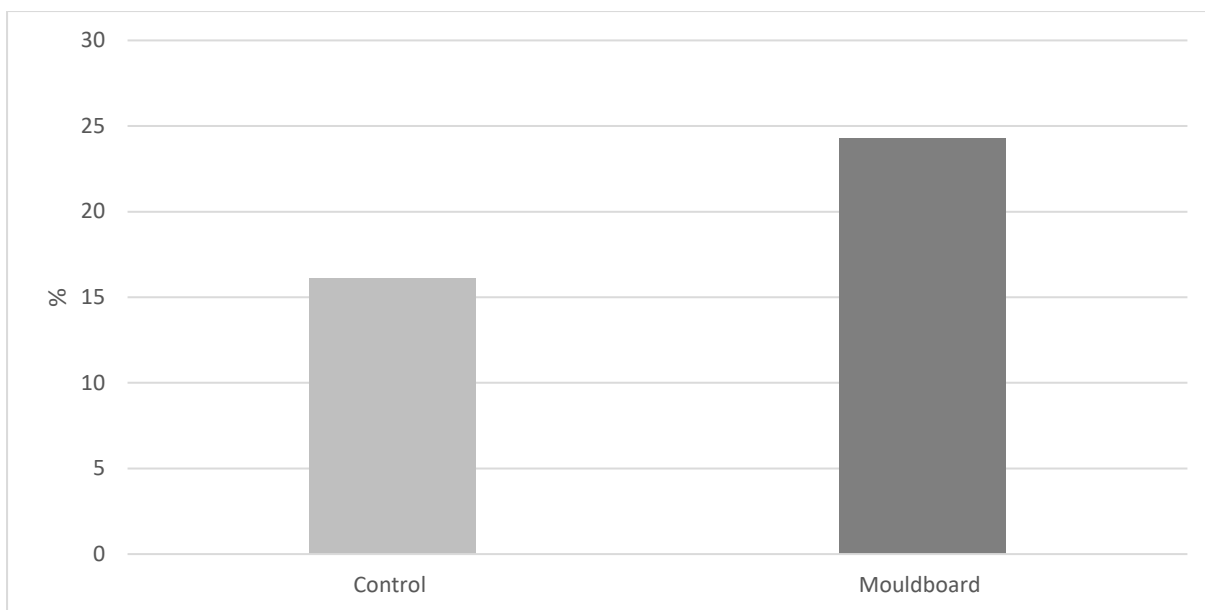


Figure 7: Average screenings % for LaTrobe barley, 2016.

CONCLUSION

The trial showed a remarkable variance in frost damage and yield between the two treatments. There are a number of possible reasons why the mouldboard ploughed treatments had reduced frost damage. Firstly, overcoming topsoil water repellence can improve topsoil moisture content which allows for better transfer of heat into, and out of, the soil. Secondly, mouldboard ploughing can increase the overall yield potential which may include more and larger heads which could result in the frost damage being proportionally less. Further analysis is required to determine if this is the case. Thirdly it is possible that the crop on the ploughed soil flowered at a different time however this is unlikely given that this is the third season since ploughing was applied and that there were multiple frost events so avoidance is unlikely. The trial will have tiny tags installed in 2017 to measure variance in canopy temperature between the two treatments. This trial will continue to be monitored over the coming years to assess the impact that soil amelioration has on soil properties, crop development and yields.

ACKNOWLEDGEMENTS

Graeme Manton for hosting the trial site and Stephen Davies (DAFWA) for assisting in the planning and implementation of the trial. Support for this research was provided by DAFWA, Facey Group and GRDC through Project: DAW00244 "Delivering enhanced agronomic strategies for improved crop performance on water repellent soils in WA".