

# On combine protein and moisture analysis using a NIT analyser with a fibre-optic cable and remote sampling device

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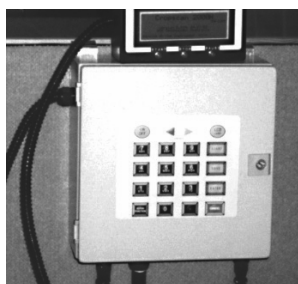
## Introduction

Continuous measurement of protein, moisture and yield of grains in a combine harvester has been a long awaited dream for farmers and agronomists. An on-the-go protein meter offers farmers the ability to make decisions on segregation of their crop, bin by bin. For agronomists, the ability to collect protein and yield maps will enable them to develop strategies on how to improve productivity and to balance the use of fertilisers.

An Australian company, NIR Technology Australia, has developed the first On Header NIR Analyser which provides reliable data for farmers and agronomists.

## Description

The Cropscan 2000H on header analyser (Figure 1) consists of: (a) Cropscan 2000 NIR spectrometer, (b) fibre-optic cable, (c) remote sampling device and (d) remote display module



(a)



(b)



(3)



(4)

Figure 1. Cropscan 2000H on header analyser.

The Cropscan 2000 NIR spectrometer [Figure 1(a)] is a diode array spectrophotometer which scans the region 720–1100nm.

The remote sampling device [Figure 1(b)] consists of a light source, a sample cell, a motor driven plunger and fibre optic collection optics. The remote sampling device is typically located under the bubble auger in a header bin, [Figure 1(c)]. As the grain travels up the bubble auger and past the sampling device, a plunger drops down and approximately 50 grams of grain fall into the sample cell which has glass windows on both sides.

Light passes through 18m of whole grains, is collected by the fibre optic cable and transmitted back to the NIR spectrophotometer. NIR light is absorbed by protein and moisture at different frequencies. The amount of light absorbed by the grains is proportional to the protein and moisture content. The NIR spectrometer measures the amount of light passing through the grains and converts this information into % protein and % moisture. The Cropscan 2000H uses the same NIR transmission technology as used by all the Australian bulk handlers and the AWB to measure protein and moisture at the silo.

When the measurement is finished the plunger is driven upwards to return the grain to the flowing stream within the bubble auger. Samples can be collected and scanned at a rate of 10 per minute. Up to ten measurements can be averaged to provide a moving average of the protein and moisture data, thus smoothing the results.

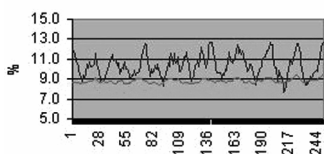
The NIR spectrometer and the remote display module are installed inside the cabin of the header. The remote display module [Figure 1(d)] shows the moving average and the bin average in the cabin. Buttons on the remote display module allows the operator to start, stop and reset the analyser.

## Calibration

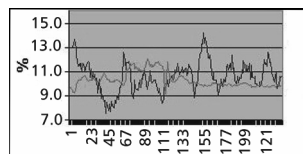
The Cropscan 2000H comes pre-calibrated for protein and moisture in wheat and barley. Five samples of grain, checked at the local silo, can be used to trim the calibration so that the on header analyser matches the silo's readings. A daily check sample should be used to ensure that the instrument is measuring correctly. Internal software automatically adjusts the instrument to match the check sample.

## On-the-go protein and moisture data

Figure 2, shows real time data collected on a John Deere harvester stripping barley in South Australia during the 2002 harvest. Figure 3, shows real time data collected on a Case header stripping wheat in Western Australia during the 2002 harvest.



**Figure 2. Real time data collected on a John Deere harvester**



**Figure 3. Real time data collected on Case header.**

Figure 4, shows a paddock map for wheat protein collected during the 2002 harvest in Montana, USA. The two strips show a high correlation between the Cropscan 2000H and samples collected from the header and analysed for protein in a laboratory.

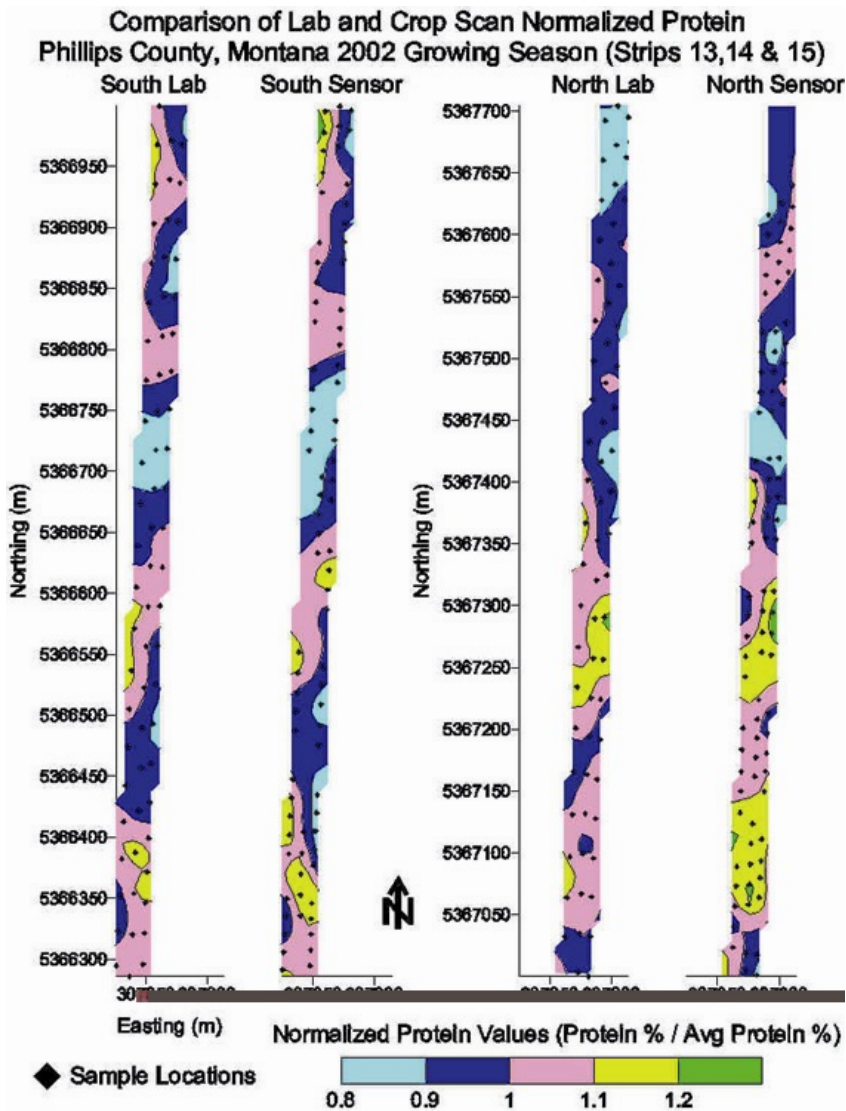


Figure 4. Paddock map for wheat protein collected during the 2002 harvest in Montana, USA.

**Conclusion**

The Cropsan 2000H is the result of four years of development and testing. The system is now available for sale and can be installed onto any header.