Guided by the crop

Mark Branson – Stockport, SA

Mark and Nola Branson together with parents Deane and Jennifer farm 1200 hectares near Stockport, in the mid North of SA. Each year approximately 80% of the land is cropped to canola, wheat, faba beans, peas, durum wheat and malting barley. The remainder is sown to pasture for the self-replacing Merino and prime lamb flocks. Average growing season rainfall is 350mm and the average wheat yield is 4t/ha. But Mark tries to avoid talking about averages as soils range from red brown earths to heavy cracking clays, topography is undulating and rainfall across the farm can vary significantly.

My first on farm experience with GreenSeeker was this year, 2006, when I used a hand held GreenSeeker RT100.

During my Nuffield Scholarship in 2005, I looked at several different scanning options but GreenSeeker was the most commercially advanced; I was keen to experiment with it on my own crops.

My interest in understanding the real rather than predicted relationship between soil available nitrogen (N) and crop nitrogen status was triggered by my frustration with nitrogen calculators. The nitrogen mineralisation calculations used in these tend to over or underestimate my nitrogen fertiliser requirement.

In August this year, I sponsored Brenda Tubana from Oklahoma State University to run a GreenSeeker workshop at my farm. The hand held GreenSeeker was provided as part of that package. The workshop was a great opportunity for other growers to gain first hand experience of GreenSeeker.

I used GreenSeeker to indicate the crop's nitrogen status, and to calculate its nitrogen requirement.

Performance

Before the workshop I scanned all my wheat, barley and canola crops. I wanted to see what differences in soil nitrogen uptake existed between a 30m by 100m nitrogen rich area, created in each paddock by applying 200kg N/ha on the 9th of July, and the rest of the paddock.

I used GreenSeeker to indicate the crop's nitrogen status, and to calculate its nitrogen requirement.

The GreenSeeker calculates the crops NDVI and infers that low values are due to N deficiency and high values due to sufficiency.

I am very pleased with the results from the sensor. Clear differences were recorded between the N-rich strip and the 30m by 100m area of crop scanned adjacent to the N-rich strip (See Table 1). These differences where not obvious when I visually inspected the crop at late tillering, except in Jumbo's where the crop was showing early signs of nitrogen deficiency, when compared to the nitrogen rich strip.

The N recommendations generated by the GreenSeeker software were generally small and due to the dry season no nitrogen applications were made.

Hitches and glitches

Initially, I had problems trying to use the sensor and its software as the

Table 1 Mark Branson's wheat crops scanned on the 3rd August, only the crop in Jumbo's showed any visual signs of N deficiency.

Paddock	Days from sowing	N Rich NVDI	Standard NVDI	Max yield (kg/ha)	N rate rec.
Jumbos	65	0.474	0.377	4200	42
Barr	75	0.76	0.65	4800	35
Barn	73	0.637	0.592	4000	14
TamFm	72	0.68	0.66	4100	5

manual was not written very well; after a few brief phone calls these problems were overcome. There was a problem at the start with the handheld computer not reading the software but after rebooting the handheld computer this has not been a problem.

I am using the software that comes with the GreenSeeker and have not had any problems, so far. Next year I will attempt to use it with the ZYNX computer for variable rate work and will see if there are any compatibility problems. At the moment I am using NTech Capture for collecting basic NVDI data and RT Mapper for Geo-referenced NVDI mapping. This data is able to be transferred into Fairport's Farmstar software.

Where to from here?

I am keen to use crop sensing to identify areas of high biomass, to map these and then carryout paddock checks to see if areas of high biomass are in reality high density pockets of ryegrass. If this works, this information would provide the basis for variable rate herbicide application and sowing rates.

I believe the collection of NDVI data could be of great benefit in the paddock choice for and nutrient management of malting barley, and for early post nitrogen applications according to how the canopy is developing during tillering.

I am definitely in the market for this type of sensor and am looking for the one with the best optics and that will work with my fertiliser boom. From my experience, the Crop Circle sensor seems to be a better sensor than the GreenSeeker but at this stage does not have the agronomic development of the GreenSeeker.

I am investigating the use of satellite and aerial NVDI collection across a whole paddock. My aim is to see if there is potential to use these relatively cheap sources of NVDI data as a basis for calculating variable rate nitrogen. I will use the handheld sensor to verify the data. To use these other sources of NDVI data with the GreenSeeker software I will need to create baseline nitrogen data for the soils and environments on my farm.

For more information

http://nue.okstate.edu/CCA_2005/Australia_Workshop2006.htm

Phil Longmire – Esperance, WA

Phil and Belinda Longmire crop 4500 hectares of their 8500 hectare farm northeast of Esperance, WA, with the remainder under pasture. The Longmires have farmed the property for 18 years, as part of a family operation with Phil's parents, Ian and Chris. The family crops barley, wheat, pulses and canola, grow pastures and run 10,000 Dohne and Merino sheep. This is medium rainfall cropping country with an annual rainfall of 425mm and a growing season rainfall of 325mm, resulting in an average wheat yield of 2.6t/ha.

I wanted to be able to identify variability that I could not see by looking at the crop and then tissue testing to establish if there was a nutrient deficiency in these areas. Having seen the GreenSeeker system being used effectively on a farm in North Dakota, USA, for VRT nitrogen application and crop mapping, I was keen to test the system on our own crops.

From the NDVI map we calculated that approximately 15% of the paddock is highly manganese deficient.

Performance

In 2006 a GreenSeeker scanner was made available for use in our area through Leighton Wilksch, Landmark, SA. It consisted of a single sensor, fitted to the back of a ute and driven across the whole paddock following our autosteer lines. From the data a NDVI map was created. We have also been looking at the Crop Circle sensor from Holland Scientific, Nebraska.

