Using Sensors to Improve Crop Management

James Hassall

Grain Grower

Precision Ag Specialist

IMAG Consulting

'Kiewa' Gilgandra NSW 2827

P 02 6848 8214

M 0428 488214

E j.hassall@bigpond.com

www.imag.net.au

Key Messages

Precision Ag Sensors give farmers the opportunity to experiment with different crop treatments and monitor their overall and spatial influence. The aim is to determine those factors that are 'Yield Limiting', ie. preventing the crop from reaching its true potential.

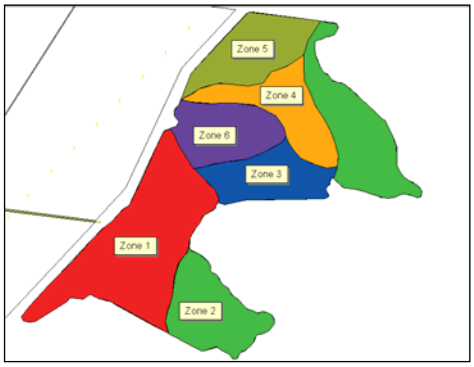
Introduction

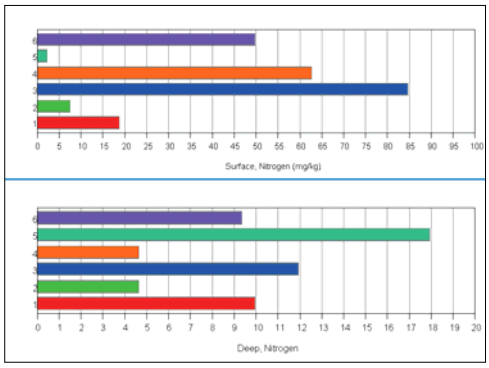
While traditional soil testing is useful for predicting reasonably stable soil traits such as pH, CEC and Phosphorus levels, it is far less reliable at accurately determining the levels and spatial variability of more dynamic nutrients such as Nitrogen. Recent experience with a range of Precision Ag sensors, which generate Yield, Protein and NDVI maps, has given me a greater appreciation for the spatial variability of soil nitrate and allowed me to experiment with different techniques for managing this variability. This forms part of my overall Precision Ag strategy of using different treatment strips, placed across an entire field, in conjunction with a range of Precision Ag tools to help determine which factors are limiting peak crop performance.

Overview

1. My current cropping system, rotations, seed placement.
    - 2000 ha of predominantly winter crop.
    - Main crops include Wheat, Canola, Barley, Chickpeas, Triticale, Lupins
    - Four year rotation: 1. Wheat, 2. Canola, 3. Barley or Wheat, 4. Pulse
    - Canola and Pulse crop planted *between* previous years cereal stubble.
    - Cereals planted *on top* of previous year's pulse or canola row.
    - Autofarm RTK Autosteer, 1.8m Tramlines, 30ft AFM Direct Drill Seeder
    - 30ft John Deere harvester with Yield Mapping and Zeltex Protein Mapping
    - Ntech Greenseeker RT200, 6 NDVI sensors with VR capability.
    - 2000 –Yield Mapping, 2004 – Protein Mapping, 2006 – NDVI Mapping.

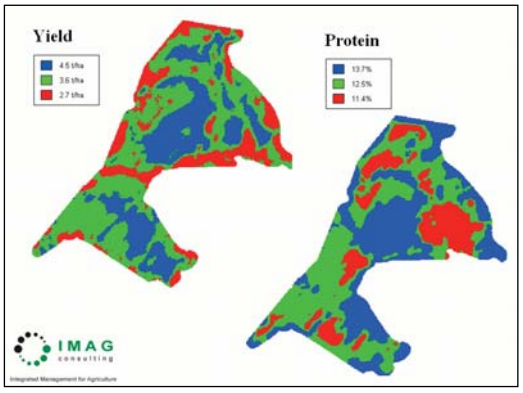
2. Soil Nitrate levels in different zones derived using crop yield and soil EM maps.





