Introduction:

Iowa State University, Dept of Food Science, has developed a large database of grain samples including wheat, soybean and corn. They have used this set of samples to develop calibrations for several brands of Near Infrared Transmission (NIT) whole grain analysers. NIR Technology Systems entered into a contract with ISU in 2009 to develop calibrations based on the CropScan 1000B Whole Grain Analyser. This report presents the results of this calibration development for analysing protein and moisture in wheat.

Procedure:

The CropScan 1000B uses a diode array spectrometer to collect transflectance spectra from 720-1100nm. Within this region of the NIR spectrum, protein (N-H), oil (C-H), moisture (O-H) and carbohydrates (C-O-H) absorb energy at specific frequencies. The CropScan 1000B meters a sample of whole seeds or kernels of grain and oil seeds through a vertical flow cell. The seeds are metered by a rotating brush wheel so of that up to 15 scans can be collected for a 500ml sample. The average of these scans is then used to develop the NIR calibration against the wet chemistry analyses for protein, oil, moisture and fibre.

A selection of 99 samples of wheat was made from the ISU sample set. Each sample was scanned using the CropScan 1000B with a 16mm pathlength cell. 10 scans were collected and averaged for each sample. Figure 1 shows the NIT spectra for the soy bean samples.
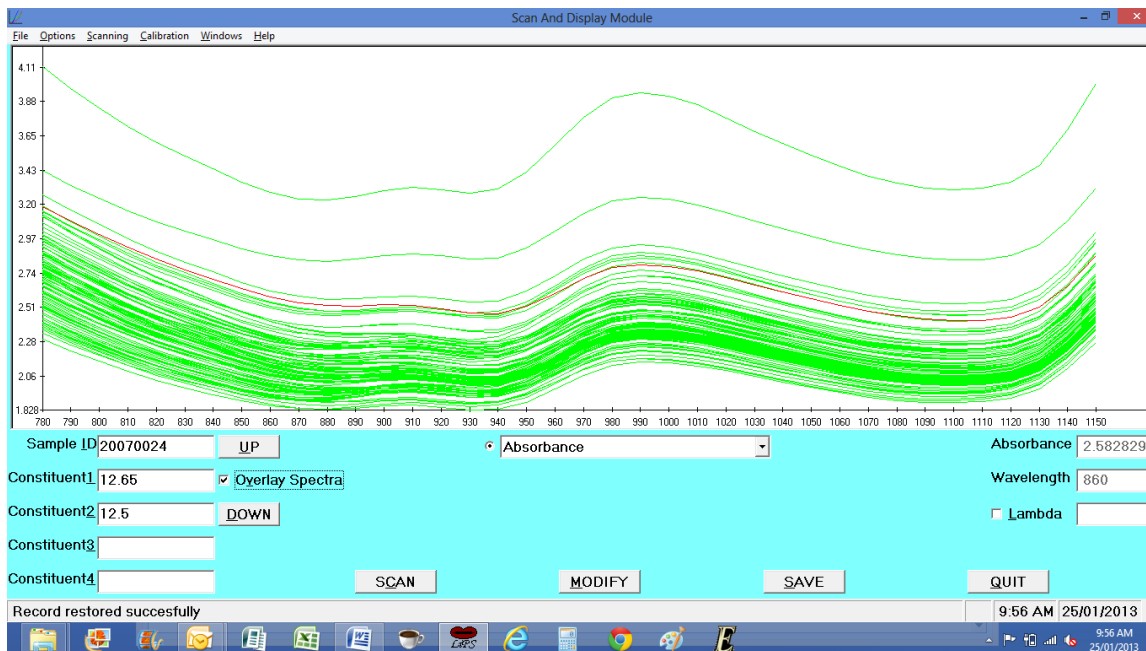

Figure 1. CropScan 1000B NIT Spectra of USA Hard Wheat.

The spectra were exported from the CropScan 1000B's internal memory and imported into NTAS (NIR Technology Analysis Software), NIR Technology Systems, Condell Park, NSW, Australia, where Partial Least Squares Regression analysis was used to develop calibrations for protein and moisture.

Results:

Figures 2, 3, 4 and 5 show the calibration plots and statistics for protein, moisture, oil and crude fibre respectively.
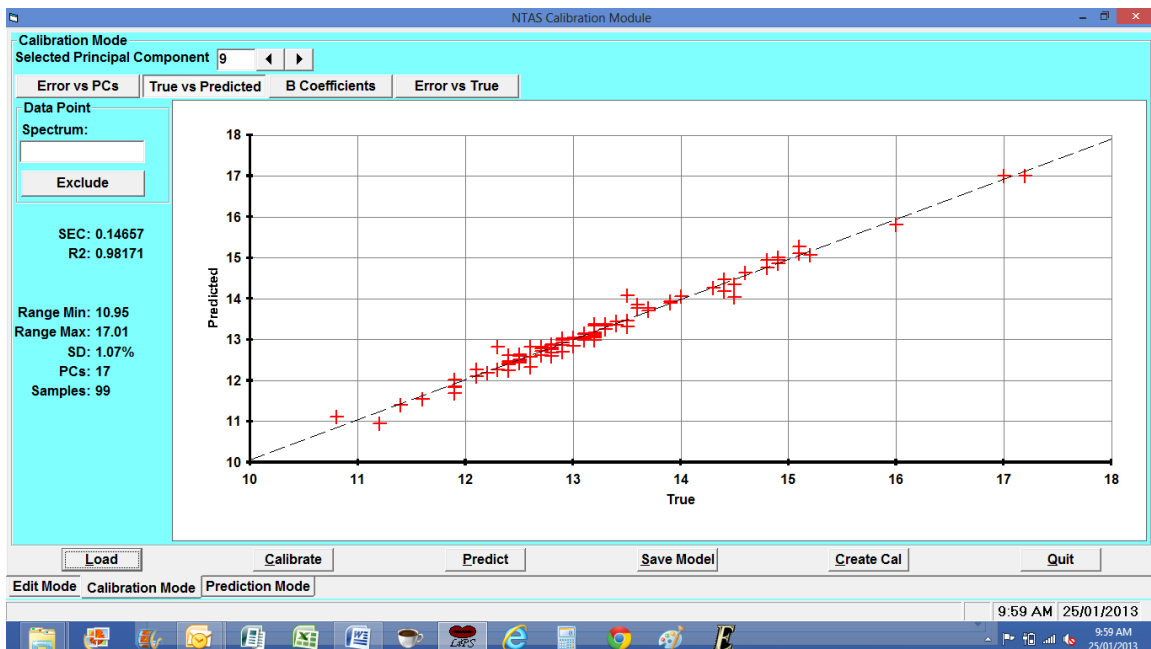

Figure 2. Calibration Plot for Protein

Figure 3. Calibration Plot for Moisture

Table 1. presents a summary of the calibration statistics.

Constituent	SEC	R^2
Protein	.20	.992
Moisture	.14	.988

Conclusion:

The CropScan 1000B has been used successfully for measuring wheat in Canada, Italy, Germany, France, Japan, Australia and the USA for over 10 years. The data presented in this report is consistent with the calibration data from other countries.