Corn grown as the first or second crop after alfalfa usually requires much less fertilizer or manure nitrogen (N) than corn grown after corn, soybeans or small grains. When alfalfa is killed, some of the accumulated N in the soil and in alfalfa leaves, stems and roots becomes available to subsequent crops.

This increased N supply is known as the “alfalfa N credit,” which is the amount of fertilizer or available manure N a grower can save, resulting in higher net return per acre.

Growers can reduce the N rate by up to 150 lbs/acre for first-year corn after a good stand of alfalfa and by up to 75 lbs/acre for the second subsequent year of corn, current University of Minnesota (U of M) Extension guidelines suggest. If growers apply too much N to corn, they lose profit by wasting N; if they apply too little, they lose profit from lost corn yield.

To better understand how growers are managing fertilizer and manure N in corn after alfalfa – and why they may or may not accept alfalfa N credits – researchers at the U of M, with the USDA-National Agricultural Statistics Service, surveyed 2,200 Minnesota farm operators during the summer of 2012. A third of the recipients responded and, after ineligible surveys were excluded, 518 complete responses were analyzed.

About one-third (36%) reported that they planted first-year corn following good alfalfa stands; 45% planted following fair alfalfa stands; and 19% planted following poor stands. If the economically optimum N rate for continuous corn on these farms is 180 lbs/acre, Extension guidelines for first-year corn after alfalfa would suggest 30 lbs N/acre (manure and fertilizer) after good alfalfa stands, 80 lbs N/acre after fair stands and 130 lbs N/acre after poor stands.

About half of the growers who did not apply manure during alfalfa termination or before corn planting reduced N fertilizer rates to first-year corn according to those guidelines (see pie charts at right). About two-thirds were within 25 lbs N/acre of the guidelines. This is an encouraging sign that growers are increasingly accounting for the extra N alfalfa supplies.

In contrast, only about a third of the growers utilized Extension guidelines for first-year corn when manure was applied during the transition from alfalfa to corn. A bit less than half were within 25 lbs N/acre of the guidelines.

A total of 378 respondents (72%) reported that they grew a second consecutive corn crop after alfalfa. Again, assuming that 180 lbs N/acre is the optimum rate for continuous corn, Extension guidelines for second-year corn following alfalfa suggest 105 lbs N/acre after good alfalfa stands, 155 lbs N/acre after fair stands and the full rate of 180 lbs N/acre after poor stands.

Based on these guidelines, nearly 40% of the growers...
who did not apply manure to either first- or second-year corn used the guideline rate of N fertilizer to second-year corn. As was the case with first-year corn, about two-thirds of them applied rates within 25 lbs N/acre of the Extension guideline to second-year corn. These results, too, are very positive.

However, for the large proportion of growers who applied manure for first- and/or second-year corn, only about 20% reduced total N rates (manure and fertilizer) to meet Extension guidelines for second-year corn, and nearly 75% applied rates that exceeded the guidelines by 25 lbs N/acre.

**These findings indicate** that more growers use Extension guidelines for first-year corn than for second-year corn, and that many fewer manage applied N as strictly when manure is applied in this rotation. These results confirm what the Minnesota Department of Agriculture found using a nutrient balance program called FANMAP – that growers on farms with both forage legume and manure N sources tended to not fully accept legume and manure N credit guidelines.

The study revealed that reasons for limited adoption of Extension guidelines vary. Limited confidence in the guidelines may be a constraint. Growers appear to rely more heavily on other sources for this information, including past experience, independent crop consultants, fertilizer dealers and soil-testing labs. A majority of growers surveyed (75%) considered these sources reliable. Most growers (69%) indicated they consult with fertilizer dealers, and nearly half (47%) consult with independent crop consultants when making decisions about N management for first- and second-year corn after alfalfa.

Recent on-farm research across southern and central Minnesota indicates that the current Extension guidelines may not be accurate enough. In these trials, first-year corn following good alfalfa stands seldom required N fertilizer for maximum yield. Further, second-year corn in 28 Minnesota and Iowa field trials required N fertilizer in only half of the fields.

For the responsive second-year cornfields, the economically optimum N rate ranged widely, from less than 60 to 175 lbs N/acre. A single “book value” for the alfalfa N credit does not always fit what growers find in fields. The one-third of respondents who vary N fertilizer rates depending on growing conditions each season may be a response to this problem.

**Improved prediction** and adoption of alfalfa N credits are needed to help growers enhance profitability and reduce the risk of N losses. Growers, fertilizer dealers, independent crop consultants, state agencies and university Extension should work together to develop advanced, site-specific guidelines and unified education about fertilizer and manure N management for corn after alfalfa.

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