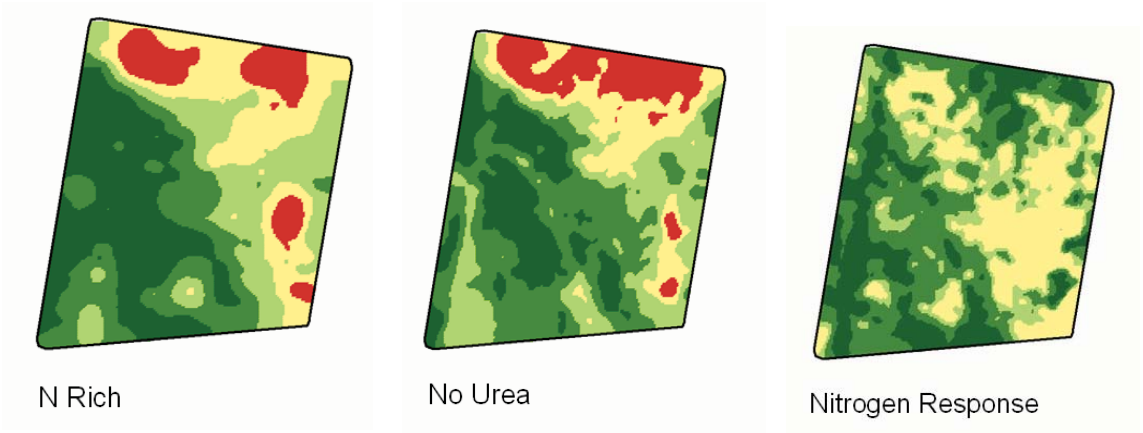
- Huge variability in soil nitrate levels across a field, how accurate can a soil test consisting of a few 'random' cores be?

3. Crop Yield and Protein Maps
   - The addition of a protein map can highlight different field dynamics.
   - Areas of very low and very high protein can help explain what's influencing the yield map.



4. NDVI – In farmer speak, what is it, what is it really measuring.
    - NDVI just a measure of chlorophyll.
    - Influenced by the number of leaves and the chlorophyll in each leaf.
    - Measure's total chlorophyll, crop and weeds!

5. Nitrogen Rich Strips as a means of generating a Nitrogen Response Map
    - Pre-drill strips across paddock with high rates of Urea. Nitrogen won't be the limiting factor to crop performance in these strips.
    - Compare the NDVI readings from these strips with the rest of the paddock.



6. Applied nitrogen persistence in different soil types.
    - If the applied nitrogen is not used by the current crop due to drought, frost etc. is there any left over for the next years crop?
    - Tends to persist for longer in heaver soils and will usually leach out of lighter soils if there is any significant rainfall over the summer fallow period.

7. A proposed strategy for better managing crop nitrogen inputs.
    - Look at applying nitrogen where it is likely to be most efficiently utilized.
    - Initially put more on heavier soils at sowing as we know that;
        i. Crop more likely to be bigger and hungrier there.
        ii. Less likely to lose the nitrogen if the crop doesn't utilize it all.
    - Monitor crop development using NDVI sensors and N-Rich strips.
        i. Assess wether the crop will respond to additional nitrogen in crop
        ii. Apply according to crop needs, soil moisture availability and seasonal outlook.
        iii. Actual rate doesn't necessarily need to be 'exact', more important to put it where it will be most efficiently utilized.

8. Farm trials as a means of better understanding true crop potential and the factors that may be currently preventing our crops from reaching it.

Conclusion

Current Crop Scanning Technology gives farmers and agronomists the opportunity to monitor crop development and with the use of 'alternative treatment strips' gain a better understanding of the crop's limiting factors and variability across their particular property.

This presentation has focused primarily on Nitrogen, but the idea can be expanded to include a whole range of traditional, and not so traditional, crop management techniques. Every farm and field is unique, not only due to differences in soil type and climate, but also due to current and historical management practices. Farmers need to determine what is driving *their crop's* productivity in *their soil* as it stands today. Crop Scanning Technology provides farmers with the tools to easily and accurately do just that.