PA possibilities

Mark Branson

Mark Branson, SPAA's incoming President shares his experience of and vision for PA.

Mark Branson, incoming President of SPAA demonstrates the use of his GreenSeeker® for making in-crop nitrogen decisions.

When I started yield monitoring in 1997 a two megabyte data card cost $500; this figure is burnt on my brain, as my first card and its precious data were lost after falling from my top pocket into a water trough.

In the intervening 11 years we have seen the price of PA equipment and peripherals dramatically decrease. Over the same period our understanding of their application and potential applications continues to increase.

Like many I have seen big savings from the use of autosteer in time and inputs. I estimate autosteer has helped reduce overlap by five per cent. I have also converted to controlled traffic farming (CTF), with implement widths matched and run on 2.2m wheel spacing. On our heavy black cracking clays and red brown earth soils the reduction in compaction and improvements in water infiltration brought about by CTF and autosteer have resulted in estimated yield improvements of between two and seven per cent.

Having adopted these changes, further soil improvements will take a very long time to express themselves fully. This is not the case for input management, the possibilities of which I believe we have only just started exploring.

Farm details

Location: Stockport, SA

Annual Rainfall: 425 to 525mm

Area: 1200 hectares, 80 per cent annually cropped, remainder grazed.

Cropping system: dryland, no-till cropping with wool and prime lamb enterprises

PA equipment: Case AFS yield monitor, Kee Zynx controller with VR capacity, Kee Zynx 2cm autosteer, GreenSeeker® handheld biomass scanner.

PA software: CASE IH AFS (SMS), ZYNX Maplink.

For the past few years I have used PA data to support variable rate (VR) applications of phosphorus at seeding, in-crop nitrogen management and more recently weed control.

Variable rate P

Soil tests indicated adequate levels of phosphorus (P) across all soil types. However, the yield maps indicated in-paddock variation. So, I decided to use a replacement rate of P based on the previous year's crop yield, rather than apply a blanket rate of 22kg P/ha across a paddock.

Replacement rate maps are calculated on a crop related replacement rate plus a blanket rate of 2kg P per tonne of grain removed to account for P tied-up in straw and the soil.

For example:

- 3.5kg P is replaced for every 1t/ha of cereal grain removed;
- 4.4kg P replaced for every 1t/ha of legume grain removed;
- 7.5kg P replaced for every 1t/ha of canola grain removed.

On average, I estimate that moving to a replacement fertiliser policy is reducing expenditure on P by about 15 per cent, with no detrimental affects on the soil test.

Biomass sensing for N

For several years I have been experimenting with biomass sensing as a method of determining in-crop nitrogen requirements. The objective is for the crop to indicate its nitrogen requirement for that growing season rather than using a pre-season soil test.

At seeding, mono ammonium phosphate fertiliser is the only source of nitrogen. Liquid urea (UAN 42 per cent N) is applied, if required, at about growth stage 31 (GS31).

All post seeding N is applied as a liquid because it is not possible to achieve an even spread of granular fertiliser across 40m, (this width is determined by the CTF set-up).

While UAN is expensive I have calculated that running over more of the crop and achieving an uneven spread of granular fertiliser would cost me more in yield loss.

I have had about 25 per cent of paddocks zoned professionally using a range of data, while I have roughly divided the remaining paddocks into high, medium and low yield areas based on personal experience and yield data. The remainder will be properly zoned in the coming year.

Urea or UAN is applied in strips (20 by 100m) in each production zone in a paddock at the two leaf, crop growth stage. These N rich strips are used to provide the biomass scanner with a reference crop that is unlimited by nitrogen. I use a GreenSeeker®, for biomass scanning.

At about the mid-tillering (GS25), I start to scan the N rich strips and the crop adjacent to the strip. If there is a large difference at mid tillering, I apply a low blanket rate of N to stop the crop becoming more deficient. If there is no difference at this stage then I do not apply N.

I continue to scan crops on a weekly basis. The next and most critical stage is at about first node stage (GS31). If there is a difference at this stage then I use the NDVI readings fed directly into the sensor software to produce a fertiliser rate for each zone in the crop. I assess this rate based on available soil moisture and future rainfall predictions and apply the prescribed or a modified rate.

Up to GS31 there is a good relationship between the readings from the nitrogen rich strip and the crop NDVI readings. Using the GreenSeeker® has certainly given me the confidence not to apply N in wheat if there is no NDVI or visual difference.

At later growth stages the accuracy of scanning can reduce because with a dense green canopy the NDVI values may saturate - that is, there may be too many green leaves to see if there is a difference. In less dense canopies and if the season looks good and I have good soil moisture levels, I am happy to scan up to GS39 and use the recommended rate for a top-up late N application. If the crop has saturated I use many methods to calculate my N rate including 'gut feel'.

Currently each zone receives a fixed rate of N but in future I hope to purchase a tractor mounted biomass sensor that will enable me to do on-the-go variable rate with the boomspray.

When using UAN, care must be taken to avoid burning leaves, especially late in crop development. UAN can be applied through flat fans, diluted or neat, and through streaming nozzles or dribble bars. When using flat fans avoid: applications at above 18°C, rates above 100L/ha and wet leaves. If these conditions occur then streaming nozzles or dribble bars should be used. UAN can be diluted 50:50 with water to lessen the potential for leaf burning.

In future, I hope Australian calibration data for the Greenseeker® will be further developed for canola, pulses and barley, as I believe that this technology can have application in all crop types, not just for nutrition but also for desiccation and growth regulants.

Weed mapping

The biomass sensor is also enabling me to map ryegrass patches, which I then treat differently in the following cropping season. I estimate about 25 to 30 per cent of a paddock can be covered with high density ryegrass patches. By scanning crops at early post emergence these patches can be identified and seeding rates in the following year can be modified appropriately.

For example, where I would have usually sown wheat at a blanket rate 100kg/ha, I have now established three seeding rates depending on the density of ryegrass in the previous crop.

- Very low density ryegrass, 70kg/ha;
- Medium density ryegrass, 120kg/ha;
- High density ryegrass, 150kg/ha.

PA in practice

I have been really pleased with the results this has achieved. The high seeding rates provided good competition and the plants do not tiller as much as those in the low seeding rate areas. So, haying off has not been experienced. The reduced tillering is likely to be due to the lack of nitrogen applied at seeding. By head emergence the crop looks pretty even and so far I have not seen an impact on yield.

From my experience this control method has been as successful as competitive crops and grazing but allows me to grow wheat in a paddock with high levels of herbicide resistant ryegrass.

Methods of variable rate weed control will provide a range of benefits and I look forward to seeing more research and development in this area.

I have already mentioned some of the aspects of PA that I hope will be available to the industry soon, including more NDVI calibrations for Australian conditions. I also would like to be able to map soil moisture accurately, as this is the real driver of the cropping system.

I believe that software and hardware need to be simplified further, to include plug and play hardware. Oh for the day when you add a piece of hardware onto the agricultural vehicle and push a button and it works, and for software that only requires a minimum of buttons to be pushed to achieve the desired result. At the moment everything is too complicated for most farmers to become excited about.

In the past 11 years I have learnt much about PA and not just to button down my top pocket when it contains a data card. Using PA is making me a better farmer; I am now more able to match inputs to production potential, which makes sense financially and environmentally. Overall PA makes me a better agronomist.

It is great to be a part of this exciting period in agriculture.

For more information

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