## **Forage Research Updates**

## **MINNESOTA** - Nitrogen Requirements of Corn Following Young Alfalfa Stands Matt Yost, Jeff Coulter, Mike Schmitt, Gyles Randall, and Craig Sheaffer, University of Minnesota and Michael Russelle, USDA-ARS

Ifalfa is terminated and rotated to corn after just 1-3 years in the Upper Midwest for several reasons including declining alfalfa stand quality, winterkill, and changes in commodity prices or government programs. For example, growers in Minnesota and Wisconsin lost nearly 2 million acres of alfalfa to winterkill in 2013. To answer questions about nitrogen (N) fertilizer requirements for corn following short alfalfa stands, University of Minnesota and USDA-ARS researchers conducted experiments at two locations in southern Minnesota over three years. Corn was no-till planted following 1- to 3-year-old alfalfa stands that were fall-terminated with herbicide on a Normania loam soil at Lamberton and on a Webster clay loam soil at Waseca. At corn planting, several N fertilizer rates ranging from 0-150 lb N/acre were applied.

At the time of alfalfa termination, alfalfa stand density averaged 27, 17, and 9 plants/ft<sup>2</sup> for 1-, 2-, and 3-year-old stands. According to current alfalfa N credit guidelines from most land grant universities in the Midwest, these alfalfa stands should have reduced the N requirement of the subsequent corn crop by 120-150 lb N/ac.

On the loam soil, economically optimum N fertilizer rates for grain yield of first-year corn were 90, 60, and 0 lb N/ac following 1-, 2-, and 3-year-old alfalfa stands, respectively. On the clay loam soil, economically optimum N fertilizer rates for grain yield of first-year corn were 105, 85, and 85 lb N/ac following 1-, 2-, and 3-year-old alfalfa stands, respectively. Therefore, 2- and 3-year-old alfalfa stands provided more N to the following corn crop and in some cases eliminated or greatly reduced the need for N fertilizer. These results indicate N credit guidelines based on alfalfa stand density may need to be adjusted for young stands with high plant densities at termination. Results from this study also support recent findings from a review of over 250 field trials conducted across the central and northern U.S., which found first-year corn following 1- or 2-year-old alfalfa stands responded more frequently than following older stands, and fine-textured soils (clay, clay loam, silty clay loam) responded more frequently than medium-textured soils (silt loam, loam, sandy loam, sandy clay loam). Ongoing research is focused on determining how alfalfa stand age and soil texture affect N fertilizer requirements of first- and second-year corn.