AgGrow AGRONOMY + RESEARCH

INCREASING YIELDS ON SANDY SOILS

Monia Gap trial 2012-2013

INDEPENDENT AGRONOMY ADVICE + CUTTING EDGE RESEARCH

INCREASING YIELDS ON SANDY SOILS

KEY POINTS

- Sandy soils consistently foster reduced crop growth, reduced biomass and subsequently reduced crop yield, especially in average or better seasons. This is magnified in no till farming systems which tend to minimise early crop vigour.

- Nitrogen status, in crop rainfall and consequent yield of the trial paddock was low in 2012.

- Yield responses and economic returns were gained in the trial on sandy soils and heavier soils from urea, chicken litter and tillage.

- Economic returns were not large, and in some cases may not be enough to offset the increased risk and cost of applying these techniques.

- The second year effect on NDVI from manure has been apparent in 2013. If the cost of the various treatments measured in this trial are offset over more than one year the risk is reduced and they become more viable options.

- Manures were less effective at increasing NDVI and yield in the no till treatments in year 1, however this effect seems to be reversing in year 2.

MONIA GAP - SANDY RISE TRIAL

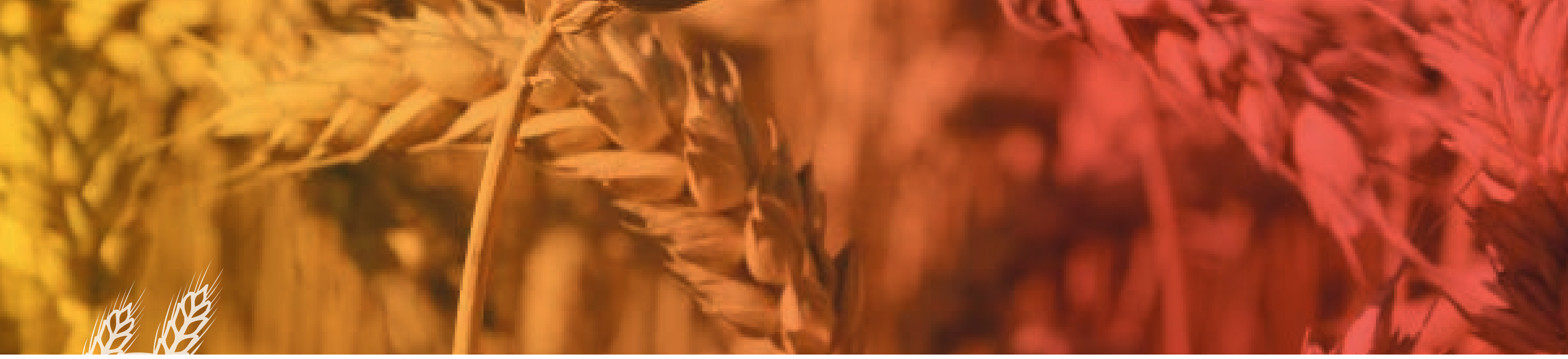
Overview

In the western cropping areas of southern NSW poor yielding sandy soil types are very common. These soil types often yield well below their potential, exhibiting limited crop vigour and often finishing the season with unused soil moisture (even in drought years). They consistently have very low nitrogen status (<0.1mg/kg NO_3 N) and often a low pH (<4.5 $CaCO_3$).

The challenge is to improve the overall productivity of these areas which has led to the question, ‘Do we spend money on these areas to try to increase yields or are the economics stacked against us?’ If the latter is the case we may be better off accepting these areas will be lower yielding and adjusting our inputs to a nutrient replacement philosophy.

A paddock scale demonstration trial was carried out in the Monia Gap area (NW of Griffith NSW) in the 2012 season to try to identify potential management options that may increase yield and profitability in paddocks that exhibit sandy soils.

2012 was a difficult season beginning with a dry summer, then widespread flooding in March. This allowed the soil profile to be filled prior to sowing. In crop rainfall from that point on was lower than average and only totalled about 100mm. The yearly total was 540mm. Temperatures were lower than average in Spring which helped during grainfill.



TRIAL LAYOUT

The paddock scale demonstration was carried out on “Greendale”, Monia Gap. The paddock chosen is 455ha and hosts some very light textured sandy rises and heavier red sandy loam flats. The paddock was split into 9 plots (figure 2) which accounted for individual treatments.

The trial was sown and managed by Jochim Jager, with litter and urea spread by a contractor 3-4 days pre-sowing.

All treatments had a standard rate of 50kg MAP with the seed at sowing.

The demonstration consisted of three fertiliser treatments including 100 kg/ha urea, 2 t/ha chicken litter and nil fertiliser; by three tillage treatments including no till, ripped and cultivated.

The no till treatments were managed as sprayed fallows with no cultivation, the ripped treatments had one cultivation with narrow points to a depth of 125mm and the cultivation treatments included a rip and one full cut cultivation with sweeps approximately one month after ripping.

Data recorded from the demonstration included NDVI imagery and yield data from headers, with data analysis conducted by Tim Neale from Precision Agriculture. Imagery was funded through the SPAA project which was managed by Central West Farming Systems.

RESULTS AND DISCUSSION

The trial paddock responded positively to a variety of cultivation and fertiliser treatments in the 2012 season. The trial, although not replicated and hence not statistically analysed, shows some useful trends.

Firstly, from figure 1 you can see the variability measured in NDVI in 2010 in the trial paddock. This was a very wet and high yielding year in the district, however this paddock underperformed. In this paddock, the lower NDVI was commonly in the sandy soils. This low NDVI was exacerbated by weed presence during the summer (as the paddock was only purchased in January and had little fallow weed control) and Trifluralin damage at sowing (which tended to be worse on the sands).

