

## 2018 USAFRI Research Project Objectives

### Plant Population and Stem Counts to Predict Yield of Modern Alfalfa Varieties University of Minnesota - Sheaffer

Project Award: \$22,342

#### Justification:

- Alfalfa is a perennial crop with stands typically maintained for 3 to 5 years in the Midwest. Successful establishment and stand persistence is affected by crop management decisions including cutting frequency and fertility, biotic factors such as insects and disease, and environmental factors such as drought, hail, and winterkill; therefore, yearly assessment of stand productivity potential is critical for profitable alfalfa production. Common questions that arise are: 1) Was stand establishment successful?; and 2) When should the stand be terminated? Because of costs associated with premature stand termination and reestablishment of alfalfa, decisions by farmers related to stand productivity have a significant effect on farm profitability. In addition, crop insurance adjusters who appraise alfalfa stands use plant population and stem density information to assess establishment success and stand losses and determine fair compensation.

Both alfalfa populations and stem density have been associated with alfalfa yield; however, these relationships change as stands age. In a widely cited publication, Undersander et al. (2011) indicated that alfalfa had tremendous yield potential over a wide range of stand densities but recommended that new seedings should have at least 25 to 30 plants per ft<sup>2</sup>. However, as stands age, Undersander et al. recommended that plant population not be used to determine productivity of older stands but that stem density be used as an indicator of productivity and when to terminate. Alfalfa populations above 55 stems per ft<sup>2</sup> have been considered optimum for alfalfa yields with yields declining with decreased stem densities. These recommendations are based on surveys at two Wisconsin locations with 1 to 3 year old hay fields containing a diversity of older varieties described as fall dormant 3 and 4 (Undersander and Cosgrove, 2007). However, this research did not consider plant and stem counts as predictors of alfalfa yield in the seeding year, when significant yields can be produced (Grev et al. 2017) and economic returns realized.

Modern alfalfa varieties have been selected for improved disease resistance and winter survival. In the Midwest, it was once common to have varieties marketed with fall dormancy 2 and 3, now most varieties are fall dormancy 4 with some fall dormancy 5 varieties now available (NAFA, 2018). The reduced fall dormancy allows for a greater rate of regrowth following harvest and greater fall yields compared to more dormant varieties. Because dormancy response affects crown morphology, it is likely these less dormant alfalfa varieties have altered stem number and stem mass compared to more dormant entries (Teuber and Brick, 1988). Selection for traits like increased winter survival may also alter crown characteristics and could affect the relationship between plant populations, stem number, and forage yield.

#### Objectives:

- The objectives of this project is to 1) Determine the relationship between alfalfa plant populations and stem density on forage yield of modern alfalfa varieties with fall dormancy ratings 4 and 5.

