# Grain protein meters

**Ashley Wakefield**, *Urania, SA*

*Ashley Wakefield has had four frustrating years as protein meters have development but now believes they have the potential to be another valuable tool to improve output management.*

***Ashley Wakefield started yield mapping in 1996. He annually produces 2500 to 3000 tonnes of malting barley and bread wheat, canola, peas and lentils on his 400mm rainfall property on central Yorke Peninsula. Over the past 10 years his PA equipment has evolved to include RTK guidance (2cm accuracy), KEE Technologies Pro- steer on the harvester and tractor and a Kee Zynx controller for data logging and variable rate management. For the past five harvests he has used an NIR Technologies protein meter.***

I was keen to use a protein monitor, as I wanted to select the areas of barley with high protein for use in the pig rations. Since closing the pig operation in May 2006 my objective is to use the protein meter to ensure each delivery of bread wheat or malting barley meets the correct specifications to maximise price per tonne.

I believe it will take several cycles of the rotation before I have sufficient protein data to use it confidently in my fertiliser decisions.

In 2006, we had a virtually trouble free harvest and the protein meter produced useful information. The NIR Technologies meter linked to a Zynx Computer produces on-the-go maps and I had the parameters set to show protein zones in 0.5 percent increments. This level of detail is not really necessary and in future I will set the parameters to identify three zones; below 9.5%, between 9.5 and 12.5% and above 12.5% for malting barley and below 10%, between 10 and 12.5% and above 12.5% for bread wheat.

The meter provides an average protein percentage for each box of grain as well as an average for every five boxes. I used the box average to determine in which silo the grain was placed. Where possible, boxes with very low or very high protein were blended in the paddock. The protein varied from 6% to 16% this year and because of the low yields we did not have the opportunity to improve the returns for each paddock.

The NIR measurement for moisture, which is the same as used at the silos, gives me confidence that grain is the right moisture to reap. Next year I will use the canola cell that will provide oil content.

In relation to protein monitoring I have had four frustrating years but I have been pleased to be working with the manufactures in the development of a meter that now has the potential to provide another valuable tool to improve output management.

***For more information Ashley Wakefield, (08) 8834 1219, ashley@netyp.com.au***

*(L-R) James Hassall, with researchers Brett Whelan and James Taylor who have been assessing the performance of the AccuHarvest® protein meter fitted to his harvester.*

**James Hassall, Gilgandra NSW**

*James Hassall crops 1620 hectares of wheat, canola, chickpeas, triticale, lupins and faba beans. For three harvests he used a Zeltex AccuHarvest® grain protein and moisture meter as part of the 'Monitoring wheat protein content on harvesters' research run by James Taylor and Brett Whelan, Australian Centre for Precision Agriculture, Sydney University. This research was last reported in Precision Ag News, Volume 2 Issue 4, summer 2005. In 2006 he purchased the same meter for commercial use across his wheat crops.*

Typical of many farmers yield mapping experience, our yield maps where showing large amounts of variability from year to year within the same areas. Previous experience collecting random grain samples across a paddock demonstrated that cereal protein levels also varied considerably so, I was keen to map this variability to see if it had a story to tell. Using the AccuHarvest® protein meter developed by Zeltex, USA and JTI, Sweden, we established, among other things, that several of the medium to high yielding zones often produced low protein wheat. This was despite usually receiving what we estimated to be adequate levels of nitrogen.

Research conducted by Wayne Strong, DPI Queensland, showed that wheat protein levels below 12.5% usually indicate a soil nitrogen deficiency that has prevented the crop reaching yield potential. Therefore, I am using the protein data to indicate areas that need more nitrogen the following year and as a record of whether nitrogen inputs have matched crop requirements.

It can also show up soil constraints or disease by highlighting areas that have high protein levels but low yield.

In 2006, we trialled a Greenseeker® RT200 to see if these nitrogen deficient areas could be highlighted in-crop. I believe together the protein meter and Greenseeker® will greatly improve our ability to deliver nitrogen to the areas of crop that are in need. The aim is to use historical yield/protein maps and management zones to set nitrogen rates at sowing. The Greenseeker® is then used to monitor crop progress and to devise a top-dressing strategy. The final yield and protein maps are then studied to see if that strategy worked.

Long term, my objective is to grow a paddock of bread wheat with protein between 12% and 13%. If I achieve this I should not be wasting applied nitrogen growing too much protein, nor using too little nitrogen and limiting yield.