Secondly, from figure 2, you can see the impact of fertiliser and cultivation on NDVI. Cultivation and fertiliser increased NDVI. The more cultivation, the higher NDVI. The increased NDVI from cultivation may be due to a number of reasons. However, it is most likely due to extra mineralisation of soil nitrogen or the mixing of the topsoil, which broke down any physical or chemical barriers that may have impeded root development.

Urea had slightly higher NDVI than chook manure, suggesting a greater release of nitrogen/ha in year 1 with urea (graph 1). This was particularly the case in no till with chook manure, where the manure may not have been fully incorporated and available to the crop.

The yield data had a very close correlation with the NDVI image (graph 4), indicating that the yield increases from the different treatments were a direct result of increased biomass.

Thirdly, as a single year gross margin all treatments returned a positive return over and above of the control treatment of no till and nil fertiliser. The best return on investment was a rip with urea. This was closely followed by no till with urea. In a single year the return from cultivation and fertilisers was small in comparison to the amount of money invested, highlighting the risks associated with implementing the treatments tested in this trial. If positive responses to yield were apparent for a number of years, the risk is minimised.

This flow on effect can be seen in figure 5 where NDVI looks to be higher than the nil in the chook manure treatments, especially the no till. Remember that the least increase in NDVI across the chook manure treatments in 2012 was in no till, so we may be observing a larger amount of manure becoming available in 2013 in this treatment.

The trend of a second year increase in NDVI following chook manure is common, and is a valid justification of using chook manure over urea.

The demonstration trial will be continued to be monitored over the next two years. This will allow any flow on effects, especially from the fertiliser applied in 2012 to be observed. The chicken litter treatment will have the greatest potential for positive impacts over coming years.

Figure 1: An NDVI image taken in September 2010 highlighting the crop biomass variability attributed to sandy soils. This paddock dramatically underperformed in 2010, which was a very high yielding season.

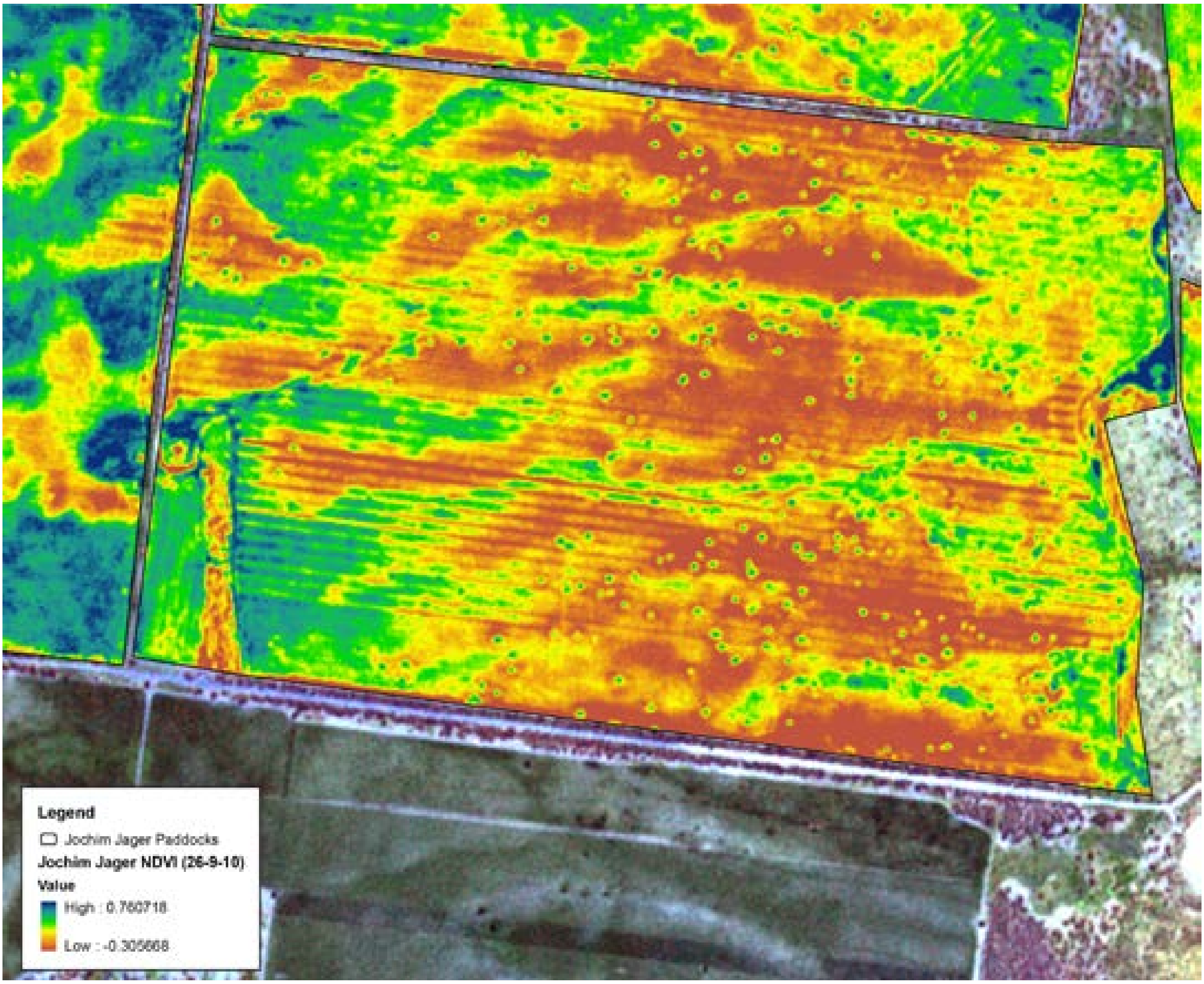


Figure 2: An NDVI image taken September 2012, including the trial plan overlayed.

