Case Study 001: In Paddock Blending using the CropScan 3000H On Combine Analyser

Introduction:

The measurement of protein, oil and moisture in grains and oil seeds are major determinants of the quality and the price of the grains and oil seeds in many countries around the world. In Australia wheat and barley farmers are paid depending on the protein of their grain amongst other measurements. If the grains can be segregated as close to the paddock, then farmers have the opportunity to blend low protein grain with high protein grain in order to sell more of their crops at a higher price.

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 fat(C-H) bonds absorb NIR light. The amount of NIR energy absorbed at the resonant frequencies for protein, water and fat are proportional to the concentration. The Touch Screen PC located in the harvester'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.

Description:

The farm, located on the York Peninsula, grows wheat, barley, canola and peas across 1500ha with an average yield of 4.5tonne/ha. Two paddocks, 221A and 221B, cover an area of 185ha where wheat was grown in 2014.

The CropScan 3000H was fitted to the farmer's John Deere Model 9770STS header which was fitted with a Yield Monitor and GPS transponder. The CropScan 3000H scanned the grain as it was stripped at a frequency of approximately 11 seconds. Each protein and moisture reading was recorded along with the GPS coordinates. Figure 1 shows the tabular data displayed on the Touch Screen PC inside the cabin. The header driver can also choose a real-time Paddock Map as shown in figure 2.
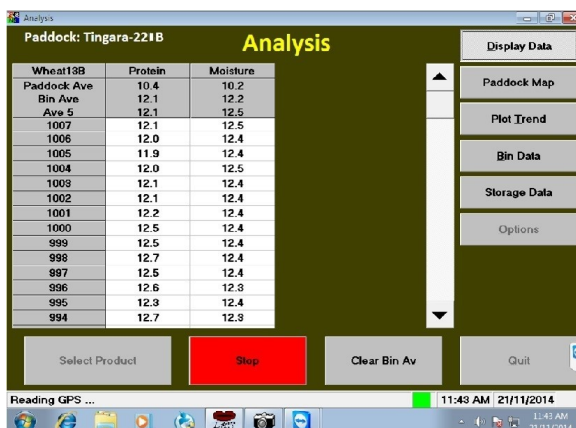

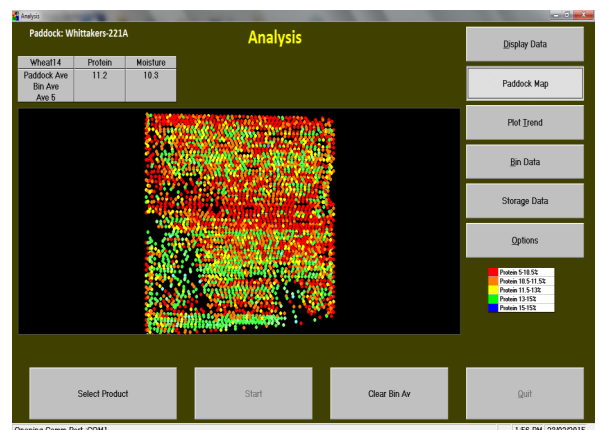Figure 1. Tabular results for Protein and Moisture in wheat

Figure 2. Real-time Protein Paddock Map

As the grain was stripped, the protein and moisture data was recorded and saved in the in-cabin PC. The grain was placed into low protein and high protein field bins, located at the beginning and end of each paddock. The grain was then blended from the two field bins into the truck, which was then driven to the local silo.

Figures 3 and 4. show the protein paddock maps for these two paddocks as generated by
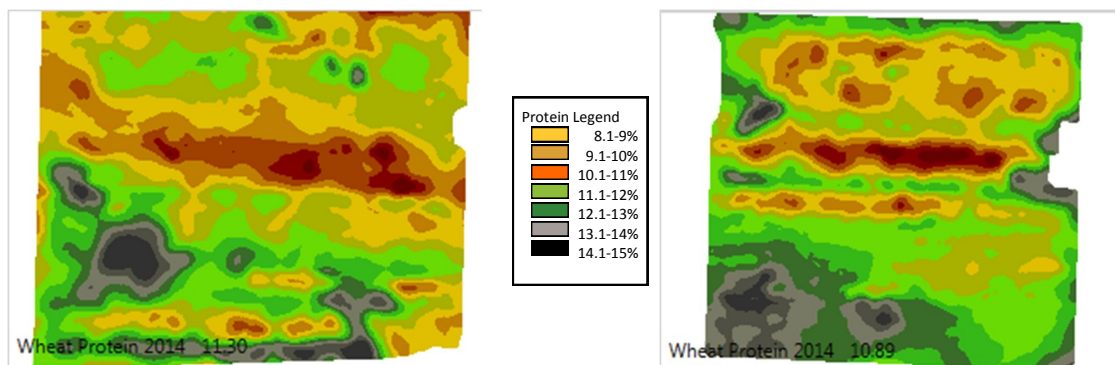

Figure 3. Paddock 221A

Figure 4. Paddock 221B

Precision Cropping Technologies (PCT), an agronomy consultancy firm that works with farmers around Australia. The maps show that the top portions of both paddocks had lower protein levels than the bottom portions of the paddocks.

By blending the wheat in the paddock, the farmer reported that out of 18 truck loads delivered to the local silo, 17 loads went APW grade, ie, > 10.5% protein. He also estimated that 10 loads would have gone ASW grade, ie, <10.5% protein, if not for the in paddock blending.

The incremental payments from blending in these two paddocks were calculated as shown below.

Average Load (tone)	(185ha * 4.5 t/ha)/18	46.25 t
ASW Price	$262/t	
APW Price	$281/t	
Revenues without blending	8 loads x 46.25 t x $262/t	$121,175
	10 loads x 46.25 t x $281/t	$103,970
		$225,145
Revenues with blending	1 load x 46.25 t x $262/t	$12,117
	17 loads x 46.25 t x $281/t	$220,936
		$233,053
Incremental profit with blending		$7,908
Incremental profit per hectare		$42.74

Conclusion:

Considering that all the costs associated with growing and stripping wheat are paid for by harvest, then any incremental profits generated per paddock goes directly to the bottom line. By blending grain from different portions of a paddock that have been identified as low and high protein, can result in a significant increase in the operating profit for a farm. This Case Study demonstrates that using an on header NIR analyser to measure protein in real time increased the profitability of these two paddock by $42.74 per hectare.