Increasing economic returns of agronomic management using precision agriculture

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Key findings

- EM38 successfully mapped differences in soil water properties across the paddock.
- Positive response to fertiliser in wheat on wheat and higher yielding season.
- Barley yield decreased with increasing rates of nitrogen and phosphorus fertiliser.

Soil Moisture and EM38

Targeted soil moisture sampling at the end of 2011 illustrated a strong correlation between crop lower limit and EM38. Sampling was repeated in August 2012 and July 2013 when reasonable levels of rainfall should have filled the profile through to 80 cm. As seen in Figure 1, the soil was at field capacity a month earlier in 2013 due to a wet winter.

This highlights the potential to use EM38 to create long term management zones based on soil water characteristics and for in-season nitrogen (N) applications to become much more targeted, especially late in the season.

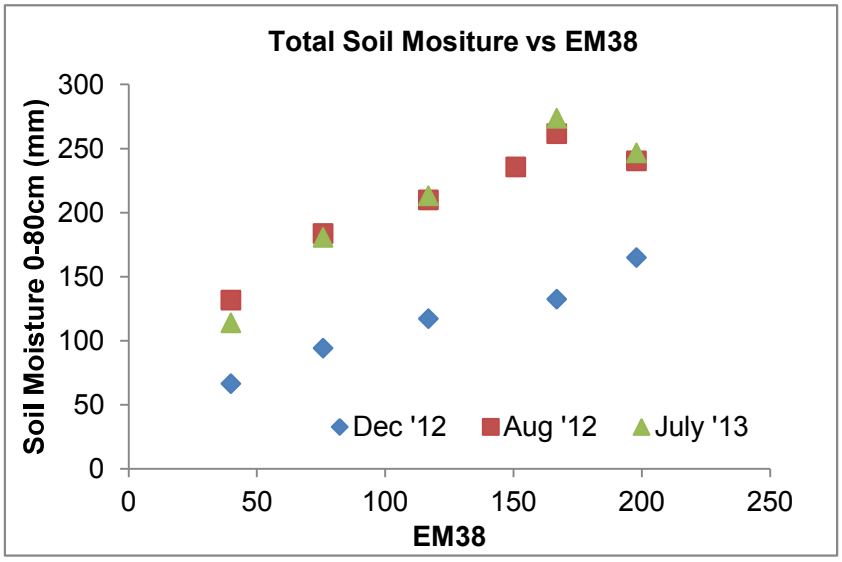

Figure 1. Total soil moisture versus EM38 at different sampling points from August 2012 to July 2013.

Barley and wheat trials, 2013

In the trials higher fertiliser rates reduced the grain yield of Fleet barley (Figure 2a). This decline in yield with fertiliser rate increased as the soil texture got heavier and with higher subsoil constraints (ie higher EM values). This is likely due to higher dry matter prodcution in treatments with additional fertiliser, which could not be converted to grain yield due to the warm and dry finish in 2013.

In Figure 2b there was a positve result (0.4 t/ha, 8% increase) to fertiliser, which might be due to the paddock being wheat on wheat. The highest response was in the lowest EM zone, which fits with the soil water findings that show the lowest EM has the lowest constraints. In the medium and high EM zones there was little difference between the fertiliser rates for wheat (Figure 2b).

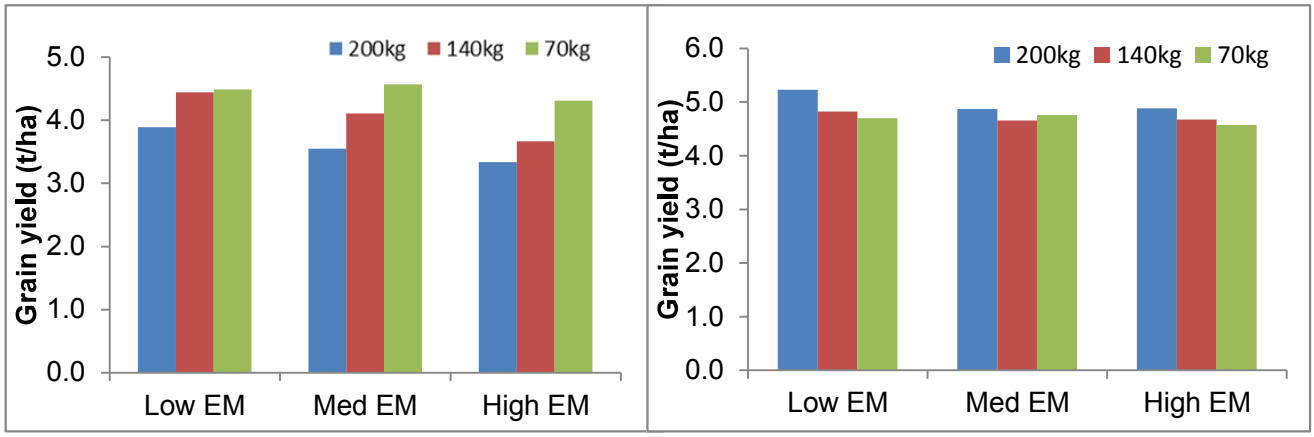

Figure 2. Response of Fleet barley (a) and Mace wheat (b) to increased fertiliser applications (28:12 DAP Urea blend) in low (30), medium (53) and high (94) EM zones.

Conclusions

Wheat responded to addition nitrogen and phosphorus fertiliser, where there were low soil constraints. The grain yield increase in each zone to higher rates of fertiliser is likely due to the paddock being wheat on wheat and starting with lower soil nutrient levels ie. nitrogen. For the barley the opposite trend was seen where there was a negative correlation between grain yield and fertiliser rate.

From a risk management point of view larger benefits are likely to be gained from extra fertiliser in areas with lower EM soils. Past trial work by our group has shown that in wetter springs the higher EM soils tend to look after themselves, due to a buildup of residual nutrition.

Contacts

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