Quantify and Promote the Benefits of Deep Ripping

December 2008

Introduction

In order to quantify the effects of deep ripping, gypsum application, and a new cultivation implement known as a Spader, the MFMG established two trial sites in the South East in 2008. Deep ripping has been shown to increase root zone area, break up hard pans, and increase infiltration. Gypsum can improve soil structural problems caused by sodicity thereby increasing root penetration and water infiltration. The Spader mixes the soil profile to a depth of around 30cm and may increase root penetration and water infiltration, thereby improving conditions for plant growth.

Method

Two sites were selected in 2008, one at Cadgee and the other at Frances. The Frances site is a shallow loam over brown clay whereas the Cadgee site is a bleached loamy sand over brown clay. Treatments were applied to the trial plots prior to sowing Canola.

Treatments included:

- Control
- Deep ripped
- Deep ripped after Gypsum application at 2.5 t/ha
- Deep ripped after Gypsum application at 5 t/ha plus Spader
- Deep ripped before Gypsum application at 2.5 t/ha
- Deep ripped after Gypsum application at 5 t/ha

After sowing, the trial plots were managed in the same manner as the rest of the paddock.

Results

Trial plots were harvested on the 20th of November, 2008. Harvest yields varied significantly between replicates. Despite this variation, the average yields in tables 1 and 2 appear to show an increase in yields in all treatments. The 'Ripped' and 'Ripped before Gypsum at 2.5 t/ha' treatments showed moderate yield increases at both sites, whereas the 'Ripped after Gypsum' treatment showed a significant increase on the lighter soil type at the Cadgee site and a moderate increase on the heavier soil texture at the Frances site. The 'Ripped after Gypsum at 5 t/ha plus Spader' treatment showed significant yield increases at both sites, up to 25% at the Cadgee site. Tables 3 and 4 show the averages yields of each treatment.

Treatment	Average yield (t/ha)	% Increase
Nil	1.61	
Ripped	1.65	2.3

Ripped before Gypsum at 2.5 t/ha	1.73	7.5
Ripped after Gypsum at 2.5 t/ha	1.83	13.7
Ripped after Gypsum at 5 t/ha plus Spader	2.02	25.4

Table 1: Cadgee site harvest data summary

Treatment	Average yield (t/ha)	% Increase
Nil	1.80	
Ripped	1.88	4.2
Ripped after Gypsum at 2.5 t/ha	1.88	4.6
Ripped before Gypsum at 2.5 t/ha	1.89	4.9
Ripped after Gypsum at 5 t/ha plus Spader	2.02	12.3

Table 2: Frances site harvest data summary

The Cadgee site appears to have benefited significantly from the Spader treatment. In the control plots a bleached soil horizon is present at about 12cm which significantly impedes root growth. The Spader was able to mix the surface horizon into this bleached horizon and therefore extend the rootzone of the crop.

Similarly, the ripping treatments are likely to have disrupted this bleached layer at the Cadgee site and extended the rootzone, resulting in increased yields. The soil at the Cadgee site is non-sodic and therefore Gypsum is unlikely to have improved soil structure. The increased yields in the Gypsum treatments compared to the Ripped only treatment may be due to the addition of sulphur. The increased yield in the Ripped after Gypsum treatment compared to the Ripped before Gypsum indicates that the ripping has mixed the Gypsum into the profile and the Gypsum has been more effective.

The Ripping and gypsum treatments at the Frances site show less significant yield increases compared to the Cadgee site. The Frances site was also non-sodic and Gypsum has had little effect indicating that soil structure is unlikely to have been improved and sulphur is not deficient at this site. The Spader treatment showed a yield increase which indicates that the mixing of the soil profile has allowed for increased root growth.

However, there was a high degree of variation in between replicates at both sites. Figures 1 and 2 illustrate the variability in yields between replicates. A statistical analysis of variance has shown that whilst the treatment plots on average yielded more than the control plots, the variation between replicates was too great to conclude that a statistically significant relationship exists between the treatments and yields.