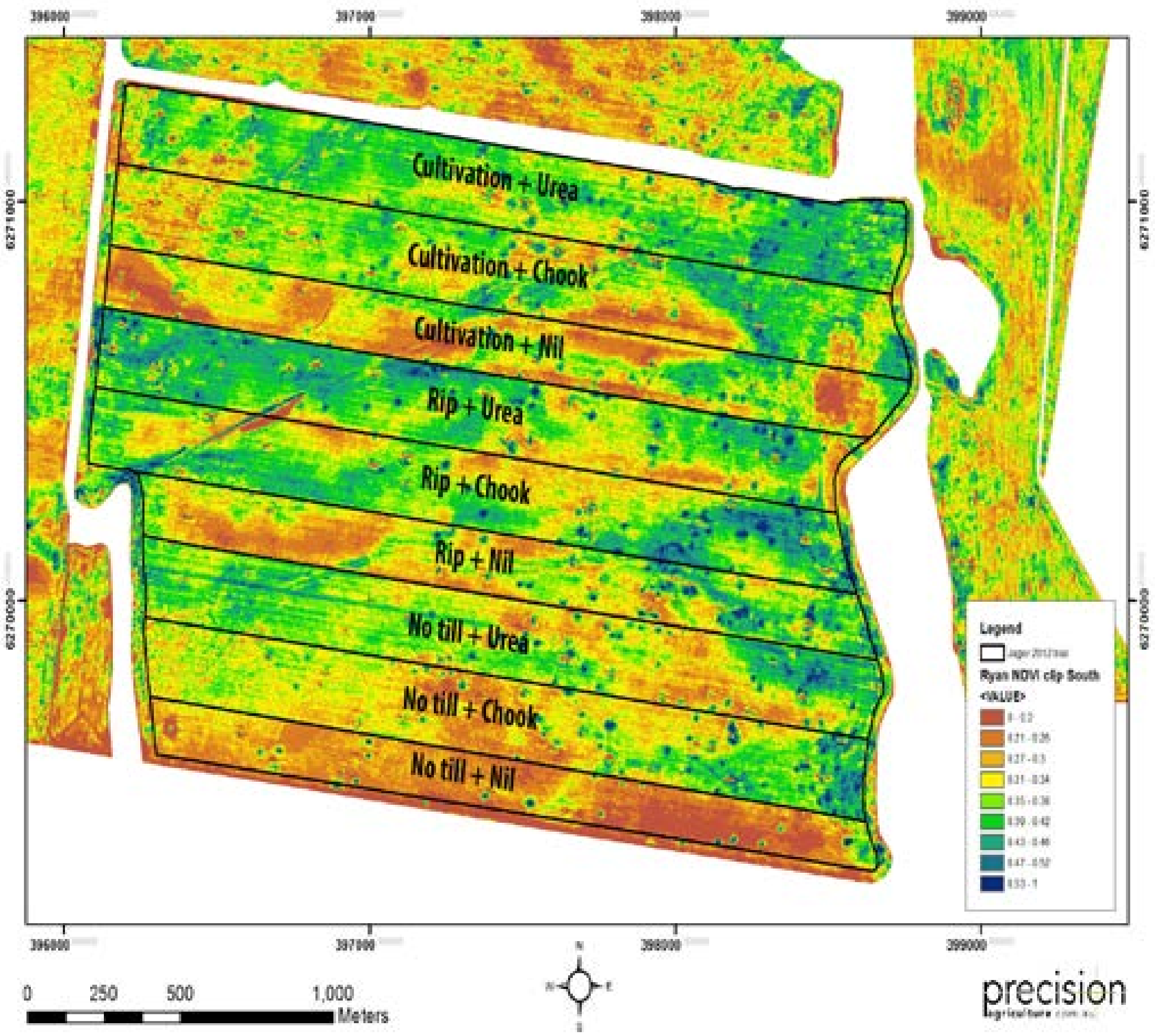


Figure 3: A close up view of the NDVI image in 2012 in the rip + chook manure treatment with the spreader path overlayed. You can see the double up effect of manure on NDVI.

