

# Economic and Agronomic Considerations for Nitrogen Applications in Cotton



Nitrogen (N) fertilization in cotton is complex due to mechanisms of loss, soil types, variety, and application timing. High input costs associated with cotton production further confound these grower decisions. Nitrogen prices have increased more than 40 percent from spring 2021, which has raised questions about reducing nitrogen rates.

Nitrogen application rates are based on the amount of nitrogen fertilizer it takes to produce a bale of cotton. Producing a bale of cotton on coarse-textured soils requires approximately 50 pounds of nitrogen, but producing a bale on fine-textured soils requires 60 to 70 pounds. Therefore, a cotton crop of two or more bales usually requires 120 to 140 pounds of nitrogen per acre. Nitrogen use rates could vary depending on production environment and varietal growth habit.

Reducing nitrogen rates is a way to hedge against increasing fertilizer costs. However, many of the risks associated with rate reduction are out of the grower's control. Weather is the primary risk factor associated with reducing nitrogen rates. Excessive rainfall contributes to nitrogen losses in the form

of leaching and denitrification. Leaching is explained as nitrates leaching through the soil profile, while denitrification is a microbial process that releases nitrous oxide into the atmosphere. Nitrogen losses also occur under dry conditions through volatilization, which releases ammonia gas into the atmosphere.

Application efficiency is vital with increased fertilizer costs. Split applications are recommended when applying more than 100 pounds of nitrogen, especially when you are considering reducing nitrogen rates. Always apply nitrogen fertilizers before the onset of the reproductive stages. Ideally, as cotton enters these stages, the soil moisture profile should be fully charged and all nitrogen applications completed. Nitrogen is a mobile nutrient, which means cotton plants uptake this element from soil water solution. It will help avoid fruit shed at the onset of bloom if you consider crop stage, application timing, and soil moisture content. In a dryland environment, where moisture is dependent on weather, nitrogen applications should come at an earlier date to capitalize on rainfall.

Some growers may opt to make three-way split application: at planting, at pin head square, and at midbloom application. Here's an example: 40 pounds of nitrogen (11.5 gallons per acre of 32 percent urea ammonium nitrate, or UAN) at planting, 40 pounds of nitrogen (UAN) at pin head square, and an aerial application of 21 pounds nitrogen (100 pounds of ammonium sulfate) at midbloom. A three-way split works best in an irrigated environment. When using colter or knifing rigs, pay close attention to the injection trench. Under marginal/wet conditions, an open trench could lead to exposure and nitrogen volatilization losses. In such situations, a urease inhibitor is helpful. Also, if you apply granular urea that remains on the soil surface for longer than 36 hours without rain or irrigation, it is best to use a urease inhibitor.

Nitrogen prices have almost doubled since March 2021. Depending on the nitrogen fertilizer, current costs range from \$0.96 to \$1.10 per pound. High fertilizer costs are likely to remain throughout the growing season due to tight global supplies and supply-chain disruptions caused by global conflicts. Nitrogen inputs will likely exceed \$100 per acre in most cases, but it is important to make sure the cotton crop has the proper amount of fertilizer available during the critical growth stages. With the current high commodity prices, it is important to ensure you are not losing more revenue from yield loss than money you are saving with an nitrogen rate reduction. When you consider reducing nitrogen rates, a successful growing season will depend on optimizing application efficiency and timing.



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