Increasing economic returns of agronomic management using precision agriculture

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Just south of the Hart Field Trial site Glen and Robert Wandel farm on the property Firgrave. In 2008 paddock No 5 was sown to wheat. At the end of what was a drier season a yield map (fig 1 – see last page of this article) was created from the paddock.

The paddock averaged 2.87t/ha but had yield ranging from 1.8t/ha up to 4.18t/ha. The paddock had consistent management across the yield ranges, thus creating a large variation in gross margin.

This raises questions about the variation in yield; first what is causing it? Can I fix it? Or can I manage my risk to it?

Firgrave is one of 5 locations across SA that have an area of the farm participating in a 3 year SAGIT funded project. 'Increasing economic returns of agronomic management using Precision Agriculture'. This project aims to improve the use of modern technology in identifying and managing paddock variation, with the overall outcome being improved management and gross margins for the farmers.

The initial key opportunities that will be targeted with the project on Firgrave are seeding and post nitrogen, phosphorus fertiliser, soil amelioration for sodicity and targeting ryegrass areas.

What has happened to date?

The initial stages of the project have been targeted at gathering information. This has included grain yield, elevation and soil surveys.

Mapping the Soil

Two types of soil sensors have been used to help us map the changes in soil conditions over the paddocks including Electro Magnetic (EM) and Gamma Radiometrics. The maps created show where the soil profile changes but to really understand what the crop sees when it is searching for moisture, deep cores have been collected and analysed.

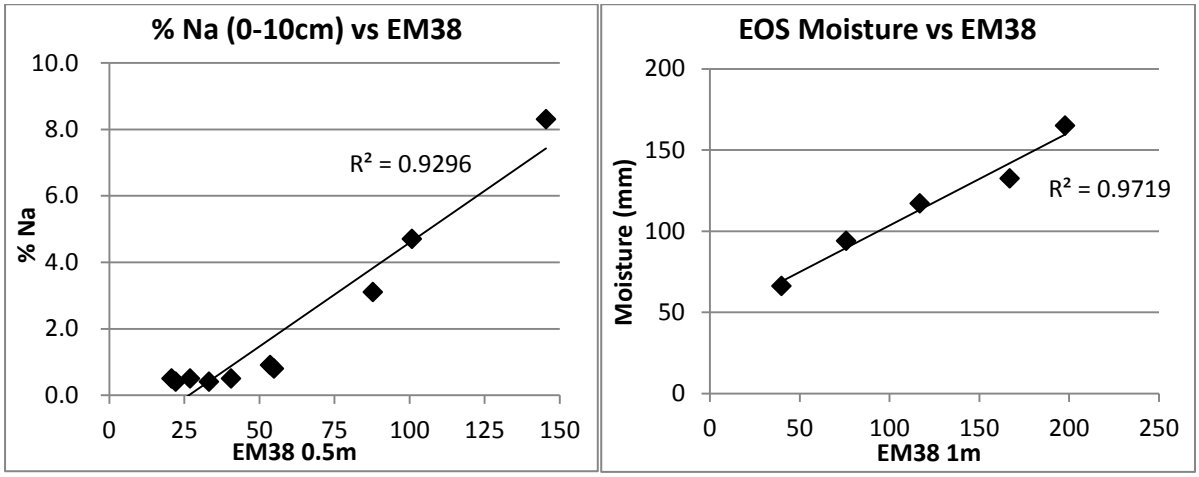
Water movement

RTK GPS elevation information has also been used to map where water can potentially move across each paddock as there will be differences in how long water has to infiltrate into the profile and store there for the crop to use.

How does this relate to yield

Historical yield maps have been analysed against the soil sensor and topography maps to assess how well they are related, then the soil core information used to identify the actual cause and what potential management changes can be made. Figure 2 (see last page of this article) is an example of an outcome from comparing the maps of soil change to the wheat yield map from 2008. It is suggesting a trend that as the EM map value increase the amount of yield produced declines.

To understand why the EM is affecting yield we need to look closely at the soil test results, the two factors most strongly following the EM are salinity and sodicity. Both these factors affect a plants ability to extract moisture from the soil, as can be seen by the end of season moistures collected in November 2011.



What are the next steps?

The main agronomic issues to be assessed in 2012 are:

- Targeting of seeding and post seeding nitrogen applications in line with identified changes in soil water characteristics ie changes in the 'bucket'
- Assessment of gypsum applications over soil zones identified as having variations in sodicity levels. A trial has already been implemented which will allow economic assessment for several years.
- Sound agronomic and economic phosphorus fertiliser management in line with changes in productive capacity of soil zones and responsiveness of soil types to phosphorus applications.