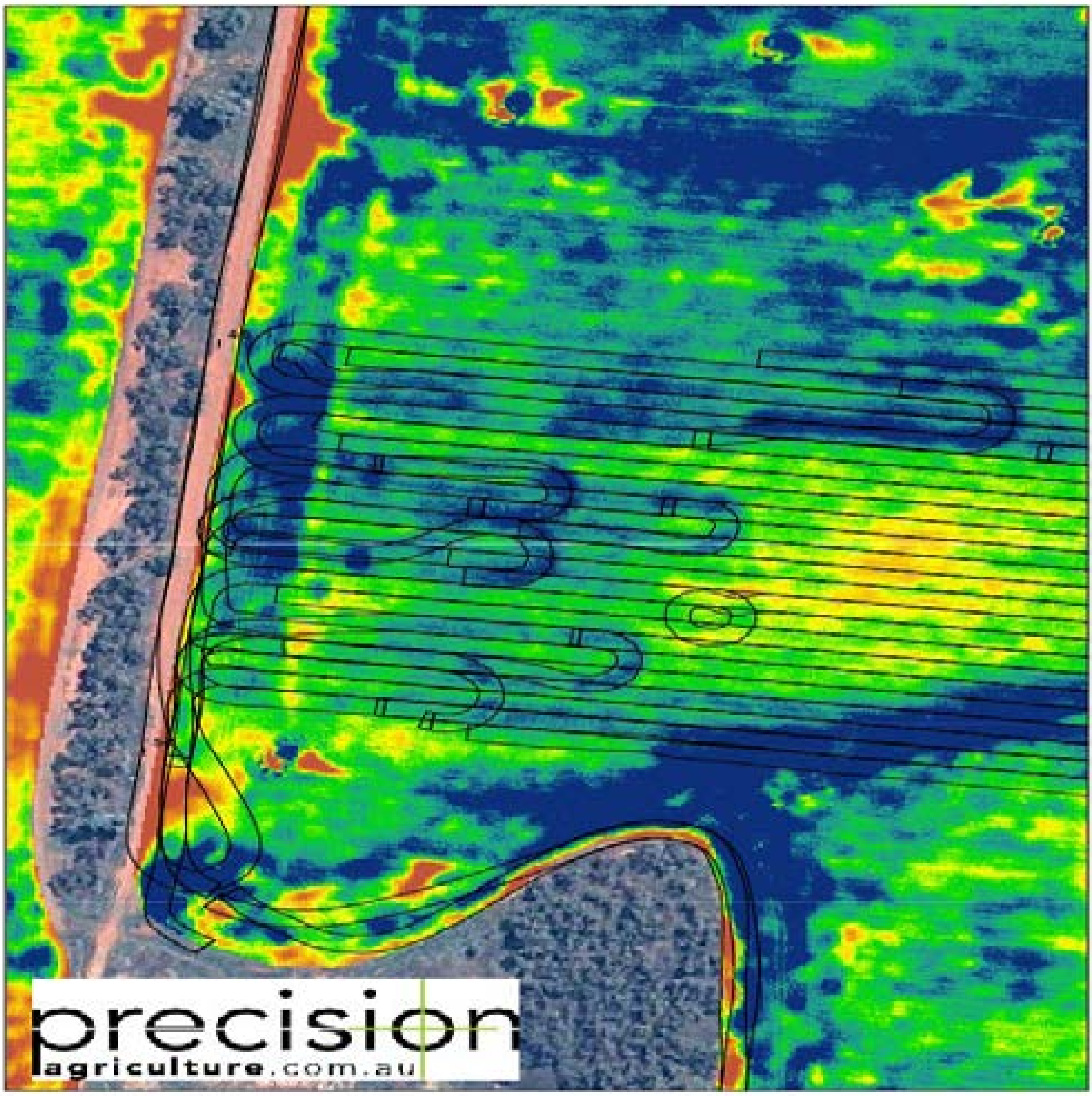


Figure 4: Harvest yield map of paddock in 2012.

