NITROGEN MANAGEMENT

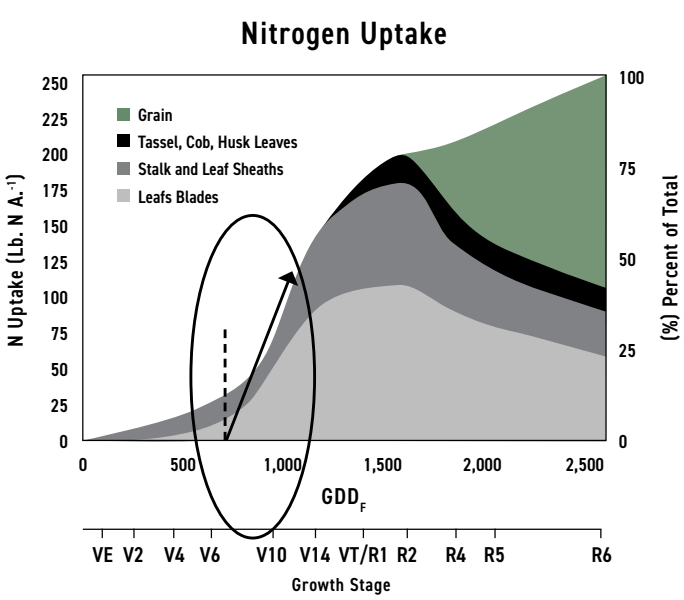
Nitrogen (N) is a critical input for a corn crop's success. It is also one of the more challenging inputs to manage as every year brings a different set of environmental conditions that can change the response to different forms, timing, and placement of nitrogen on your farm. Researching nitrogen is equally challenging because so many external factors can impact the results. That's why multi-year and multi-location data are key components to gaining a deeper understanding of nitrogen. Through Beck's PFR, we continue to evaluate different timing and placement methods as we strive to help solve the puzzle that is nitrogen management.

The goal of nitrogen management in corn is three-fold: 1) to have sufficient N available to meet crop demands throughout the growing season 2) to optimize N availability from a total rate/cost perspective (ROI) and 3) to minimize losses to the environment through denitrification, volatilization, and leaching.

As with all nutrients, N stewardship is about managing the "4Rs":

1. Right source/form of nitrogen – matched to geography, soils, and crop growth
2. Right rate to meet crop needs – EONR or science-based
3. Right timing for crop growth – available when N is needed
4. Right placement to optimize source, rate applied, and crop growth

More on the "4Rs" can be found at **https://nutrientstewardship.org/4rs/**



WHEN IS N USED? A corn plant uses a great deal of its N later in the growing season. In fact, over 75% of N uptake occurs after the V10 growth stage. The most rapid uptake usually occurs between V8 and VT when the corn plant takes up between 7 to 9 lb. of N each day. Ensuring that ample N is available in the correct form during the corn plant's growth is key to maintaining the potential in every field.

Chart adapted from Bender, et al., 2015

First, understand corn nitrogen needs over time and growth. The figure at left is a depiction of when corn uses N. The key takeaway is that corn from V8 to VT needs 7-10 lb. N/day. In order to ensure N is available, apply prior to the rapid uptake stage.

Second, N management begins with a recommendation for N fertilizer needs. Although not perfect, the Economic Optimum N Rate (EONR) Calculator for Midwest Corn States **http://cnrc.agron.iastate.edu/** provides the best starting point available. Additionally, there are 120+ N studies conducted by the PFR Team available here: **beckshybrids.com/pfresearch/**

Third, a nitrogen recommendation accounts for all sources of N availability, including livestock manure, prior crop credits, soil nitrate tests (if applicable), and credit from nutrient sources that contain N, like DAP, MAP, and AMS. Consider climate conditions and the use of an N stabilizer where fall-applied anhydrous ammonia is included in the recommendation.

