Deep ripping provides yield increases near Northam, Western Australia.

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Key messages

1. Deep ripping provided a 446 kg/ha wheat yield increase in 2017.

Aims

To assess the impact of deep ripping on wheat yield in a sand over gravel soil type near Northam, WA.

Method

The impact of deep ripping on wheat yield was assessed in a sand over gravel soil approximately 20kms east of Northam by farmer Ty Fulwood and agronomist Tim Boyes agVivo. Treatment strips were established in early 2017 using a 3.5m wide Heliripper to a depth of 700mm. Treatment strips were alternated with untreated control strips to create the replicated trial shown in Figure 1.

Plots were aligned to fit with the existing 12.2m control traffic system though four passes of the Heliripper was used and created 14m wide ripped plots which extended uniformly into the control plots. This is likely to have increased yield in the control plots reducing the relative difference between treatment and control.

All plots were sown with the growers seeding machinery as part of the normal seeding operations and was sown to wheat in 2017. Harvesting of the trial plots was carried out using the grower's machinery using yield monitoring equipment to record yield mass.

Soil and plant measurements

A number of soil and plant measurements were collected during the 2017 season in addition to yield. Soil penetration resistance using a digital cone penetrometer was measured twice in each plot and used to assess differences in soil compaction. Where possible, the rip line was located and five insertions were recorded at each site with the average of these insertions used to characterise the soil resistance at each location. Normalised Difference Vegetation Index (NDVI) was collected using an Un-manned Aerial Vehicle (UAV) to assess differences in above ground plant biomass and plant greenness between plots.

Figure 1: A deep ripping trial was established at Mount Noddy Farming near Northam in 2017.

Results and Discussion

Crop Yield

Deep ripping provided a 446kg yield increase compared to the control plots when entire plot lengths were compared though large variation across the trial meant this was not statistically significant (Figure 2).

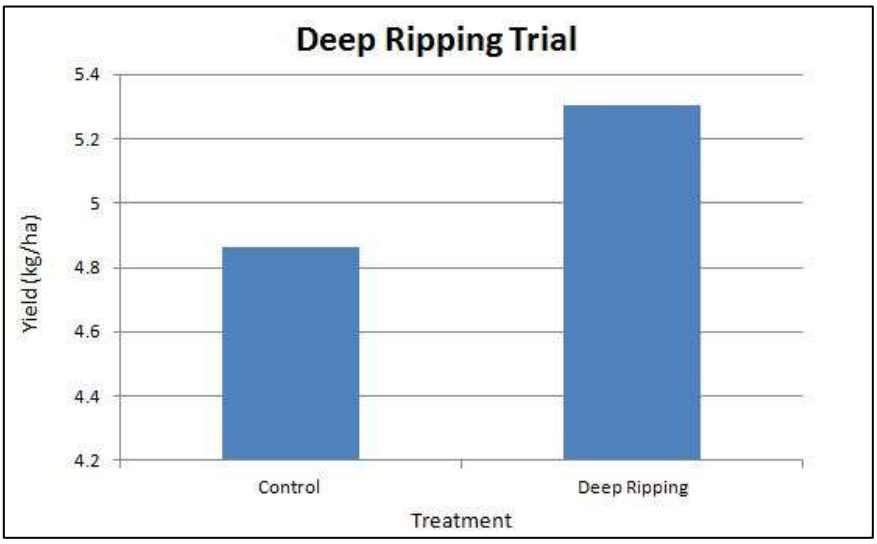

Figure 2: Average crop yield for the deep ripping and control plots showed that deep ripping to 700mm provided a yield benefit in 2017.

Analysis of harvest data showed large variation in yield mass existed along each plot and also within and between the treatments (Figure 3). It is thought that small scale changes in soil type are causing these differences and influencing the deep ripping response.