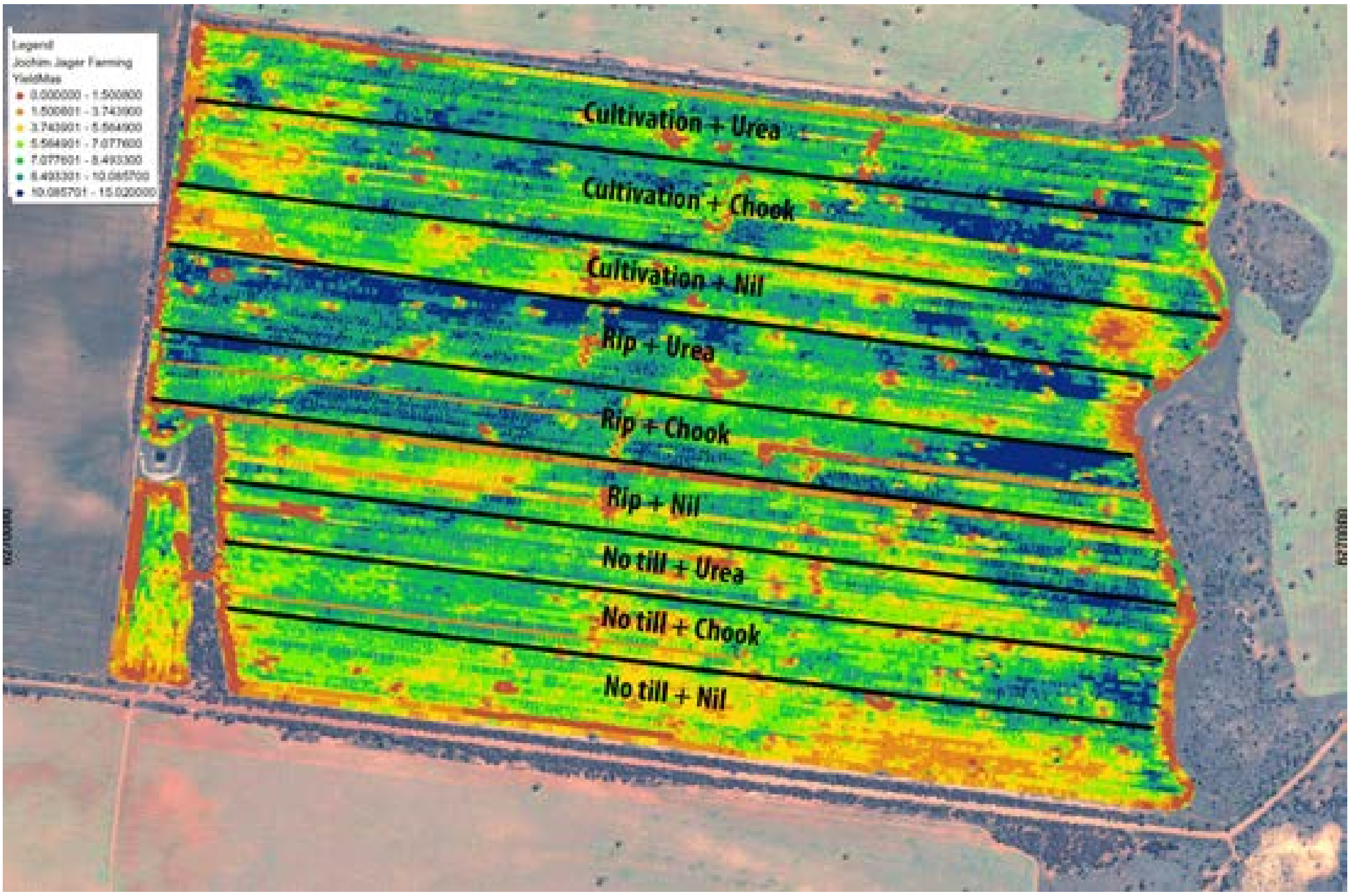
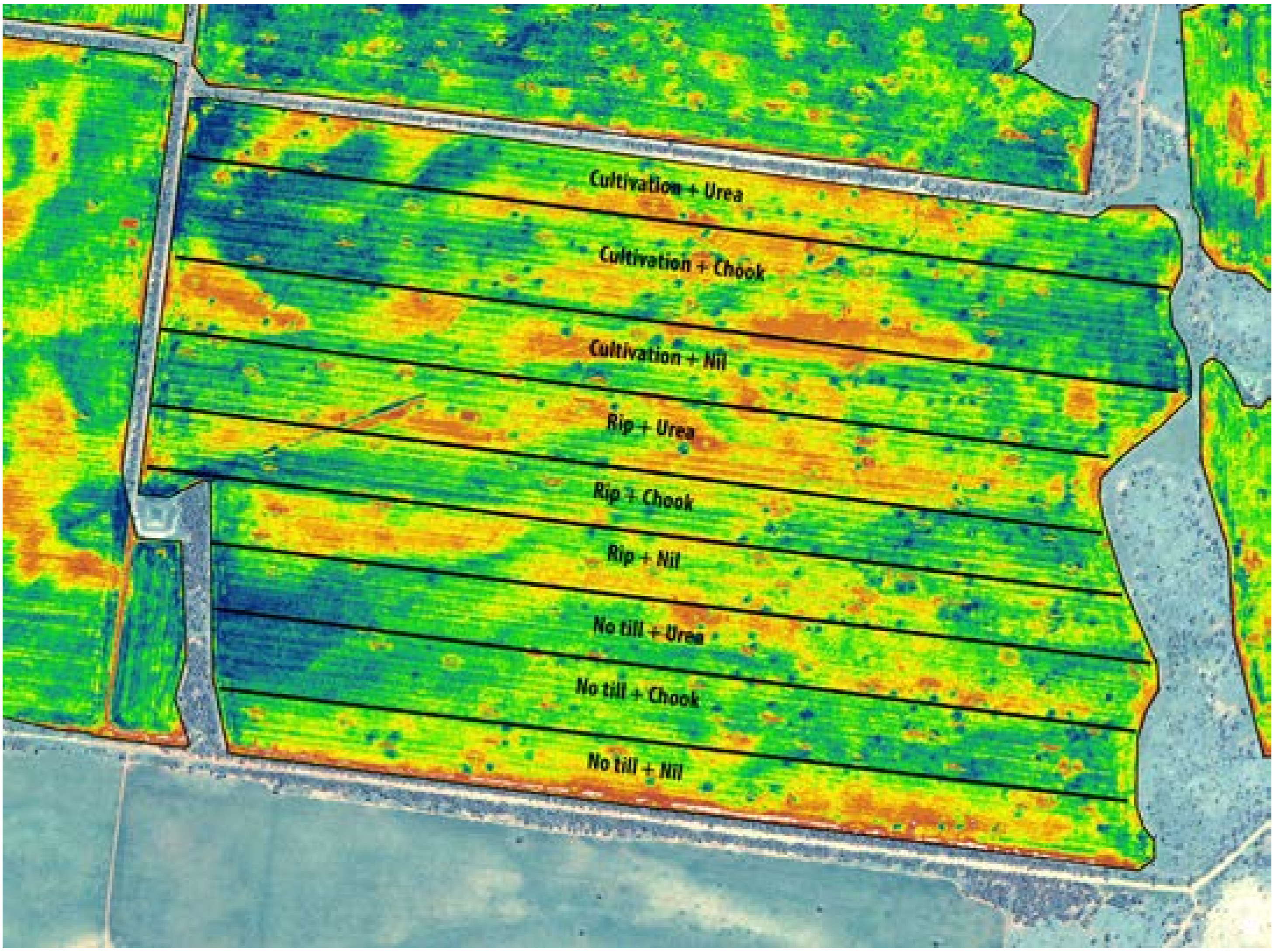