We scanned 180 hectares of hard wheat at mid tillering. Tissue testing plants from areas of low NDVI, as indicated by the GreenSeeker, has highlighted that manganese is the most limiting nutrient. From the NDVI map we have calculated that approximately 15% of the paddock is highly manganese deficient. If we can apply foliar manganese with our

Even with close inspection it is unlikely that nutrient deficiency will be visually identified until it is severe. Sensors such as GreenSeeker can help provide an early warning.

herbicide, at rates of up to 3.5L to these areas, with a constant base of 1L, this will be cost effective. Our trial work with high rates of foliar manganese this season is showing good responses.

After the test paddocks have been harvested we will compare the NDVI map with yield data and analyse the effect of variation and the dry season.

Hitches and glitches

To date we have not really put the software interfaces to the test. Apparently, compatibility with our ZYNX system is only a formality according to both parties. We are hoping to analyse the data through SMS Advanced.

Where to from here

I am excited about the potential of gathering biomass data at every pass of the boom-spray for both crops and pastures.

These data layers will be analysed to try and find the key limiting factor - be it rainfall, compaction, nutrition or disease. Our first priority is to supply high rates of nutrient to the small proportion of cropped area that requires a nutrient boost. Our aim is to make nutrient application cost effective and highly responsive. Hopefully the layers of data will eventually paint a consistent pattern to help indicate more options for effective and affordable cost applications.

Grower Experience

Currently we are looking at purchasing two Crop Circle sensors (from our experience this system has given us a more accurate footprint) and locating them across our 36m boom-spray. This will give us an average NDVI across the width of the boom, based on two 18m passes. As we can only vary inputs in the direction of travel and not across the width of the boom, we feel two sensors will be sufficient.

To apply the liquid nutrients we will use an additional tank, controller and pumping system and plumb the boom into our second spray line. This will enable us to apply nutrients at the same time as broadleaf herbicides.

NSW cropper Richard Heath has been using N-rich strips as a method of judging crop nitrogen requirement for the past four years. In 2005 he started using a GreenSeeker to calculate in-crop N requirements.

Richard Heath – Gunnedah, NSW

Pine Cliff is a mixed cropping and grazing property on the Liverpool Plains. Richard with his father and three brothers crop 3300 hectares of winter and summer crops including wheat, corn and sorghum. Annual rainfall is 636mm (summer dominant) and average wheat yields are 4.5t/ha. In this area the predominant method of nitrogen fertilisation is incorporation of anhydrous ammonia or urea either in the months before seeding or during a one-pass seeding operation. Top dressing is uncommon.

Since 2003 we have used high nitrogen (N) strips in-crop and found these to be much more accurate than soil tests for determining the need for top dressed nitrogen.

In 2003 and 2004 the rate of nitrogen recommended from soil tests for a 5t/ha crop was 100kgN/ha. N-rich strips were created and visually compared to the crop; these indicated no fertiliser was required. Comparisons were also made using tiller counts, tissue tests, an N-Sensor, aerial and satellite imagery. All methods indicated that the crop did not require nitrogen fertiliser.

Despite all this data we lacked confidence and applied fertiliser to a proportion of the crop, leaving enough strips without fertiliser to allow us to measure a range of treatments. While there was a yield benefit from applying N it was not enough to cover the cost of the in-crop N and its application.

In winter 2005, a net benefit of $20/ha, over normal practice, was achieved by top dressing nitrogen at rates determined by visual observation of nitrogen rich strips. The benefit was gained mainly from savings in fertiliser rather than extra yield.

Performance

In October 2005 we had our first on-farm use of GreenSeeker RT200, although we had tested a hand held RT100 in 2004. We opted for the GreenSeeker as unlike the N-Sensor it has its own light source, allowing it to be used anytime of day or night. We also liked GreenSeeker because it is supported by software based on a robust agronomy package. The GreenSeeker software gives a recommendation based on the crop data not by varying a predetermined nitrogen rate.

In the first year we used the GreenSeeker to map and recommend rates for side dressing urea on corn and sorghum.

In the corn paddock soil tests recommended a rate of 50kgN/ha. N-rich strips were established by applying 60kgN/ha pre sowing and these strips where visually evident by side dressing, six-weeks after planting. The GreenSeeker recommendations for the block averaged 25kgN/ha (64kg/ha urea), with the recommended rate in the areas of high potential being 50kgN/ha, the same as the soil test.

We used the GreenSeeker data to create a variable rate application map and urea was side dressed in alternate strips at 40, 60 and 80 kg/ha.

No economic response to N was recorded at any rate. However, if we had used the GreenSeeker recommendation rather than N requirement generated by the soil test we would have saved 40kg/ha of urea across the paddock.

This year all our winter crop nitrogen applications were applied as UAN, on-the- go by the GreenSeeker using a Hardi controlled on Hardi Commander boomspray fitted with fertiliser nozzles. There were no compatibility problems between the programs and the rate response was generally very good.

I like the fact that the GreenSeeker software logs the recommended N and the actual N rate applied. This is important as the actual rate depends on rate of flow response by the control applicator.

'benefit was gained mainly from savings in fertiliser'

Hitches and glitches

We have been happy with the system. Data is imported from the GreenSeeker software into FarmWorks, Farmsite and this works well.

The biggest challenge is to know where to locate the N-rich strips. Our aim is to place them in a part of the paddock where N is anticipated to be the only limiting factor. We use a combination of knowledge and information from PA data to help locate the strips. In a paddock over 100 hectares we use two N-rich strips.

Where to from here?

As the GreenSeeker is permanently on the boom-spray it is used to record NDVI every time a spray application occurs. This data is mapped giving us a picture of how biomass is changing across a paddock during the year. In future we may use this information for planning variable rate use of plant growth regulants and possibly fungicides.