

# N Management Considerations

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## NOTES FROM THE FIELD

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Knowing the timing and amount of rain events in 2020 would provide enough information to know when to apply the corn crop's N requirement with one application. However, since weather remains an unknown, planning for multiple applications utilizing different sources, times of application, and placements is a best defense to minimize N loss, maximizing utilization.

### **A good nitrogen recommendation starts with an estimate of N required.**

Nitrogen is the second greatest input cost in corn production and a primary concern to water and air quality when it is not utilized. It makes economic sense to focus on its management from both an economic and environmental perspective. Start with the N Rate Calculator to establish an economic base application.

The N Rate Calculator takes into consideration the price of corn per bushel in relationship to the cost of N per pound. Maximizing yield per acre can sometimes be costly, especially if that last bushel of corn harvested requires significantly more N than was covered by the revenue it generates. The N Rate Calculator does not mandate the rate of N a farmer will apply. However, it provides a starting point for an N Management Strategy. Visit the website, follow the instructions and give it a try. <http://cnrc.agron.iastate.edu/>

### **Planning for a dry 2020 growing season?**

Nitrogen should be applied as early as possible and injected into the soil if a dry growing season is anticipated. All nutrients must move to plant roots with soil water. Since water taken up by the plant under droughty conditions comes from subsurface soil moisture, placing nitrogen close to the source of water (injection) increases the concentration of N moving with limited soil

water into the plant (as nitrate-N). Surface placement or shallow incorporation of N in a droughty environment will result in little N utilization. An amount that is 2x what is needed can be surface-applied to dry soil and corn plants will still fire (N deficiency) if no rain is received after the application.

### **What happens to N not utilized due to drought?**

The drought of 2012 provided an example of what can happen when N is applied and not utilized. Over 200 fields were sampled for nitrate-N concentration following the harvest of 2012 but before any fall N was applied. On average, enough N was detected in the upper 12 inches of soil to meet the crop's N requirement. Unfortunately, there was no crop to utilize it. Elevated nitrate-N concentrations were detected late-winter of 2013 in several lakes as a result of the drought and unused applied N. Fall-applied N was not the primary source. The elevated concentration was an outcome of the 2012 drought, a fact that should not be forgotten.

### **Planning for a wet Spring?**

Nitrogen applications should be delayed as late as possible. Fall or early Spring-applied N will be the most vulnerable to loss processes. If the primary N requirement will be applied pre-plant, a nitrification inhibitor, such as N-Serve (anhydrous ammonia) or Instinct II (UAN or urea) should be considered. A post-emerge strategy will limit N loss but increase the risk of not getting the N applied. Placement of post-emerge N can be injected, surface broadcast or banded (Y-Drop). The window for post-applied N tends to be a challenge in wet Springs.

Consider using urea treated with Agrotain (NBPT) broadcast post-emerge. Agrotain protects the urea-N from volatilization for at least 10 – 14

days. Add boron to the urea application and test for a boron response. Great way to deliver boron and to determine whether boron will be a part of your 2021 nutrient management strategy. Allow Illini FS to make this timely application. Wolfrax Boron and our automated delivery system makes it easy to mix with Agrotain-treated urea for a broadcast surface application. Visit with your local Illini FS Crop Specialist for more information or to request a post-emerge surface application of Agrotain-treated urea.

### **Denitrification is common with a wet Spring.**

Denitrification occurs when soils are saturated (pore space is filled with water) for an extended period-of-time. The loss process only occurs to the nitrate-N form (only plant-available form containing oxygen). With the absence of soil air, oxygen is removed from NO<sub>3</sub>-N by anaerobic soil bacteria. Once oxygen is removed, the modified NO<sub>3</sub>-N becomes an unstable gas and is lost to the atmosphere. It takes approximately 24 -48 hours for denitrification to start. A loss of 5 - 6% of nitrate-N per day is anticipated for each day the soil remains saturated.

### **Leaching is common with a wet Spring.**

Leaching is the movement of nitrate-N with soil water as it leaves the zone of application. Soil texture tends to determine the potential for leaching losses. Soils with a higher content of sand (considered coarse-textured) tend to leach more than the heavier soils (containing significant clay). The larger soil pores make it easier for water to move downward in the soil profile. Medium-textured soils (silts or silt loams) are also prone to leaching. The increase use of subsurface tiling to remove excess soil water from medium-to-heavy textured soil provides an avenue for nitrate-N to be lost.

