

# Case Study 002: Potential Variable Rate Fertilisation using Paddock Maps from the CropScan 3000H On Combine Analyser



## Introduction:

There exist a direct correlation between the Nitrogen produced by grains and oil seeds in the form of Protein and the availability and uptake of Nitrogen in the soil. As such Protein Paddock Maps offer the potential for farmers to generate a comprehensive understanding of the Nitrogen availability and uptake from their paddocks. This information can then be used to implement Variable Rate Fertilisation in order to optimize the fertiliser usage and to reduce the input costs of cropping.

The CropScan 3000H On Combine Analyser is a Near Infrared analyser designed to operate on a Combine Harvester to measure protein, oil and moisture in grains and oil seeds as they are harvested. As grain travels up the clean grain elevator, grains drop into the Remote Sampling Head where they are trapped between a top and bottom flap. Light passes through the sample of grains and is collected by a fiber optic cable on the opposite side. The light is transmitted back to

the NIR spectrometer located inside the harvester's cabin. The light is separated across the wavelength range from 720-1100nm. Within this region of the electromagnetic spectrum, protein(N-H), water(O-H) and oil(C-H) bonds absorb NIR light. The amount of NIR energy absorbed at the resonant frequencies for protein, water and oil are proportional to the concentration. The Touch Screen PC located in the combine's cabin computes the protein, oil and moisture of the grains and presents the data in the form of real-time paddock maps, trend plots and bin by bin



tabulation. The data can then be posted to a web site where it can be viewed on a smart phone, tablet or PC.

This Case Study presents data collected from a South Australian farm during the 2014 harvest. It shows a paddock where a different fertilizer was used along a strip within the paddock.

## Description:

The CropScan 3000H On Combine Analyser was fitted to a CASE IH 8120 Combine Harvester. The CropScan 30000H generated a real time paddock map for protein on the in cabin touch screen PC. Figure 1. shows the protein paddock map generated in a paddock off a farm located in Loxton, SA. Figure 2 shows a post harvest yield map generated from the CASE Yield Monitor fitted to the combine.

The farmer wanted to investigate the potential of using the data from the CropScan 3000H to implement Variable Rate Fertilization. He applied additional Nitrogen fertilizer to a strip within the paddock. The green section at the lower section of the plot shown in Figure 1 is where the additional fertilizer was applied. In Figure 2, the Yield Map shows a corresponding yellow/red strip.

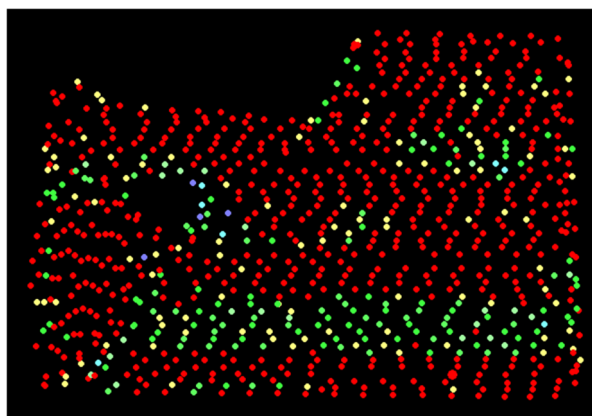


Figure 1. CropScan 3000H Protein Paddock Map

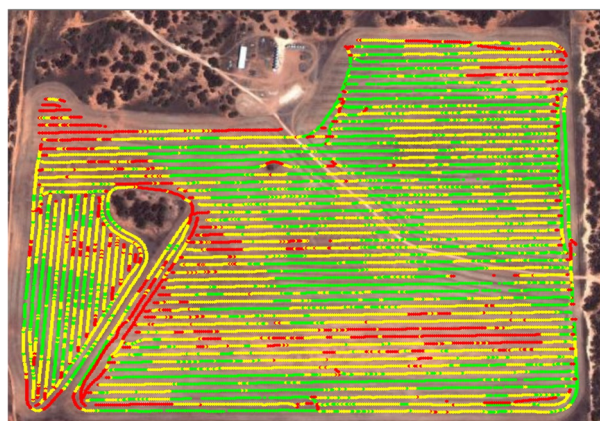


Figure 2. Yield Map

Figure 1 shows that using a different fertilizer resulted in a significant increase in the protein content along this strip, i.e., red dots represent 10-11% protein, yellow dots 11-12%, green dots 12-13% and blue dots 13-14%. Overall the addition of the different fertilizer resulted in a 2% increase in protein content and a grade jump from APW to AH2 and AH1 grades. The price difference between APW and AH2 was approximately \$30 per tonne and the between APW and AH1 of \$40 per tonne.

Figure 2 shows that the addition of the different fertiliser had a negative affect on the yield in this strip. The yield dropped from an average of 1.9 tonne per hectare to 1.1 tonne per hectare. Unfortunately the drop in yield offset the increased payment due to protein and so in this instance the farmer lost money by adding the different fertiliser.

### Comment:

The farmer's objective of this trial was to demonstrate that the protein content of the grain in his paddock could be increased by Variable Rate Fertilisation. His conclusions were that variable Rate Fertilisation would work to increase or balance the protein content of the grain across the paddock.

The study also showed that a complete understanding of the distribution of the Nitrogen in the paddock is required in order to optimize the Yield/Protein relationship.

The CropScan 3000H On Combine Analyser provides real-time Protein Maps which when used in conjunction with a Yield Map allows the farmer to understand the potential performance of different inputs across the farm. By collecting paddock maps for both Protein and Yield, the agronomist should be able to develop prescription files that can be used in the following year to vary the rate of application of the fertilizers used on the crop in order to balance out the protein and yield and to optimize the profit potential for each paddock.