

Economic and Agronomic Considerations for Nitrogen Application in Cotton

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

Nitrogen rates are based on the amount of nitrogen fertilizer it takes to make a bale of cotton. A bale of cotton produced on coarse textured soils requires approximately 50 lbs of N, whereas 60-70 lbs of N are required on fine textured soils. Therefore, recommendations for a two bale or greater cotton crop are usually 120 – 140 lbs per acre. Nitrogen use rates could vary depending on production environment and varietal growth habit.

Reducing N 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 N rates. Excessive rainfall contributes to N losses in the form of leaching and denitrification. Leaching is explained as nitrates leaching through the soil profile, and denitrification is a microbial process that releases nitrous oxide into the atmosphere. Nitrogen losses also occur under dry conditions as volatilization where ammonia gas is released into the atmosphere.



Application efficiency is vital with increased fertilizer costs. Split applications are recommended when applying more than 100 lbs N, especially if considering reducing N rates. Nitrogen fertilizers should be applied prior to the onset of the reproduction stages. Ideally, as cotton enters the reproductive stages, all N should be applied with a fully charged soil moisture profile. Nitrogen is a mobile nutrient, which means cotton plants uptake nitrogen from soil water solution. Therefore, considering both crop stage, application timing, and soil moisture can help avoid fruit shed at the onset of bloom. In a dryland environment, where moisture is dependent on weather, it is recommended to apply at an early application timing.

Nitrogen prices have almost doubled since March 2021. Depending on the N fertilizer, the current costs range from \$0.96 - \$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 N rate reduction. If considering N rate reductions, paying close attention to application efficiency is key to a successful growing season.

Some growers may opt to make three way split application which would include: at plant, pin head square, and mid bloom application. An example of this could include: 40 lbs N (11.5 gallons per acre 32% UAN) at plant, 40 lbs N (UAN) at pin head square, and an aerial application of 21 lbs N (100 lbs ammonium sulfate) at mid bloom. A three way split works best in an irrigated environment. Growers using colter or knifing rigs need to pay close attention to the injection trench. Under marginal/ wet conditions an open trench could lead to exposure and N volatilization losses. Under these situations a urease inhibitor is encouraged. Also, if granular urea is applied and remains on the soil surface for longer than 36 hours without rain/ irrigation, a urease inhibitor is encouraged.