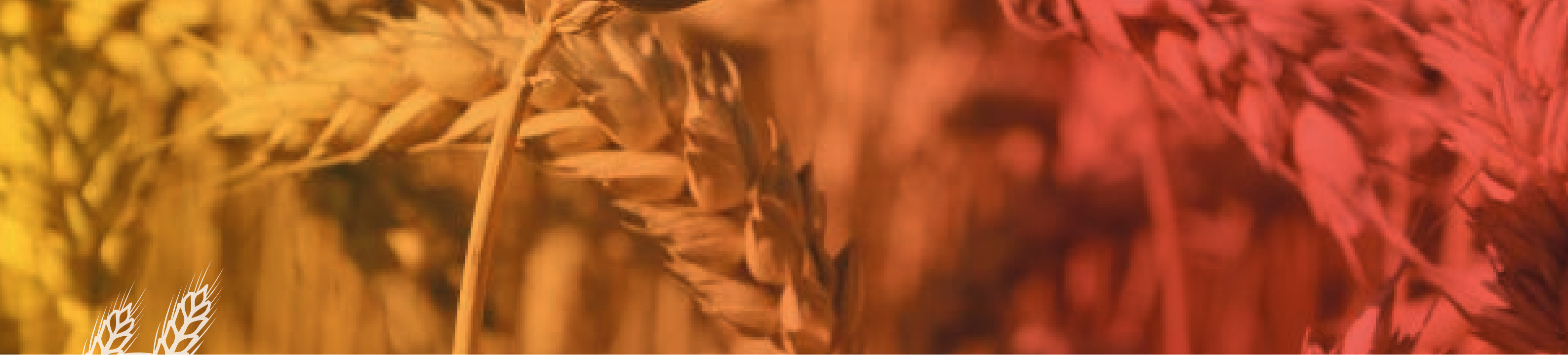
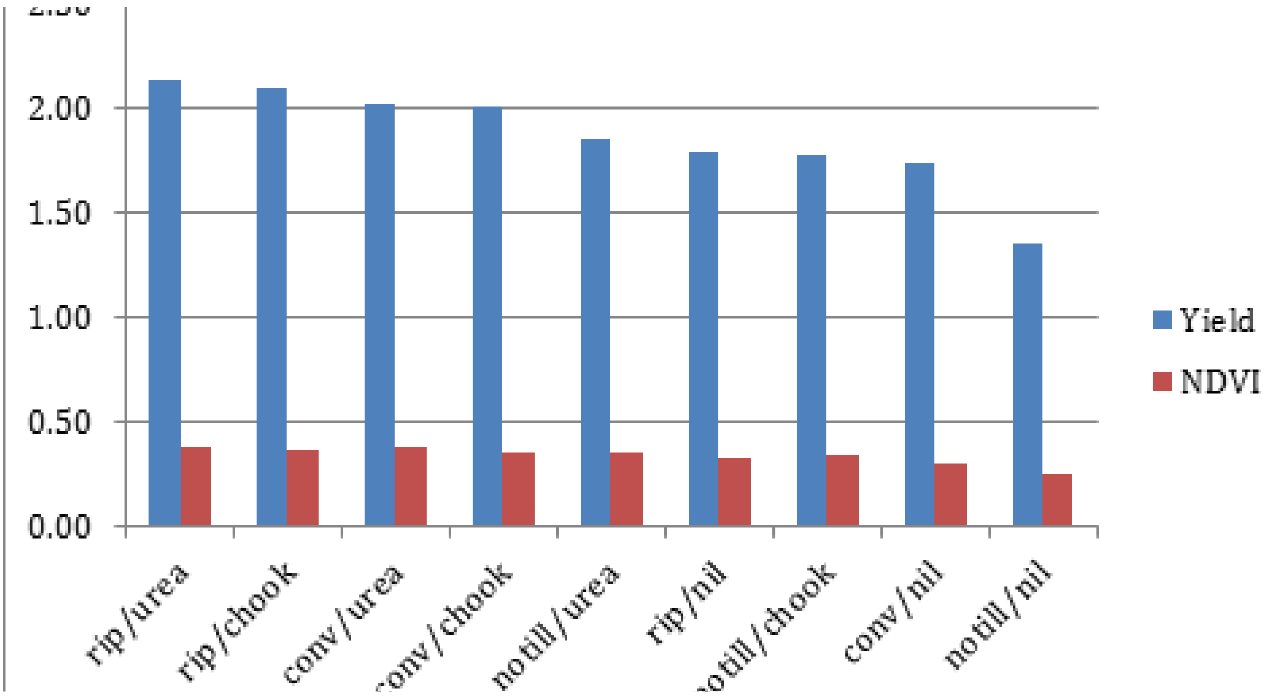


