2018 USAFRI Research Project Objectives

There's An App for That! Validating Real-Time Assessment of Alfalfa Nutrtive Value
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Project Award: $34,818

Justification:

- We live in an age of rapidly changing technology, with information available at our finger tips. The agricultural sector is a technology leader, and farmers are well-known as early adaptors and innovators. For example, remote sensing technologies can be used to predict alfalfa yield and some forage nutritive value components. Specifically, remote sensing technology combined with growing degree day units explained most of the variability in several forage nutritive values (Noland et al., 2017), and visible and near-infrared reflectance (NIR) has been used to predict nitrogen, neutral detergent fiber (NDF), acid detergent fiber (ADF), and the relative forage value (RFV) based hay grade classifications (Starks et al., 2015). Nutritive value is a general term that describes the feeding value of alfalfa (and other forages) to livestock. Of the forage nutritive value components, several are commonly used to predict animal performance, including NDF and ADF, which are predictors of intake and digestibility, respectively. Both of the above technologies have the potential for rapid assessment of alfalfa characteristics over large areas; however, they are complex to use, cost prohibitive, and not accessible to the average alfalfa grower or livestock owner.

  Imagine having the power of near-infrared spectrometer (NIRS) in your hand, allowing for immediate, in-field analysis of forage nutritive value. Recently, NIRS micro-spectrometry was developed and released by SCiO (Tel Aviv, Israel). Briefly, the SCiO device is an affordable, hand-held, lightweight sensor that uses a wavelength in the NIR range (700-1100 nm) and communicates with smartphones using Bluetooth wireless technology (see image). The device and associated prediction equations can estimate dry matter (DM), crude protein (CP), energy, fat, oil, starch, and sugar concentrations of various feed stuffs. This technology is now being marketed for use with animal feed, agriculture, raw materials, food and beverages, manufacturing, pharmaceuticals, and produce within major Ag corporations (i.e. Cargill) forming partnerships with SCiO. We propose to evaluate the accuracy of this technology for predicting the nutritive value of alfalfa.

  Currently, morphological development of alfalfa (i.e. 10% bloom) or days between cuttings (i.e. 28 days) are traditionally used to schedule harvest times and estimate the nutritive value of alfalfa. However, visual appraisal of alfalfa maturity can be challenging, and both approaches can be poor predictors of alfalfa nutritive value due to seasonal variability and weather condition impacts on plant growth. A refined strategy based on numerically staging alfalfa growth for a set number of stems (Mean Stage by Weight or Mean Stage by Count) improves the accuracy of prediction, but is impractical for producers in the field because of the time requirements and field variability. Another common approach is to use predictive equations for alfalfa quality (PEAQ) based on maturity and height of the most mature stems to predict RFV (Sanderson, 1992). Although this approach provides a low-cost and rapid method of prediction, numerous samples are needed for improved accuracy, and sampling may be time prohibitive. Having access to in-field, real-time alfalfa nutritive values are critical to aid farmers in decision making regarding harvesting, feeding, and marketing alfalfa.

  Objectives:

- The objective of this project is to 1) Evaluate the accuracy of NIRS micro-spectrometry technology when evaluating alfalfa nutritive value.