2018 USAFRI Research Project Objectives

Evaluating Hand-Held NIRS Units for Measuring Forage Quality of Fresh-Chopped Alfalfa and Alfalfa Hay and Haylage
Cornell University - Cherney

Project Award: $18,671

Justification:

- New technology has minimized optical background noise and allowed the development of small, robust NIRS units. Instant, real-time nutritional analysis of forage on location has the potential to allow results to be rapidly incorporated into management decisions, and to assess variability in forage lots.

  Since the portable NIRS units themselves, along with their software and calibrations, are very different from each other, we hope to identify the unit best suited to on-farm deployment. Reducing variability between formulated and delivered rations, based on commercial dairy farm studies, has the potential to either increase dry matter intake and increase milk production several lbs/cow/day, or conversely, to significantly reduce feed costs.

  At the 2018 World Dairy Expo, companies had booths promoting their hand-held NIRS devices for immediate analysis of forage to monitor trends, maximize feeding and improve animal performance. Dairy farmers from around the world were inquiring about the practicality of such instruments. At the 2018 Cornell Nutrition Conference, ABVista gave a presentation to farmers and consultants on how their portable NIR unit can improve feeding precision and maximize milk yield. Matt Digman will be presenting a talk on "On-Farm Applications of NIRS" at the upcoming 2019 Cornell Dairy Operations Managers Conference.

  We expect interest from both consultants and farmers in on-farm NIR units will rapidly increase, as more companies promote the technology. SeedWay sales managers in the Northeast currently have the SCiO NIR units. Cargill has independently developed calibrations for the SCiO NIR, and provide farmers real-time forage analysis under the "Reveal" brand name. Unlike the other hand-helds, SCiO measures only a relatively small portion of the NIR spectrum, and its relative accuracy needs to be evaluated. DairyOne Forage Laboratory is now selling and servicing the NIR4 unit.

  This technology will be strongly promoted for dairy farms and other ag. industries, but there has been no independent evaluation of any of these instruments. Rapid assessment of forage quality of alfalfa, including moisture content, can be very useful to both farmers and hay brokers. One of the keys is finding the right applications of this technology, where the accuracy is better than the variability, and where a management decision can be made, based on NIR results. Portable NIRS units are widely available for mounting on harvest equipment, but interest in hand-held NIRS units has led to the production of such units by 5 separate companies so far. Stratio (a USA company) will release a small NIR unit somewhat larger than SCiO (LinkSquare-NIR) in early 2019.

  On-farm NIR units have the potential to increase appreciation for forage testing, or they could damage forage testing efforts if on-farm NIR results are not reliable. While we plan on focusing on forage crop uses, hand-held NIR units have a wide range of applications, including analysis of grains, meats, milk and dairy products, beverages, and whole fruits and vegetables. As with commercial laboratory or any other type of NIRS instrumentation, success is primarily dependent on the spectrometer's calibration.

Objectives:

- The objective of this research is to evaluate the accuracy and precision of five hand-held NIRS spectrometers for measuring forage quality of fresh-chopped alfalfa, alfalfa hay, and haylage. Sampling studies with commercial dairy corn silage and alfalfa haylage bunkers have clearly shown that significant day-to-day changes in forage DM and composition occur. Assuming that accuracy is sufficiently better than variability, we will identify the most suitable applications for this technology, where it is best suited to aid in management decisions.