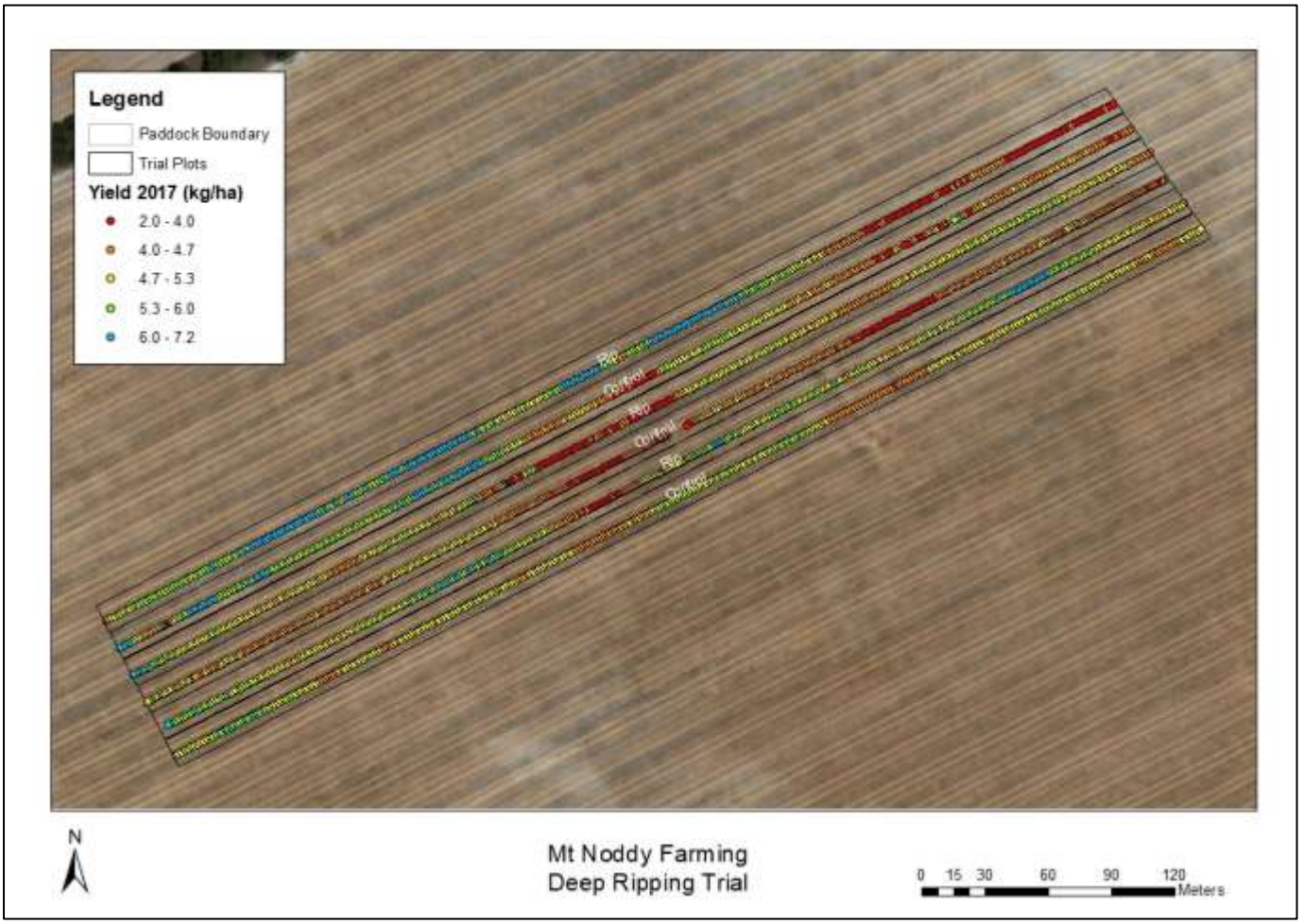

Figure 3: Yield data for each plot showed an overall yield increase in the ripped plots though also large variation in yield within plots.

NDVI imagery was captured across the trial in September 2017 using an UAV and multispectral camera. This imagery showed some variation in plant biomass existed between the treatments as well as along each plot (Figure 4). Biomass differences were observed in specific areas of the trial with the eastern end of the trial appearing to be more responsive to deep ripping than the western end.