Finally, there are multiple methods to get N to a crop, so planting and weed control should take priority over N applications. Even if you are locked into an anhydrous purchase, you can still sidedress your corn with this product. Stick with the goal of supplying the crop with ample N throughout the growing season to maximize yields.

Split/Sidedress Nitrogen Applications

The advent of readily available sources of both granular and liquid sources of N and more flexible equipment to apply means it is no longer necessary nor agronomically recommended to have all N available at planting. However, applying the majority of recommended N as a late POST application is not recommended, either. In both cases, the risk is too great – the former, risk due to loss or positional unavailability; and in the latter, risk of crop needs and unavailability due to movement.

A split or sidedress N application can be planned, or added in response to weather-related losses early in the season. Applications made after the plants have emerged allow you to maintain more available N during key growth stages like ear development (V4 to V8), and the late vegetative and early reproductive stages from V12 to R1. By minimizing losses, you can see yield increases and minimize the negative environmental impact of N applications which.

Sidedressing is a PFR Proven™ practice that has become the standard in our N programs across our PFR locations. Our standard N program is 2x2 up front followed by a sidedress application at the V3 growth stage. The split-application N program has proven to be the most efficient and most cost-effective way to fuel our corn for years at multiple locations. Check out more on this study at **https://www.beckshybrids.com/pfresearch/Detail/ArtMID/1316/ArticleID/2731/2019-PFR-PROVEN-SIDEDRESS**.

BECK'S AGRONOMY RESOURCES RELATED TO N MANAGEMENT

PUBLICATION	TITLE
Agronomy Briefs	Yield Components of Corn, Economic Optimum N Rate, Nitrogen Timing and Placement, Spring Applied Anhydrous Ammonia Risks, Sulfur Deficiencies in Corn, Potassium and Corn Development, Corn Foliar Nutrition, Tissue Testing
CropTalk	No Fall Nitrogen? No Problem, Fall's Unfinished Business. Now What?
Agronomy Talk	Sulfur Nutrition and Deficiency
PFR Study	Nitrogen Application Study, 2019
PFR Report	Flexibility in Your N Program

Beck's PFR team has also conducted research on different N management products, practices, rates and hybrids to help farmers make the best decisions for their farms and analyze various options to maximize their return on investment. Since 2012, Beck's PFR has worked to determine the Economic Optimum Nitrogen Rate (EONR) in a corn-after-soybean and corn-after-corn rotation. As a mobile nutrient, the amount of N that is necessary each year varies due to environmental conditions and the cost of N inputs.

Do hybrids differ in their response to N rate? We have learned over time that some hybrids and hybrid families tend to have a higher likelihood of response to full-season N availability while others may have a lower level of response. It is important to know the N response of the hybrids you plant in order to place products in fields and situations that optimize yield within your N program. The Beck's Product and Program Guide contains ratings and information on our hybrids with regard to N response – high (H), medium (M), and low (L).

Our EONR for corn-after-soybeans rotations consistently comes in around 190 to 195 units of nitrogen/A. In any given year, we typically see a 25 to 50 unit of N difference in the EONR between the N efficient hybrid and the higher N response hybrid at a given site. In this rotation, it is traditionally 175 units for the N efficient user and 200 units for the higher N user. This has resulted in a long-term average EONR of 190 to 195 units nitrogen/A.

Do you need to stabilize your sidedress N? The sidedress stabilization decision is impacted by several factors including what level of N is in place or soil-available, whether or not you applied some N through the planter or a weed-and-feed program, and what growth stage the crop is at. Those systems would provide NO_3^- N to be available early in the season.

Most anhydrous stabilizers on the market extend the length of time your N remains in the NH_4^+ form and reduce the potential for loss via denitrification or leaching. Stabilizers do what they say they will do. But keep in mind, you will want both NO_3^- and NH_4^+ forms in the soil during the rapid uptake phase to supply the current crop needs as well as the future crop needs. Delaying NO_3^- nitrogen availability at V8 or later is not desired.