Crop Sensors and High Yielding Cereal Crops – A Tool for Better Nitrogen Management?

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The following summary is an updated version of a conference paper first presented in Australia in February 2008. The results presented are from a GRDC funded project (SFS 00015) on disease and canopy management in cereals taking place in southern Australia and an agribusiness extension project on canopy management which took place in NSW. These are joint projects linking the Australian farmer groups (lead group Southern Farming Systems) with the New Zealand levy organisation FAR and in northern NSW Agvance Agriculture and the Eastern Farming Systems group.

This work has led to an investment in crop sensor research in New Zealand to assess whether the management of larger, higher yielding crop canopies can be improved with the use of the same technology.

KEY SUMMARY POINTS

Crop sensors, measuring the reflectance from the cereal crop canopy, may offer a better opportunity of matching crop needs to nitrogen input, when combined with GPS technology.

- Early Australian trials in wheat have shown good correlations between crop structure scores, such as tillers, and crop reflectance readings NDVI (normalised difference vegetative index) when assessed at early stem elongation (GS30-31).
- At the same growth stage, initial work, comparing the reflectance of nitrogen rich strips (plots receiving nitrogen at planting) with zero N control plots, has revealed that these reference points could be a guide to the likelihood of a nitrogen response.
- Trial work has also demonstrated that crop sensors (GreenSeeker® in these trials) could have use as a research tool to quantify differences in green leaf retention during flowering and grain fill.
- In work in NSW the correlations between NDVI readings at flowering and final yield have been better than dry matter readings taken at the same time. This result appears to be linked to the ability to differentiate biomass that is actively photosynthesising as opposed to total biomass.
- There are number of issues that need to be clarified if NDVI readings are to be used commercially as a basis for nitrogen application, for example the documented lack of correlation to canopy size above a Green Area Index (GAI) of three, means that in high yielding crops (Australian HRZ or New Zealand) NDVI may not be a reliable guide for nitrogen application later in stem elongation.
- Another issue is the possible need for different NDVI algorithms for different varieties and the ground truthing to ensure that variations in canopy biomass are linked to nitrogen, as opposed to other agronomic factors.
- Despite these drawbacks initial FAR work carried out in New Zealand, illustrated that NDVI measurements taken with the GreenSeeker® at late booting (GS45-49) (when canopies were frequently in excess of GAI four), gave very good correlations to final yield taken three months later at harvest.
- The use of crop sensor derived information, such as NDVI, combined with GPS could be a powerful tool for applying variable rate inputs on the “visual” basis of crop need.