CropScan 3000H On Combine Analyser

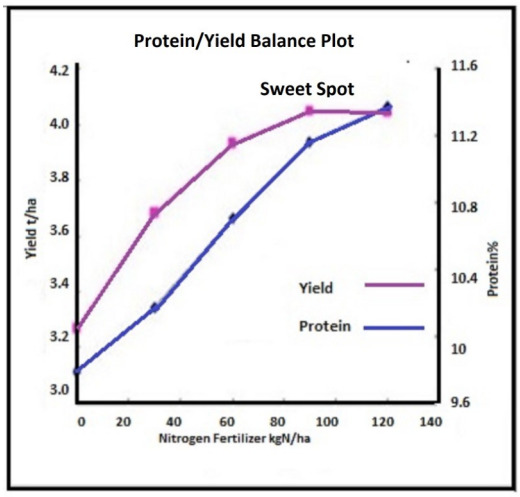
… Push your paddock to its fullest potential

Protein/Yield Balance in Australian Cereal Crops:

Introduction:

In 1963 JS Russell reported his findings on the relationship between yield response and grain protein content in an article written for the Journal of Australian Agriculture and Animal Husbandry. Basically he showed that yield response is positive to Nitrogen fertilizer up to 11.4% protein. If the grains are harvested and have less than 11.4% protein, then the yield potential has not been achieved. In other words, if the grain protein content is less than 11.4% then you are leaving money on the paddock.

McDonald and Hooper, University of Adelaide, Dept of Agriculture, reported 50 years later that their trials across southern Australian crops held Russell's findings to be still valid.



The adjacent plot comes from the CSIRO, Brill et al, 2012. The data was produced from trial in the Parkes area of NSW. The plot shows the effects of increased Nitrogen fertilizer on Yield and Protein. At approximately 11.5% protein the Yield plateaus where as the Protein continues to increase. Where these Yield is optimum and the Protein achieves the best grade payment, is called the "Sweet Spot". The optimum Yield can vary for different varieties and growing conditions.

Implications for Farmers:

If the yield in certain zones across the paddock is less than the paddock average and the protein content is less than 11.5% in these zones then there was insufficient Nitrogen available for the plant to achieve full yield potential.

Protein and Yield Mapping:

Yield maps have been available to the majority of farmers for many years. However most farmers have not taken notice of the implications of these maps. Protein maps have only been available in the last two or three years and only where the farmer has installed an On Combine NIR Analyser such as the CropScan 3300H. Figure 2 shows a Protein map and a Yield Map of a wheat field from Broden Holland's farm in Young, NSW, 2016.

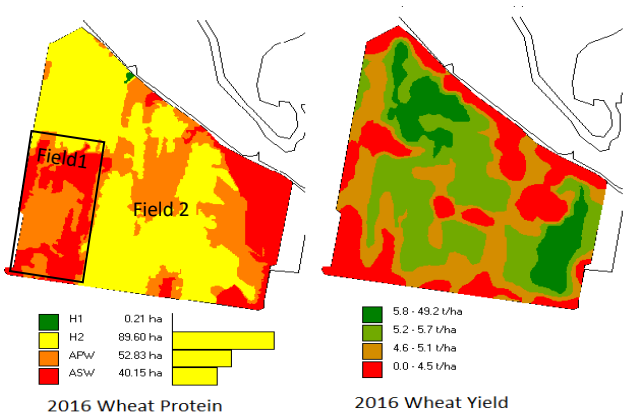


Fig 2. Protein and Yield Maps of NSW Wheat Field

Fig 3. shows the Protein/ Yield Correlation Quadrant map for the field. There are four possible scenarios for the Protein/Yield relationship.

Blue: Higher Protein/ Higher Yield
Green: Higher Protein/ Lower Yield
Yellow: Lower Protein/ Higher Yield
Red: Lower Protein/Lower Yield

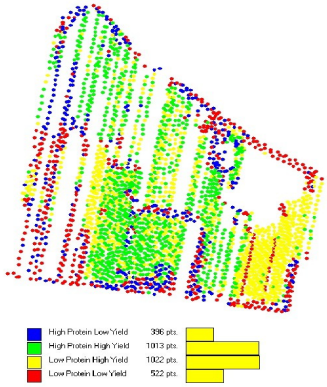


Fig 3. Protein/Yield

2016 had a high rain fall and the yields across this farm were higher than normal. This field had been created by opening up two smaller fields as shown on the map. Based on the Protein/Yield Correlation maps, the farmer changed to a Variable Rate Nitrogen Fertilization program as shown in figure 4. He used a simple formula to increase the rate or Urea in the zones base don the protein content.

