

As corn harvest is concluding, many farmers are turning their thoughts to preparing for next year's crop. One thought is on how to best apply nitrogen (N) fertilizers to maximize N use efficiency and corn yields.

Nitrogen fertilizers can be applied at many times throughout the year—fall, spring, preplant, at planting, sidedress, or through fertigation. When deciding when and how to apply N fertilizers, consider the 4Rs of nutrient management:

Right time of application, right fertilizer type, right placement, and right application rate.

### **Fall vs. Spring**

Generally UNL does not recommend fall N fertilizer applications in corn. Research has shown that fall applications of N fertilizer are less efficient than applications during the growing season.

Corn uses N more efficiently when applied as close as possible to when the plant needs it. Nitrogen is very mobile and easily lost from the soil through leaching and denitrification. A significant quantity of N applied in the fall can be lost throughout the winter and spring.

This is the first fall in several years when entering winter with good stored soil moisture across much of the state. With normal precipitation this winter and early spring, the risks of leaching and denitrification increase. When deciding whether to apply N in the fall, weigh the time savings of fall applications when field work is limited with the cost of extra N that will be needed and the increased uncertainty about how much will be available next year for plant use.

### **Consider these factors:**

- Apply anhydrous ammonia because it's not initially leachable.
- Apply after soil temperatures are below 50°F. (Check CropWatch Soil Temperatures for your area.)
- Because of the potential for N loss, UNL N recommendations for corn are increased by five percent when applied in the fall.
- Fall applications of nitrate (NO<sub>3</sub>) forms of N are discouraged due to substantial risk of leaching and denitrification.

Fall N applications are not advisable on sandy or other easily leachable soils, or where ponds or surface drainage is delayed.

- Nitrification inhibitors help reduce the potential for loss through leaching or denitrification, but are less effective with fall than with spring application.

### **Growing Season**

#### **Application Considerations**

Multiple (or split) applications of N are generally more efficient than single large doses (especially on sandy soils) due to N loss potential. Also, crops use N more efficiently when it is placed beneath the soil surface. Broadcasting N on the soil surface increases the likelihood that some N will be lost due to ammonia volatilization or runoff.

This is one reason why anhydrous ammonia, which must be injected, sometimes appears to be a better N source than urea or UAN solution, which often are surface applied. In general, as long as N fertilizers are correctly applied, all are agronomically equal. Fertigation is efficient if it's timely and if application rates are not excessive.

Irrigation or rainfall soon after the application of urea fertilizers significantly reduces the potential for ammonia loss. The use of urease inhibitors with surface-applied urea fertilizers reduces the potential for ammonia loss.

### Soil Sampling and N Credits

Efficient N fertilizer use requires that the producer gives proper credit for N sources already present before selecting the appropriate N application rate. Significant sources of N include:

- soil residual nitrate (determined by soil sampling),
- manure and organic materials (determined by sample analysis),
- legumes (determined according to the previous crop)
- irrigation water (determined by irrigation water sampling).

Actual N credits from these sources can vary widely, but in many cases the N fertilizer rate can be reduced significantly after accounting for these credits.

Accounting for residual soil nitrate-N has become especially important due to recent weather patterns. Drought conditions can have a significant impact on how much N is left in the soil after harvest. The only way to determine the availability of residual soil nitrate-N is through soil sampling.

#### Resources and Software

For more information on nitrogen fertilizer use in crop production, see these University of Nebraska-Lincoln **Extension publications**:

- Fertilizer Suggestions for Corn, EC117
- Nutrient Management for Agronomic Crops in Nebraska, EC155
- Guidelines for Soil Sampling, G1740
- Soil Sampling for Precision Agriculture, EC154

These software tools can aid in decision making:

- Soil test software for interpretation of soil analysis results for all Nebraska crops:
- The Corn Nitrogen Recommendations Calculator