## HEDGE THE RISK OF N LOSS.

**Two-Pass Strategy.** Consider a combination of source, rate of application, time of application, and placement (the 4Rs) to create a Two-Pass N Management Strategy. Hedge the risk of dry weather with an early Spring N application (injected preferred). A nitrification inhibitor should be considered if applied well ahead of planting. Hedge the risk of wet weather by including a post-emerge application. Regardless of the efforts made (use of nitrification inhibitors), extended periods of saturated soil prior to May will result in N loss. Allow 2-3 weeks between applications to realize a difference as a result of a multiple N application strategy.

**Three-Pass Strategy.** Add an application of 30 to 50 pounds N pre-plant, usually UAN applied as the carrier for pre-plant (residual) herbicides. This strategy would reduce the percent of N applied post-emerge. The purpose of this application is to provide the young corn seedling a source of N when a primary pre-plant application of N is injected and corn residue is incorporated ahead of planting. Note: Allow 2-3 weeks between applications to realize a difference as a result of a multiple N application strategy. Suggestion: Early pre-plant – 50%, Pre-plant with herbicides – 25%, Post-emerge – 25%.

## APPLICATION OPTIONS

**Early Pre-Plant.** Early Spring N applications tend to be susceptible to saturated soil conditions prior to plant uptake (2018 is an example in East-Central Illinois). Consider using a nitrification inhibitor (N-Serve or Instinct II) for N applications made well ahead of planting time. Slowing nitrification (conversion of ammonium to nitrate) keeps the applied N in the stable ammonium-N form (not susceptible to denitrification or leaching). A suggested rate of application would be 50% of estimated N requirement.

**Pre-Plant.** A minimum broadcast application of 30 to 50 pounds of N is suggested there is no plan for any pre-plant N. The application provides the seedling plant a source of N during the early stages of stand establishment. Residue worked into the soil prior to planting will promote microbial immobilization of soil N. Microbes will

out-compete the young seedlings, possibly causing a temporary early-season N shortage. A suggested rate of application would be 50% of estimated N requirement.

**Planting-Time.** A planting-time application of N provides a readily available nutrient source to the young seedling. However, there is a significant investment in time and equipment to make this a part of an N Management Strategy. The cost vs. benefit of application timing and placement minimizes the adoption of this practice. Rate of application depends upon placement.

**Early-Post.** An application of N at the “early growth” stage (V3-V6) minimize the opportunity for N loss due to an early wet Spring. The early-post application can be injected (UAN/anhydrous ammonia), surface broadcast (urea treated with NBPT), or banded (UAN Y-Drop). Surface broadcast urea treated with NBPT will result in a faster crop response due to placement but either should work equally well, providing there is moisture to move the N into the plant. A suggested rate of application would be 50% of estimated N requirement.

**Late-Post.** Applications of N during the rapid stage of corn growth can be timely if N loss is significant pre-plant or early post. However, the risks associated with such an application should be considered. Plants are rapidly growing. An untimely rain could increase the risk not making the application. High winds could tangle corn plants making it impossible for a ground application (aerial N applications much more expensive). There is equally significant risk of not receiving adequate rainfall following application to get the applied N to the plant roots (normally dry in late June/early July). A suggested rate of application would be 50% of estimated N requirement.

## Sign-up for an N-TRACKER Plus Site in 2020.

The best N Management Strategy can easily be compromised with an unexpected change in the growing environment. Will it rain? Will it stop raining? These are common questions echoed at different times before or during growing season. Establish an N-TRACKER Plus Site to create a window into the soil to watch the dynamics (behavior) of plant-available N. How many pounds of N are detected in the upper two feet? What form is it in? Where is it at? How much N is needed?

These are common questions that N-TRACKER Plus attempts to address. With six years of tracking experience, there is a significant level of confidence with integrity and interpretation of the test results. This year each site will also track two other essential nutrients that tend to move with soil water, sulfur and boron. Sound interesting? Visit [www.n-tracker.com](http://www.n-tracker.com) for more information. Comments are welcomed.

## Avoiding laws and regulations.

It will not be laws and regulations that help Illinois meet the targeted reductions in nutrient loading by 2025, it will be the adoption of practices that maximize nutrient utilization, optimizing harvest yield and minimizing nutrient loss to the environment (If you use it, you won't lose it.) It is about using, not losing nutrients that were paid for and applied. What we need are tools that help us quantify the behavior of nutrients in the soil once applied. Is it still there? Was it lost? Where did it go? Is there enough?

Once we are satisfied with the answers to these questions, we will improve how we manage nutrient inputs both from an economic and environmental perspective. Now is the time to proactively continue our search for the answers. Let us help you with N-TRACKER Plus.

Visit with your local Illini FS Crop Specialist to learn more about these and other agronomic issues that can help your farm succeed in 2020.



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