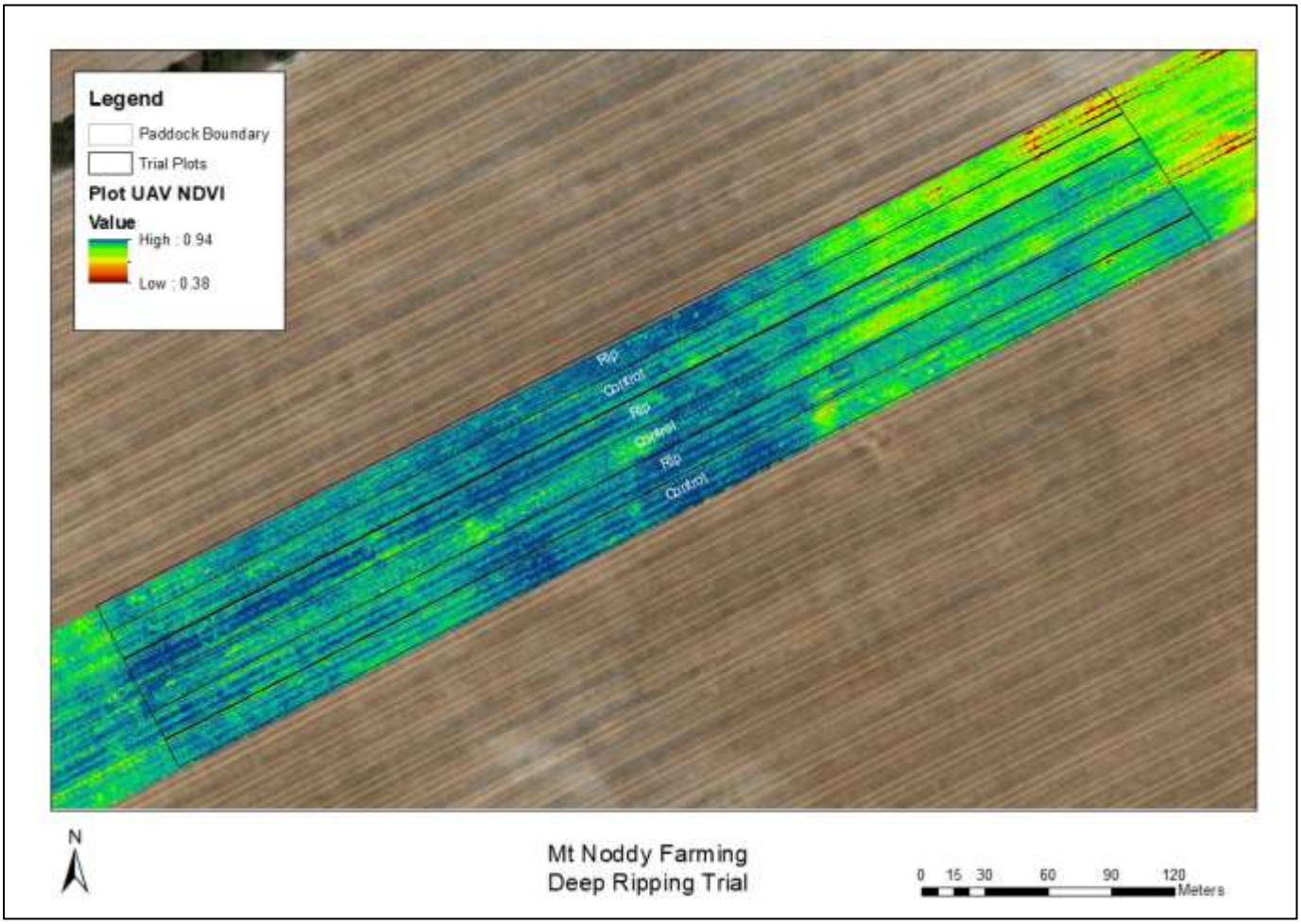

Figure 4: UAV NDVI imagery captured during September 2017 shows variations in biomass across the trial.

Soil and Plant Measurements

Soil coring was not carried out at this trial site in 2017 though is planned to be done during the 2018 season in areas of biomass variation identified in the UAV NDVI imagery. The soil properties in areas in which the largest yield responses to deep ripping were observed will be measured to guide were these large responses are likely to be seen in other areas of the farm.

A Rimick CP300 Cone Penetrometer was used to measure soil compaction at 30 locations across the trial. This was made up of five insertions at 5 locations along each plot. Insertions locations were randomly chosen in the control plots though the ripping line was found and measurements taken from within the rip line for the ripped plots.

