

# The Power of N Maximizing Nitrogen Efficiency in Corn

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**Corn growers are well aware of skyrocketing fertilizer costs that have occurred over the last year.**

To say 2022 will be a challenging year for corn growers is a gross understatement. Corn demands a lot of nitrogen and in the absence of adequate amounts of available nitrogen in the root zone, yields will be depressed.



**Properly fertilized corn (left) compared to nitrogen deficient corn (right)**

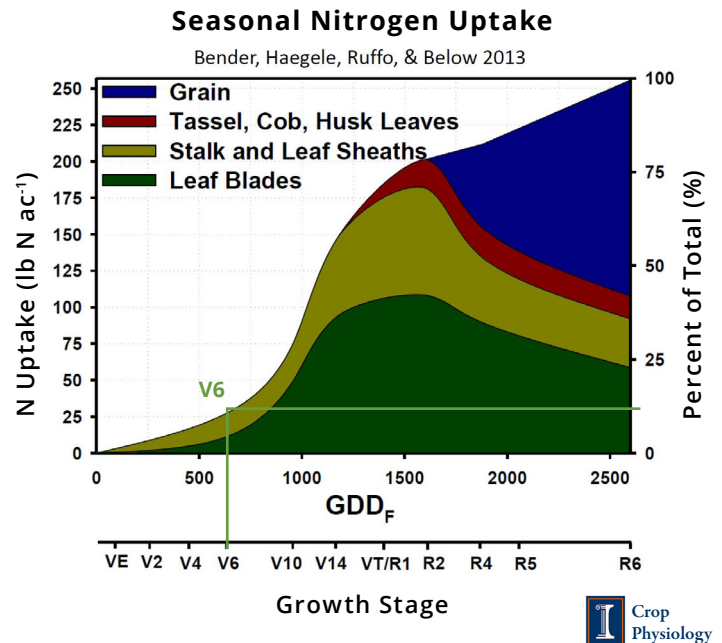
In a year when corn prices are strong and fertilizer costs are high, growers need to put a very sharp pencil to their fertilizer budgets and adopt management tactics that maximize nitrogen uptake efficiency and minimize losses to the environment. Be realistic with your yield goals. Perhaps use a three-year average as a realistic target. The relationship between nitrogen application rate and corn yield is not linear. There is a point where increased costs for higher applications rates does not generate the additional bushels needed to pay for the extra nitrogen.

**Timing of Nitrogen Applications:** It has been a common practice to apply the full seasons compliment as a single preplant application either in the fall or spring. This practice introduces risk because the longer nitrogen is in the soil, the more prone it is to leaching and/or denitrification losses. Ideally, N should be applied as close as possible to when it is needed and at the rate it is needed.

As can be seen in the nitrogen uptake curve developed by researchers at the University of Illinois, only about 10-12% of the seasonal nitrogen requirement is taken up before about V6.

Even though early season N needs are quite low, presence of available nitrogen in the soil may be critical for corn to attain high yields. From *Optimal Placement and Application Timing of UAN for Best Efficiency, Growth, and Yield of Corn*:

The corn plant sets its yield trajectory early in the season based on available N. The signal by which soil N availability is communicated within the plant is poorly understood, but some studies implicate that root synthesized cytokinins increase in response to N supply and systematically transmit this signal to other tissues (Takei et al., 2001; Sakakibara et al., 2006). Although supplying nitrogen later in-season to match the nutritional needs of the corn plant is important for optimizing usage, early season requirements of N cannot be ignored. (Below, Winans – Univ. of Illinois)



From a practical perspective, this means split applications of about 50 lbs. plant available N per acre from VE to V6 and the rest during the rapid vegetative growth phase and grain fill period from V6 to R6.

## PROTECT YOUR INVESTMENT – USE NITROGEN STABILIZERS

The nitrogen cycle in soils is a very leaky system, meaning nitrogen can be lost to the environment by several different mechanisms and can be very significant (up to 40% losses or more). These losses reduce both nitrogen uptake efficiency and return on fertilizer investment and potentially reduce production. These mechanisms are:

### Ammonia Volatilization:

Urease enzyme, present in all soils, converts urea to ammonia gas. This means that surface applied urea is susceptible to ammonia loss (as much as 40%) if not incorporated into the soil by rainfall, irrigation, or tillage. Ammonia volatilization can occur on all soils regardless of texture or pH.

### Nitrate Leaching:

This form of nitrogen loss occurs when negatively charged nitrate is moved below the plant's root zone by percolating water. Leaching tends to be more prevalent on lighter textured soils, but it can happen on all soil types.

### Denitrification:

This is a nitrogen loss process where microbes convert nitrate into gaseous forms that will escape in the atmosphere and lost from the soil when soils are saturated (anaerobic). Denitrification tends to be of greatest concern on heavy texture soils when soil temperatures are warm.