



# Cattle Feed

## Introduction

Production of animal feeds requires precise control over the different constituent components based on the final product specifications.

Relying on traditional wet chemical analysis is not feasible as the time taken is too great. Therefore rapid multi-component NIR analysers have replaced most of the traditional methods. These analysers can be placed directly in the production area and can be operated by plant personnel. The analysis time is less than one minute.

## The Analyser



Figure 1: The Quant FT-NIR analyser with large bottle sample holder accessory (right) - AgriQuant Configuration

The AgriQuant FT-NIR analyser system is a revolution in FT-NIR technology and user friendliness. Designed around new FT-NIR interferometer technology the AgriQuant requires preventative maintenance at only 5 year intervals (source replacement), has a small footprint, no hygroscopic optics, incorporates a modular design allowing rapid detector changes and allows the development of unique sample handling accessories.

## Calibration

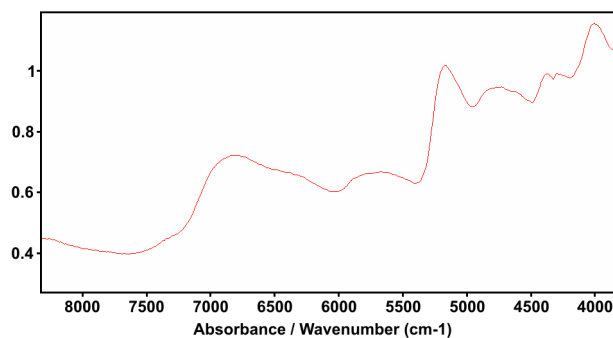


Figure 2: Typical FT-NIR spectrum of cattle feed

The Quant is calibrated against certified methods for the different components.

The NIR region contains both combination and overtone information. The most sensitive bands are those derived from the O-H, N-H and C-H stretch regions. In order to compensate for pathlength changes due to scattering effects from the sample, all spectra were pre-processed using Multiplicative Scatter Correction and mean centring. A Partial Least Squares (PLS) model was developed based on the analytical and spectral data.

## Calibration Performances

61 cattle feed samples, containing various amounts of different raw material, were measured, **unground**. Table 1 shows the performance of the calibrations developed for all the components with chemical reference analysis available. a repeatability test and test with an unknown set of samples have not been done in this project but have been done for pig feed and can be seen in the application note for pig feed.

Property	Range %	NIR SECV Unground - Plastic bag	Corr. Coefficient
Protein	14 – 38	0.80	0.99
Fat	2 – 10	0.45	0.89
Starch	6 – 35	1.60	0.95
Sugar	3 – 10	0.70	0.80
Ash	5.5 – 10.5	0.70	0.74
Raw Cell Matter	6 – 16	1.18	0.80
Moisture	9 – 15	0.40	0.90
Density	0.5 – 0.64	0.01	0.77
Salt	0.6 – 1.2	0.07	0.80
Phosphorus	0.5 – 0.95	0.03	0.93

Table 1: Performance of the cattle feed calibrations

Higher SECV values than above are obtained by grinding the samples prior to analysis.

However this sample preparation significantly increases analysis time. A study comparing ground and unground samples has been done for soy raw material and can be seen in the application note for soy.

## Conclusion

The AgriQuant is a FT-NIR analyser designed for solid sample measurements and can analyse ground or unground cattle feed samples. The results are obtained in less than one minute on multiple components. 50 to 60 samples can be measured each hour, allowing direct feedback for the mill operators to optimise production.