Smart Ag Research

2020 Summary: Evaluation of Geospatial Protein Content Grain Analysis During Harvest with CropScan 3300H: Near Infrared Transmission Grain Analyzer

This multi-year project is evaluating the CropScan 3300H Grain Analyzer — an aftermarket on-combine digital technology to measure several qualitative properties of harvested grain, oil seeds, and pulse crops in near-real time including protein, moisture, oil content, and colour — which allows producers to map geospatial crop information, which can be used for various field management strategies.

Objectives

- Assess the relative accuracy of geospatial and near real-time protein and moisture content measurements by a CropScan 3300H Near Infrared Transmission Grain Analyzer.
- Evaluate the in-field functionality of this CropScan technology under agronomic conditions in central Alberta.

Introduction

OCCI is working with Farmers Edge to evaluate technologies capable of near real-time measurement, and mapping of grain protein content to support farmers with running efficient operations.

This digital ag technology is beneficial for producers as the equipment allows them to make better informed decisions as it relates to grain management while harvesting, and using the same information for crop management in future years.

Study Details

- CropScan 3300H was installed on the Smart Farm combine (2004 John Deere 9660) to assess accuracy and functionality in measuring protein content of barley.
- Prior to harvest, protein measurements were obtained by ground truthing the field; 16 barley samples from various field locations were sent to the analytical chemistry laboratory of the National Research Council of Canada.
- Protein content estimates of the CropScan unit were compared from the same locations.

Results

- CropScan predictions aligned with the true protein measurement of the barley.
- The equipment was simple to set up and operate (no issues, no added time to harvest activities, no downtime to operation).
- CropScan and Vantage Canada provided excellent service and training regarding care, calibration, and operation of the CropScan unit.
- Resources and manuals provided were simple to use and contained all necessary information needed to calibrate and operate the device.

Note: All testing (whether NIR spectrometry or analytical chemistry procedures) have a certain error threshold which is inherent to the procedure. Typical NIR models used for agricultural production are able to explain about 93% of the variation measured for total protein. Analytical chemistry procedures typically have a higher accuracy rate, but are also much more costly and time consuming.

Analysis	Mean (Protein %)	Min (Protein %)	Max (Protein %)	Range (%)
CropScan NIR	11.22	9.01	13.42	4.41
NRCC Analytical Chemistry	10.59	9.33	12.24	2.91

Summary statistics of CropScan and NRCC data values. The consistency of an over-estimation by 0.6% suggests a bias likely a result of the calibration process.

Future Research

CropScan is an ongoing multi-year project with opportunities for additional testing of different crops and qualitative measurements the CropScan 3300H is capable of; further considerations will be added to the project scope in upcoming years.