Corn Split N DST

Determine the feasibility and profitability of using post-planting nitrogen application for corn production.

SplitN.AgClimate4U.org

This product is designed to help farmers and farm advisors understand the risks and benefits of using post-planting nitrogen (N) application for corn production. The Corn Split N tool combines historical weather and fieldwork data with economic considerations to determine the feasibility and profitability of completing a second (split) N application within a user-specified time period.

This tool may help you with decisions that:

- Increase corn yields
- Reduce nitrogen costs
- Reduce nitrogen losses to the environment
- Affect the likelihood of completing fieldwork tasks

With the Corn Split N tool you can quantify the costs and benefits of post-planting nitrogen applications for your farming operation to help your bottom line and the environment.
Why Split Apply Nitrogen?

Farmers traditionally apply nitrogen to the soil in a single pass during either the fall or in the spring before planting. However, early nitrogen application can result in significant losses due to weather factors (e.g. warm, moist soils). Research has shown that a split application of nitrogen – one application in the fall or around the time of planting and a second application after planting when there is the greatest demand for N from the crop – can reduce total nitrogen use (savings to the farmer) and/or reduce nitrogen loss to the environment (savings to society).

There are some risks involved with a split nitrogen application strategy. Greater costs are incurred because two passes through the field are required. Additionally, the second application (if conducted using ground application equipment) may be hindered due to weather conditions. If soils are too wet during the time when a second application of nitrogen is needed, insufficient nitrogen may result in lower yields. With the Corn Split N tool farmers now have a way of quantifying the costs and benefits of post-planting nitrogen applications.

Split Nitrogen Timing and Application Methods

University recommendations suggest applying N by V6 if you do not use a starter N. If starter N is used, the post-planting application is determined by height of the corn plant and equipment used. For typical surface application equipment, application by V8 is recommended. Some surface application equipment may be able to apply N until V10. Split nitrogen application can also be conducted using aerial application. The Corn Split N tool is intended for use with surface application equipment.

Nitrogen management of corn includes many factors, one of which is the timing of application. Recommended application times vary depending on the climate and soil conditions of your location. This tool is designed to assist farmers with planned sidedressing of nitrogen.

Planned split N applications are different than rescue N applications. Rescue N is for the purpose of remediaying a known problem of insufficient N in growing plants. It may occur early enough for surface application of N or so late that aerial application is the only option. Planned split N applications are done with the intention of supplying sufficient N without waiting for the crop to express a need. By that time it may be losing yield.

The Corn Split N tool helps farmers investigate the implications of planning a post-planting sidedressing of N. Research indicates that split N applications have several potential benefits. First, the total amount of N needed for optimal yield may be lessened. Fertilizer savings are most likely to be experienced where the risk of N loss is high. Second, increased yield may occur. Research results differ on whether or not yields can be increased. In some years, split N applications increase yields and in others it does not.

If a farmer plans to apply nitrogen post-planting and is unable to accomplish this due to weather or equipment problems, there is a good chance that yields will suffer. This tool estimates how often that will occur given your described equipment complement.
Reducing Nitrogen Loss

Some farmers use post-planting nitrogen applications to reduce nitrogen fertilizer loss. Nitrogen loss via leaching is problematic on well-drained, sandy soils, whereas poorly drained soils tend to lose nitrogen via the process of denitrification during times of soil saturation.

The Corn Split N tool can help farmers analyze the feasibility and economic outcome of reducing nitrogen loss via post-planting applications. The concept is that less total fertilizer would be applied to the corn crop because less is expected to be lost. There is no expectation that yield would be increased over supplying all of the fertilizer prior to planting – only that the quantity of fertilizer loss is reduced; and, therefore, the total quantity of fertilizer purchased is reduced. Typically, to accomplish this objective, a reduced rate or starter fertilizer rate of nitrogen would be applied in the fall or around the time of planting. A post-planting application would later be applied to the growing crop to supply all its needs. The risk of this management approach is that yields could suffer if poor weather conditions prohibit post-planting nitrogen application.

Example Situation:

You’re a farmer in Story County, IA, who planted 1500 acres of corn beginning May 1. You’re planning to apply additional nitrogen between June 4 (when you expect all planting will be completed) and June 22 (before reaching V8). You estimate that 30 fewer pounds of nitrogen fertilizer would be applied using a split application approach than if all had been applied prior to planting. You put down an initial 50 lbs of nitrogen last fall. However, if the fertilizer is not applied by June 22, your crop consultant said to expect a 27 lb/acre yield loss on those acres not receiving the post-planting application of nitrogen.