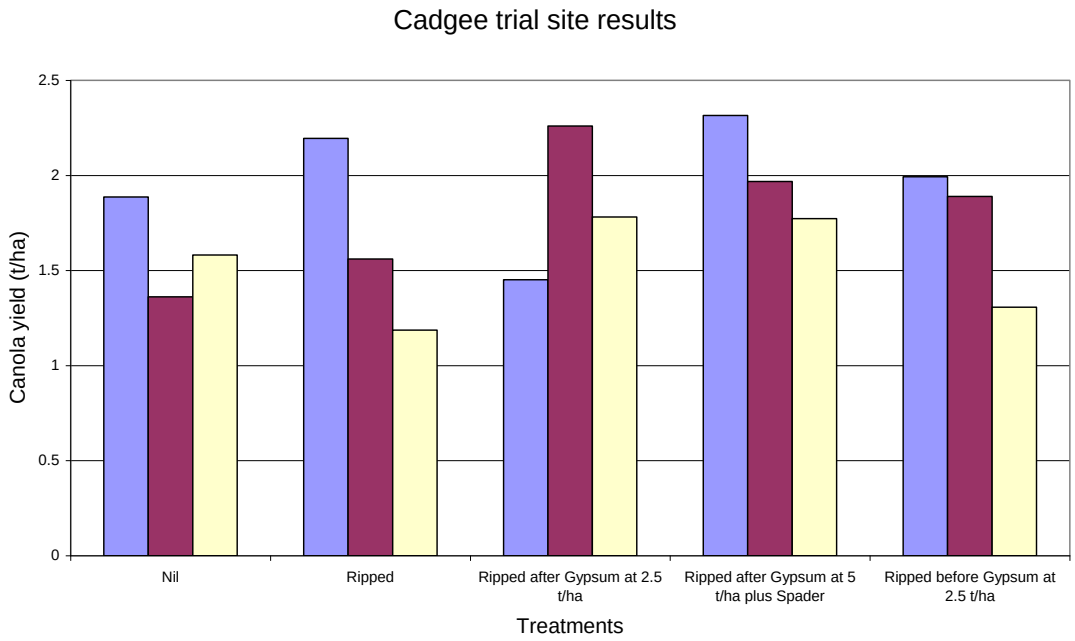

Figure 1: Harvest results from the Cadgee trial site.

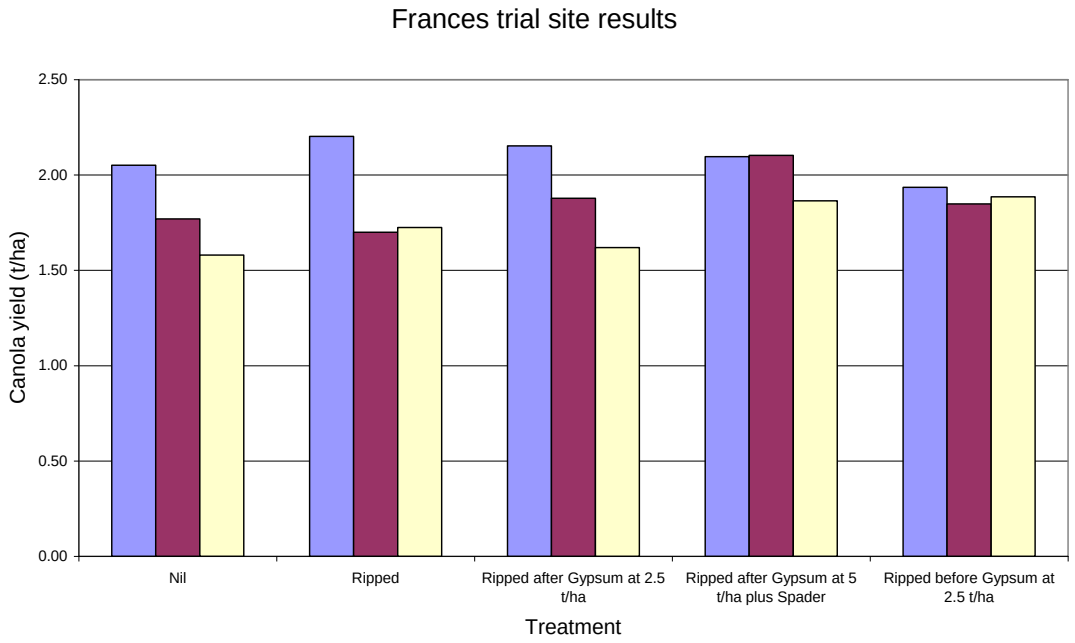

Figure 2: Harvest results from the Frances trial site.

The high degree of variation between plots is likely to be the result of the poor season. The region experienced a relatively dry winter and an extremely dry spring. This poor season is likely to be the cause of the highly variable yields. There was also some evidence of bird damage in some plots at the Cadgee site which would have increased the variability of results.

Trial	Treatment	Moisture (%)	Protein (%)	Oil (%)
Cadgee	Ripped after Gypsum @ 5t/ha + Spader	5.6	23.8	39.3

Cadgee	Ripped	5.6	25.3	38
Cadgee	Ripped before Gypsum @ 2.5t/ha	5.5	25.1	38.1
Cadgee	Ripped after Gypsum @ 2.5t/ha	5.6	24.2	38.2
Cadgee	Nil	5.6	24.3	38.5

Table 3: Moisture, protein, and oil analysis of Cadgee trial site seed

Site	Treatment	Moisture (%)*	Protein (%)*	Oil (%)*
Frances	Nil	5.6	18.8	45.9
Frances	Ripped	5.7	18.0	45.7
Frances	Ripped after Gypsum @ 2.5t/ha	5.5	18.9	45.9
Frances	Ripped after Gypsum @ 5t/ha + Spader	5.5	19.0	45.3
Frances	Ripped before Gypsum @ 2.5t/ha	5.7	18.6	45.8

Table 4: Moisture, protein, and oil analysis of Frances trial site seed

Tables 3 and 4 show moisture, protein, and oil analysis of the seed harvested from both trial sites. These figures show only slight variation, suggesting that the treatments have not affected seed quality. Analysis of seed harvested in the future will provide further information regarding the effects of these treatments on seed quality.

Conclusion

Although the treatments, especially the Spader treatment, overall appear to have produced yield increases, the variability between replicates was too great to be able to prove this statistically. Further plant growth and yield measurements are required in future seasons in order to establish firm relationships between treatment and crop yields. The soil modification caused by deep ripping and spading are long lasting and as such it is possible to carry out crop measurements in future seasons. The effect of Gypsum can also be measured in future seasons and may be more obvious as more of the product becomes soluble.

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References

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