The average soil strength was found to be reduced in the deep ripping plots and did not exceed severe levels of compaction (i.e. 2500kpa) to the depth of 750mm (Figure 5). The control plots were found to be more compact than the deep ripped plots with severe soil compaction being measured between 500mm and 750mm soil depth.

Previous research has found 2500kpa to be the compaction level where plant root growth begins to be inhibited. This indicates that the deep ripping created a less compact soil profile when compared to the control and removed compaction as a constraint below 500mm across the trial site.

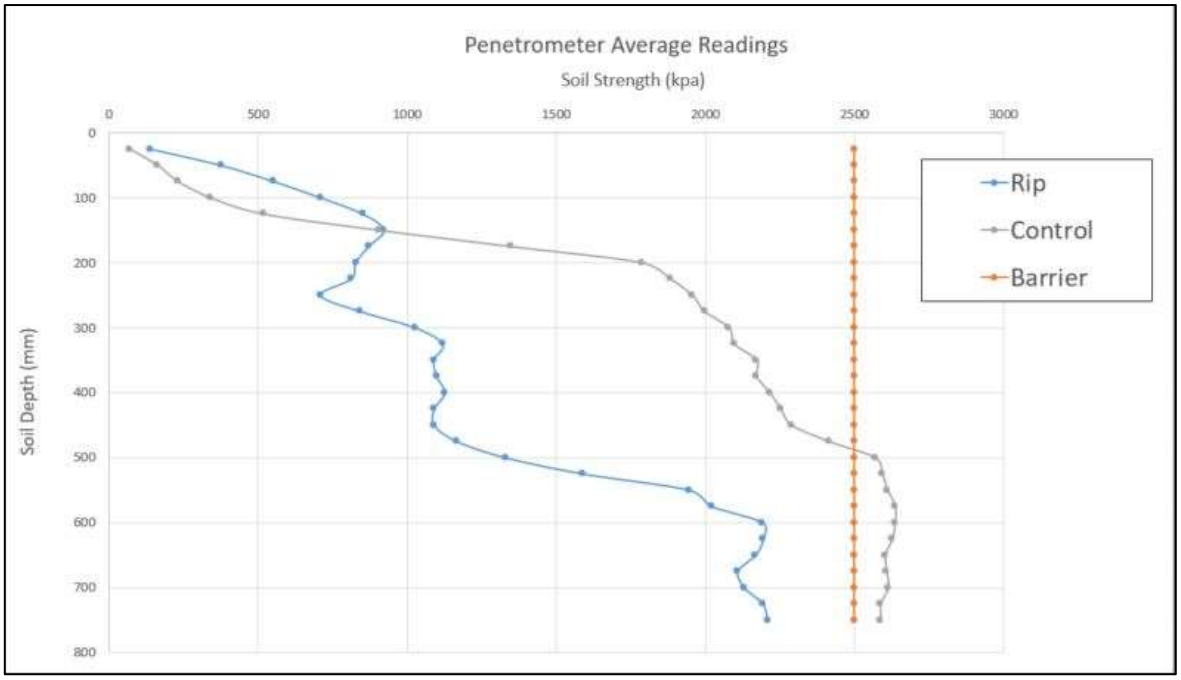

Figure 5: Average soil strength measurements from ripped and control plots as recorded by a cone penetrometer in August 2017.

Returns of Deep Ripping

A detailed economic analysis of the advantage of deep ripping has not yet been carried out at this site though the results of the trial encourage further replicated trials to accurately quantify the benefits of deep ripping in the area.

The yield responses to deep ripping will continue to be monitored over the 2018 season to see if the treatment effects continue. The longevity of the treatment effect will determine how cost effective deep ripping is in this environment and on these soil types. The yield results from the 2018 season will be important to quantify how long the ripping effect seen here will last.

Soil testing will provide more information on the causes of the large yield responses in parts of this trial and is likely to offer a guide as to where these large responses may be seen in other parts of the farm with the same soil properties.

Conclusion

Ongoing yield increases likely to have provided a positive return on investment to the farm business. The yield response from the upcoming 2018 season will give an indication as to the longevity of the deep ripping effect and therefore how likely it is that an ongoing economic advantage will be realized from the practice.

Acknowledgments

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