The Economic Analysis indicates that post-planting nitrogen application would be possible on all 1500 acres in 30 of the last 34 years, or 88% of the time. The net benefit of this approach, after accounting for additional costs of the second nitrogen application and savings from your reduced nitrogen use, would result in a net savings of $2,000 each year.

In the worst year of the last 34 years, only 920 of the 1500 acres planted to corn received post-planting nitrogen. In this case, the money saved from unused nitrogen was outweighed by yield losses on the 580 unfertilized acres. The net economic result is that, in this one year, you would lose $59,000.

The Breakeven calculation indicates that in 30 of the last 34 years, or 88% of the time, post-planting nitrogen application would have provided economic returns at least equal to the economic costs. As long more than 1479 of the 1500 acres received the post-planting application of nitrogen, the benefit would exceed the cost.

The worst case scenario gives an upper bound on the number of acres a farmer desiring to test split N applications should commit to this management style. If a farmer is confident that the machinery will be available during the necessary time, they can conduct a relatively risk free trial of split N fertilization on the worst case scenario number of acres (920 acres in this example).
Saving Nitrogen and Increasing Yield on Sandy Soils

Retaining nitrogen in sandy soils is often problematic. Nitrogen loss is so common that in some years, yield suffers because more nitrogen was lost prior to planting than was anticipated. Thus, there is great potential for increasing yields and reducing overall nitrogen use on sandy soils by adopting post-planting nitrogen application.

Typically, to realize both reduced nitrogen application and increased yield, a reduced rate of nitrogen would be applied in the fall or around the time of planting. A post-planting application would later be applied to the growing crop to supply all of its needs. The risk of this management approach is that yields could suffer if poor weather conditions prohibit post-planting nitrogen application.

Example Situation:

You’re a farmer in Marshall County, KS, who started planted 1500 acres of corn beginning April 30. You’re planning to apply additional nitrogen between May 29 and June 13 (before reaching V8). You estimate that 40 fewer pounds of nitrogen fertilizer would be applied using a split application approach than if all had been applied prior to planting, and a yield benefit of 5 bu/acre is anticipated. You did not apply any nitrogen to your fields last fall or before spring planting, and your crop consultant said if fertilizer is not applied by June 13 you can expect a 52 bu/acre yield loss on those acres not receiving the post-planting nitrogen application.

The Economic Analysis indicates that post-planting nitrogen application would be possible on all 1500 acres in at least 27 of the last 36 years. The net benefit of this approach, after accounting for additional costs of the second nitrogen application, yield gains, and savings from your reduced nitrogen use, would result in a net savings of $44,000 each year.

In the worst year of the last 36 years, only 262 of the 1500 acres planted to corn received post-planting nitrogen. In this case, the yield losses on the 1238 unfertilized acres outweighed the yield gains and nitrogen savings. The net economic result is that, in this one year, you would lose $255,000.

The Breakeven calculation indicates that in 30 of the last 36, or 83% of the time, post-planting nitrogen application would have provided economic returns at least equal to the economic costs. As long more than 1317 of the 1500 acres received the post-planting application of nitrogen, the benefit would exceed the cost.
About Useful to Usable (U2U)

U2U is an integrated research and extension project, funded by the USDA, to improve farm resilience and profitability in the North Central U.S. by transforming existing climate data into usable products for the agricultural community. Our goal is to help producers make better long-term plans for what, when and where to plant and how to manage crops for maximum yields and minimum environmental impact.

The U2U team includes climatologists, agronomists, social scientists and computer specialists who have come together to create tools to aid in farming decisions. Partners include Purdue University, Iowa State University, Michigan State University, South Dakota State University, University of Illinois, University of Michigan, University of Missouri, University of Nebraska, University of Wisconsin, the High Plains Regional Climate Center, the Midwestern Regional Climate Center, and the National Drought Mitigation Center.

U2U Study Region

Map created by Adam Reimer

Crop data from National Agricultural Statistics Service (NASS) U.S. 2007 Census of Agriculture
Major corn areas harvested over 60,000 acres of corn
Minor corn areas more than 5,000 acres of corn

PROJECT CONTACTS:
Linda Prokopy,
Associate Professor and Project Lead, U2U
Purdue University
765-496-2221
lprokopy@purdue.edu

Melissa Widhalm,
Project Manager, U2U
Purdue University
765-494-8191
mwidhalm@purdue.edu

For more information, please visit
AgClimate4U.org
@AgClimate4U

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