Following several years of trial work, improved protein calibration curves have been developed for Australian crops and I am now happy that this protein meter is accurate and reliable. When bread wheat samples were tested in the AccuHarvest®, then by Grain Corp and the Bread Research Institute (BRI) variability between the three was under 0.5%.

The Zeltex meter gathers spot protein and moisture data four to five times a minute, which is displayed in the cab and logged to a data-logger and can be mapped latter. I use Jmp® and Arcview® to integrate yield and protein data, to generate nitrogen removal maps and to highlight areas of interest. The AccuHarvest® also provides an average protein for every harvester box of grain. I have used this to segregate low protein wheat that I required for a particular contract. However, currently I primarily use the protein data as a diagnostic tool for nitrogen management rather than as a blending tool for grain marketing.

The reliability of the protein and moisture readings also means that we know the protein and, in particular, the moisture levels as soon as we start harvesting a paddock, without the need for numerous trips to the silo with samples.

Next year we plan to calibrate the Zeltex for oil, protein and moisture in canola and would like to try and map pulse crop characteristics.

RTK, auto steer is used for all operations and all equipment, except the harvester, operates on tramlines. The former allows us to accurately farm on a spatial basis, the latter helps us prevent soil compaction and improve our soils.

***For more information James Hassall, (02) 6848 8214, j.hassall@bigpond.com***

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**Colin Stoeckel – Swan Reach, SA**

*With three Zynx systems, autosteer on three tractors and two harvesters, and two yield and two protein monitors, Colin Stoeckel and his father Adrian have invested heavily in PA equipment. They started yield mapping on their 7000 to 8000 hectares of low rainfall Mallee country near Swan Reach, South Australia in 1999. They calculate that the majority of equipment has paid for itself in the year of purchase.*

*Farming with their respective wives Sonya and Dawn, one permanent and one part time workman, Colin and Adrian Stoeckel run a simple system growing feed or malt barley. The average rainfall is 275mm and a Kee Zynx multi channel controller is allowing them to vary seed and fertiliser rates on the dunes and swales that run across the property.*

We established between three and five crop zones based on past knowledge and paddock history and these were verified with soil testing. Zones are fine tuned each year based on yield data, disease history and frost potential. Broadly they fall into the sand hills and the flats.

On the flats, dropping seed and fertiliser rates to 35kg/seed, 0 to 5kg/ha of urea and 35 to 40kg of MAP has resulted in crops of one to two tonnes per hectare compared to 0 to 1 tonne per hectare as invariably they burnt off. On the sand hills yields had increased substantially, in a normal year 0.8 and 1.5 tonne per hectare is produced compared to 0.1 to 0.6 tonne per hectare, before variable rate. Inputs are now 65kg/ha seed, 40-60kg/ha urea and 50kg/ha MAP but more work is being done on this as our sand hill results have not stayed consistent.

The variable rate is allowing us to better manage our inputs and yield while the addition of the protein monitor is allowing us to blend our malting barley on-the-go and maximise the value of the crop.

For the past three harvests we have been testing a protein meter from NIR Technology. Despite some early teething problems this is developing into a very useful tool for blending and ensuring the sample meets malting grade.

***being able to blend with improved accuracy paid for the units in the first year***

*The ability to blend in the paddock and after seed grading is helping the Stockels deliver more barley that meets malting specification*

As very high protein barley is mostly grown on the flats we harvest these areas separately for feed. For the remainder of the paddock two harvesters work in different parts of the paddock and the grain with different protein levels is blended in the field bin or truck, to produce an average protein reading that meets malting barley specifications.

We feel that more work is required before protein maps are part of our fertiliser management tools because a single protein reading is not very accurate. The protein meter is sampling once every 15 to 20 seconds and needs an average of at least 10 readings to produce an accurate protein reading.

In our area moisture is not normally a problem when harvesting barley, so we have not examined moisture readings from the protein meter closely at this stage.

In addition to blending to a specification in the paddock, we use one protein meter on the outlet auger of our seed grader to double check protein after grading. Removal of screenings can result in the sample having a lower protein than malting specification.

We have been pleased with our investment in protein meters. Our first year was border line for protein and we estimate that being able to blend with improved accuracy paid for the units in the first year. If it had been a very low protein year this would take longer.

***For more information***
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