Further information

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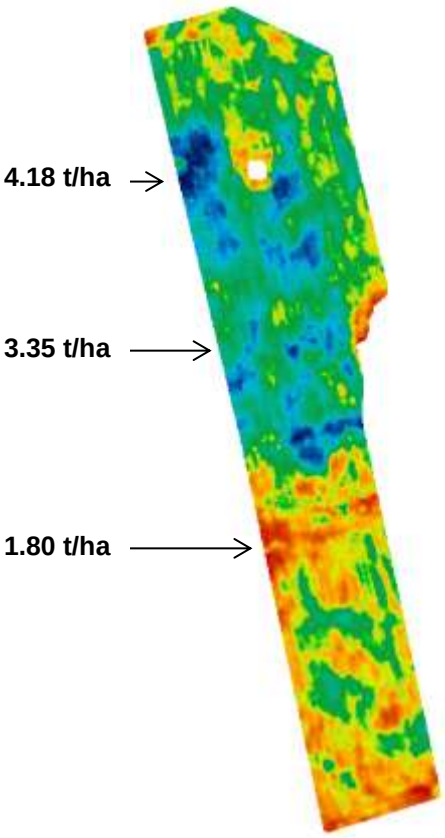

Figure 1. Wheat yield from 2008 season showing low and higher yielding areas within paddock No 5.

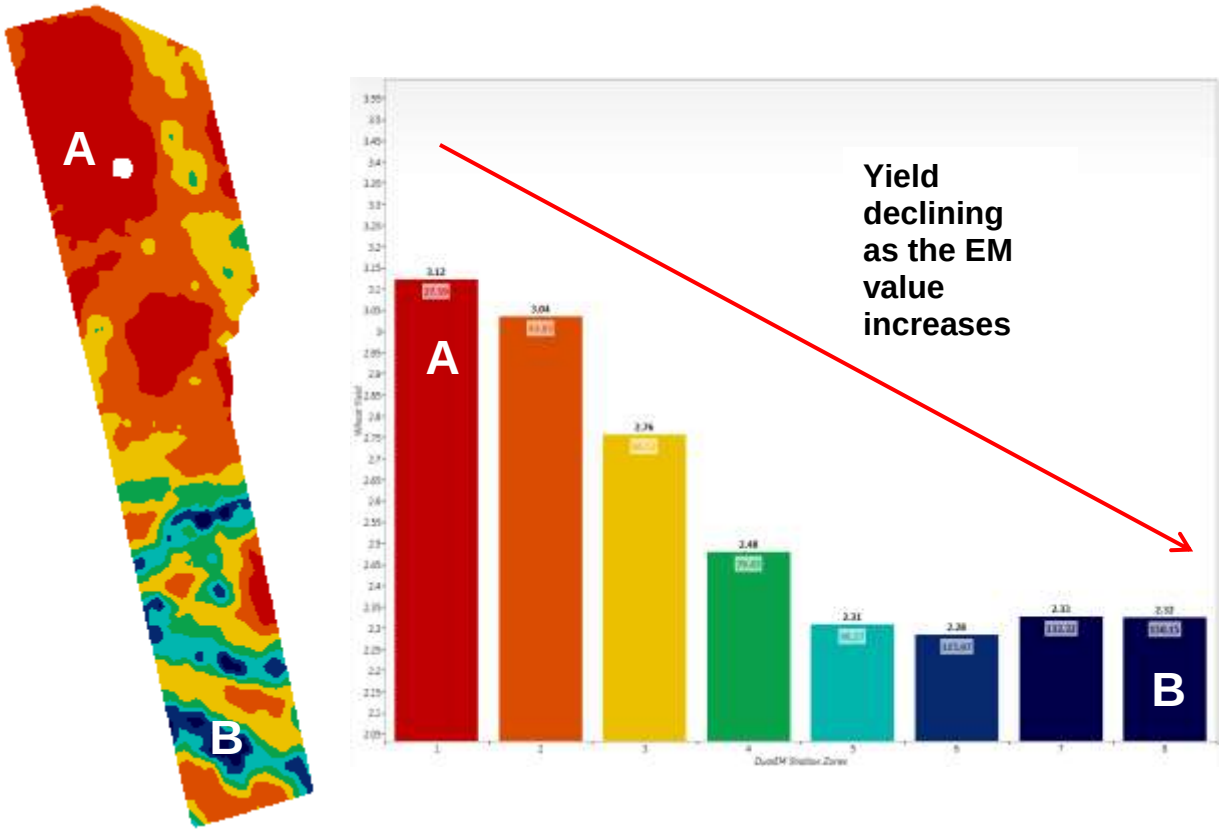

Figure 2. 'A' is a low EM area with highest wheat yield 2008, 'B' is a high EM area with lowest wheat yield.