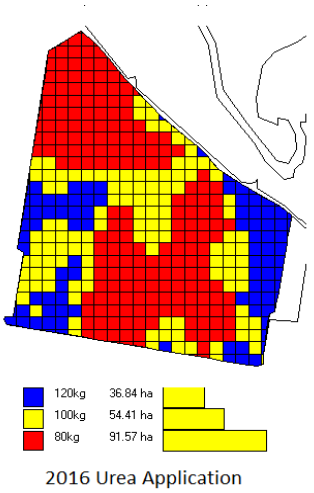


Fig 4. Variable Rate Nitrogen Application map

Blue Zone: Protein < 10.5 = 120 kg
Yellow Zone: Protein 10.6 -11.5 = 100 kg
Red Zone: Protein 11.5 - 13.0 = 80 kg

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In 2017 the farmer grew wheat again on the same field. The rainfall was average and the yields across his farm were less than the previous year. He applied the Urea according to the above formula several weeks after sowing.

Figure 5 shows the Protein and Yield maps for 2017. Figure 6 shows the Protein/Yield Correlation Quadrant map for 2017.

The zone marked Field 1 had previously a below average yield and protein less than 11.5%. The application of extra Urea, i.e., 120kg/ha, in this zone resulted in an increase in yield and a jump in protein grade from APW to H2. The bulk of Field 2 where 100kg/ha of Urea was applied, jumped form H2 to H1 grade. The yield in this zone did not increase as compared to 2016 crop.

There is another zone marked Variety Trial in the 2017 Protein map. The farmer had planted a different variety of wheat in this corner. Although the fertilizer rate in this zone was 120-100kg/ha, the protein did not match the rest of the field, i.e., APW and ASW as compared with H2 and H1. However the yield was higher in this zone. Obviously the plant had responded well to the extra Nitrogen in the growth stages but run out of Nitrogen in the flowering and filling stages.

The farmer made three significant observations about the 2017 result in relation to his Variable Rate Fertilization program.

1) He calculated that the variation in yield across this field had been reduced by 40% as compared to 2016. The VRF program, although quite simple, achieved a significant improvement in the consistency across the field in terms of yield and protein.
2) He also calculated that he realised an additional $5000 income based on in field blending to raise the wheat from H2 to H1 grade and thereby gaining an extra $10 per tonne.
3) The zone marked Variety Trial was also separated out from the rest of the field based on protein. If he had blended the wheat from this zone with the other zones then he would have down graded the H2 to APW and potentially lost $30 per tonne.

His final comments was that his simple approach to VRF quickly captured the low hanging fruit. Further understanding of the protein and yield maps will possibly allow them to increase productivity even further.

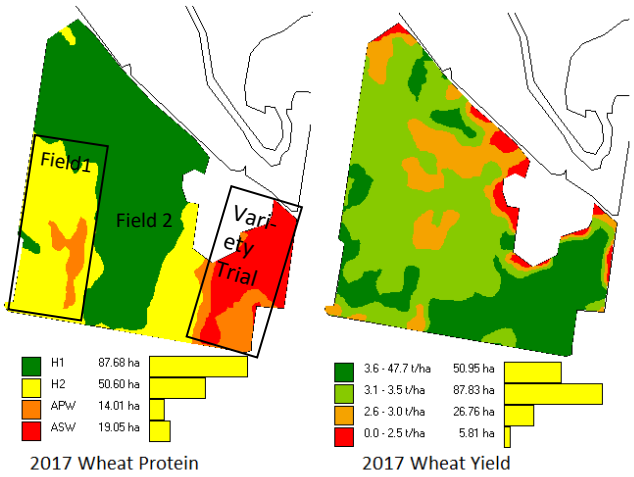

Fig 5. Protein and Yield Maps for 2017

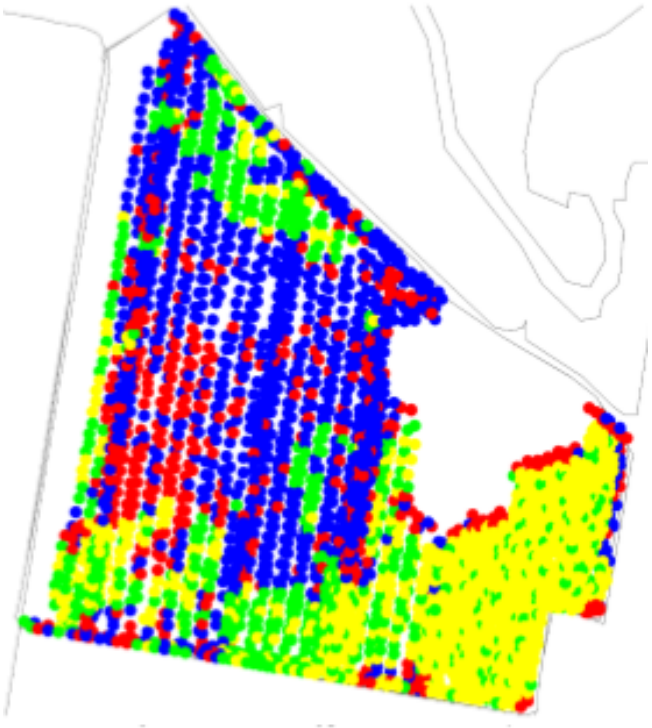

Fig 6. Protein/Yield Correlation Quadrant Map

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