Figure 5: NDVI image of the paddock in September 2013.

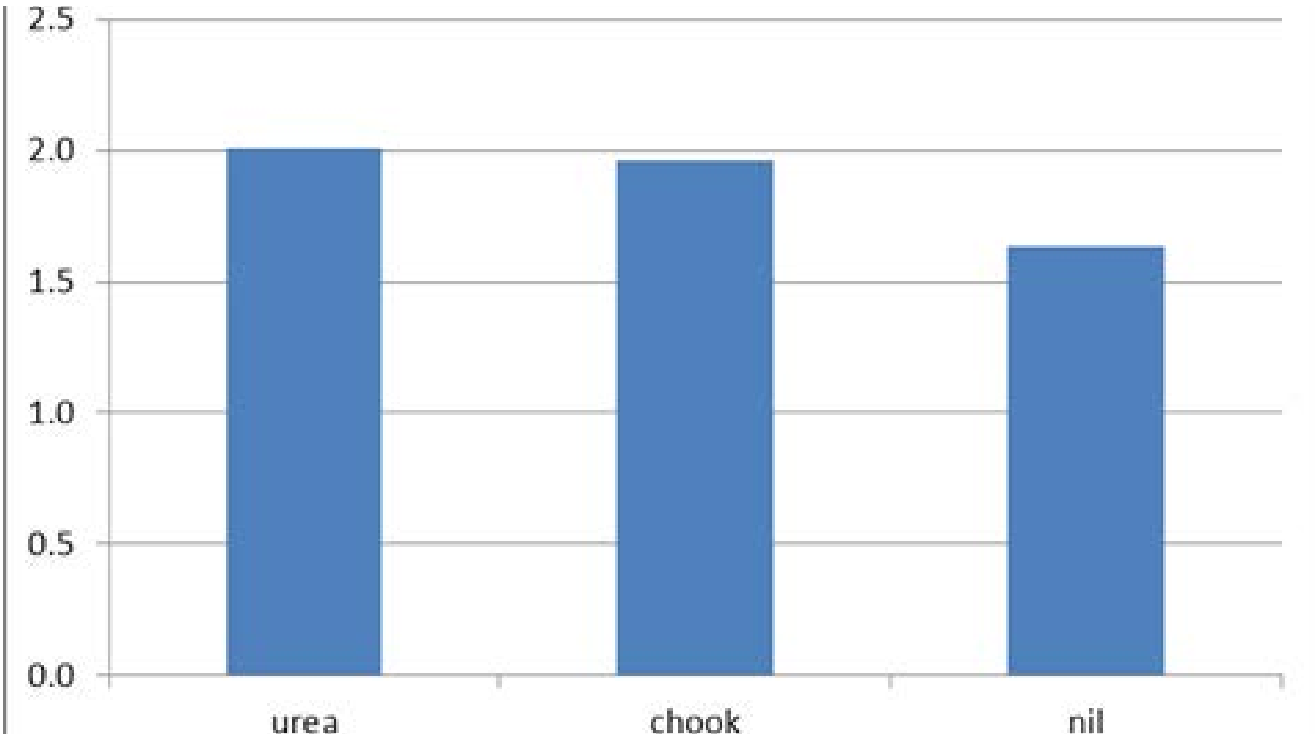


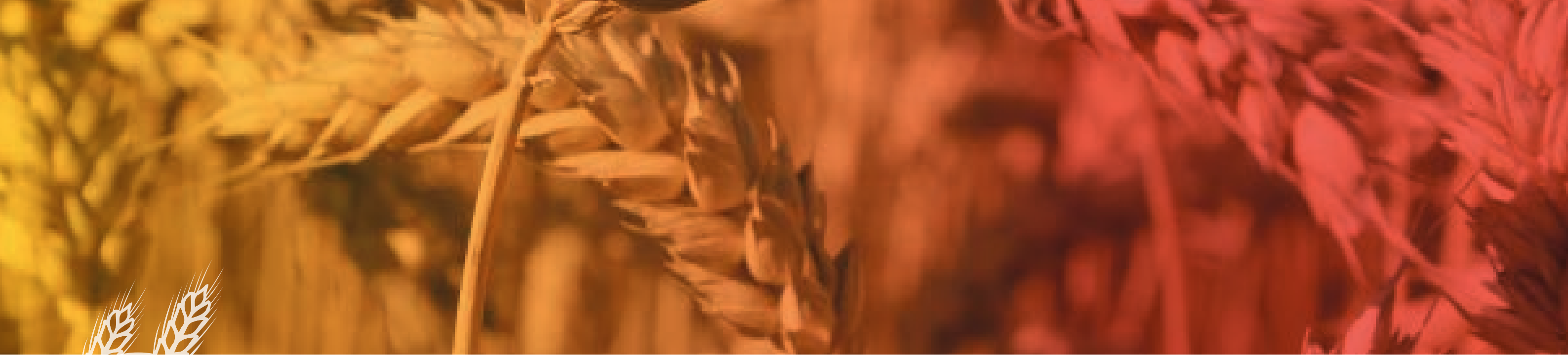


Graph 1 – Yield data from individual treatments



Graph 2 – Yield data from fertiliser treatments averaged across all tillage





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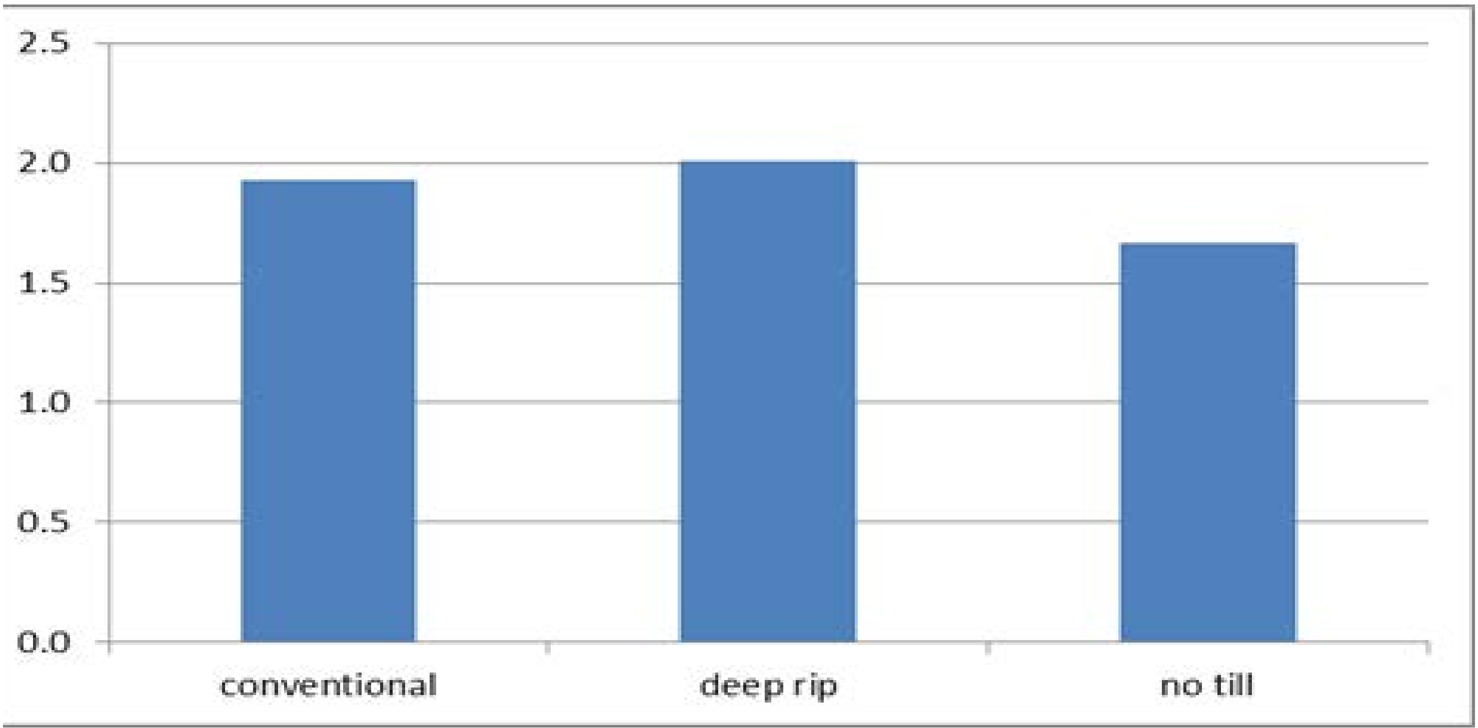
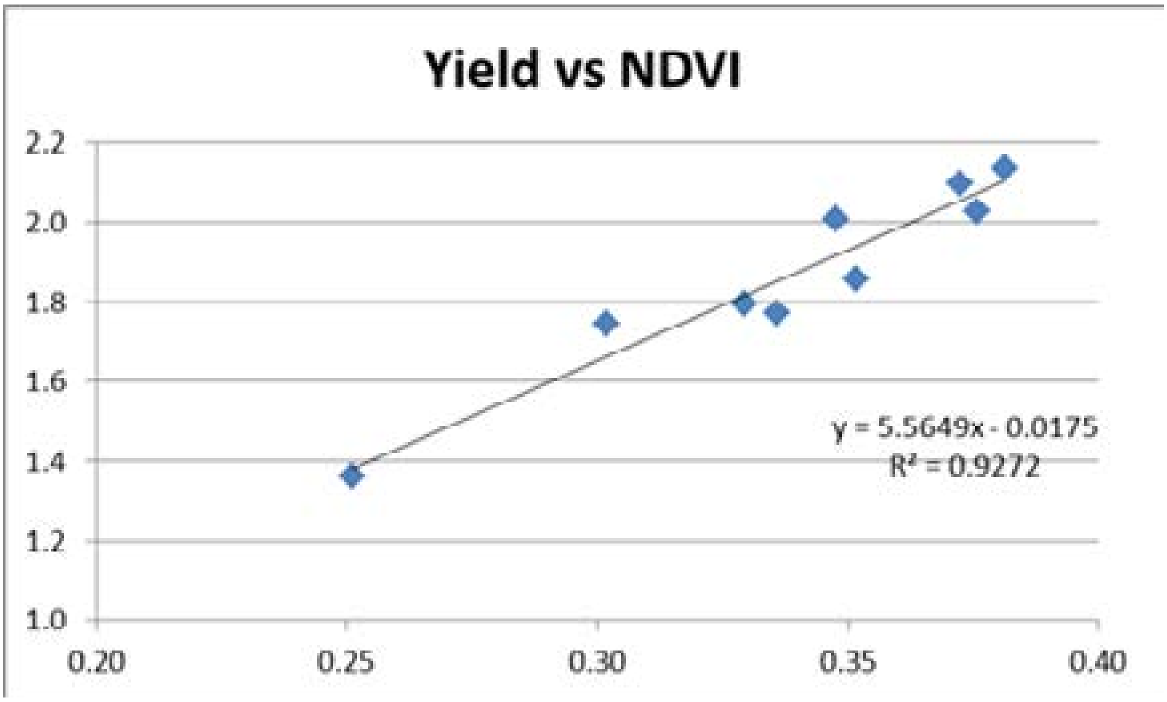
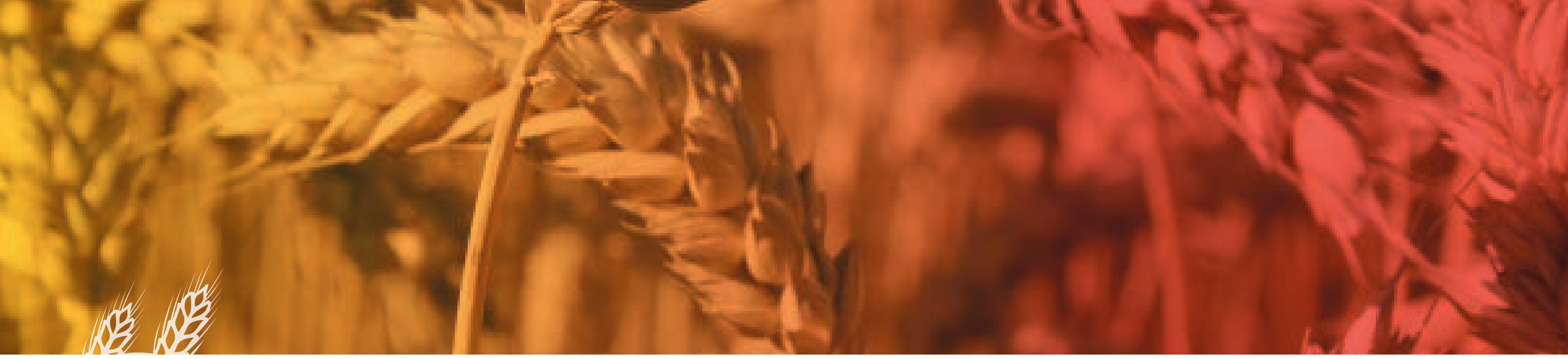


Graph 4 – Correlation of yield to NDVI





ECONOMIC ANALYSIS

The costs used in the economic analysis are summarised below in table 1. It includes input costs, application costs and costs of cultivation for each of the treatments.

Table 1: Economic analysis of each treatment compared to No till with Nil fertiliser.

Treatment	Tillage costs ($/ha)	Fertiliser ($/ha)	Spreading ($/ha)	Total Cost ($/ha)	Yield (t/ha)	Profit over nil ($/ha)	Profit Rank (1-9)
No Till - Nil	17.45	0	0	17.45	1.36	0	9
No Till - Urea	17.45	56.00	6.00	79.45	1.86	58.00	2
No Till - Chook	17.45	70.00	16.00	103.45	1.77	12.40	8
Rip - Nil	74.58	0	0	74.58	1.79	46.07	5
Rip - Urea	74.58	56.00	6.00	136.58	2.14	68.07	1
Rip - Chook	74.58	70.00	16.00	160.58	2.10	34.47	6
Cult - Nil	58.30	0	0	58.30	1.74	50.35	4
Cult - Urea	58.30	56.00	6.00	120.30	2.03	57.95	3
Cult - Chook	58.30	70.00	16.00	144.30	2.01	29.15	7

ACKNOWLEDGMENTS

This trial would not have been possible without the dedication of our farmer cooperator Jochim Jagar, and his agronomist Mat Ryan (Ag Grow Agronomy and Research).

We would also like to acknowledge the financial input from Central West Farming Systems through the SPAA project for funding the imagery in 2012.

Also the technical support and data analysis from Tim Neale, Precicision Agriculture.

CWFS Central West Farming Systems Inc.