

**NITROGEN-15 RECOVERY FOR SURFACE-
AND SUBSURFACE-IRRIGATED COTTON**
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Abstract

Nitrogen-15 labeled fertilizer can be used to measure fertilizer N use efficiency and fate of added N in different N management and irrigation practices. To date, fate of N fertilizer in irrigated cotton has not been well documented in the Southern High Plains. In the arid west, N fertilizer recommendations are based on a soil NO₃ test. In-season monitoring of plant N status may lead to improved N fertilizer recommendations because spring soil NO₃ tests do not account for NO₃ loss or gain between soil sampling and planting. We tested multi-spectral reflectance and chlorophyll meter measurements as in-season N decision aids for two irrigated cotton sites in TX. Zero-N, soil test-based, chlorophyll meter-based, reflectance-based, and well-fertilized N treatments were tested. Multi-spectral reflectance measurements were made using a CropScan® MSR16R spectroradiometer at 20 in. above the canopy, and chlorophyll meter (Minolta® SPAD 502) readings were taken on the leaves. In-season N applications of 30 lb N ac⁻¹ were applied to reflectance and chlorophyll meter plots when the sufficiency index (relative to well-fertilized) was < 0.95 at early squaring, early bloom, and peak bloom. Lint yield responded to N at Lubbock in 2000 and 2001. No N response was observed at Ropesville, due to high spring soil NO₃ and to strong insect pressure. In nine out of twelve treatment-years, less N was applied with chlorophyll meter and reflectance treatments than with the soil test approach. Nitrogen-15 recovery in plants at first open boll ranged from 19 to 38%. Cotton recovery of added N is usually lower than that of cereal crops. This is due to slower growth of cotton, lower N requirements, a deep rooting system, and in our case, substantial soil NO₃. These studies indicate that the internal N requirement for 2 to 3 bale/ac cotton in the Southern High Plains is 40 lb N/bale. In these efficient irrigation systems, ¹⁵NO₃ leached below 24 in. was negligible. Total ¹⁵N recovery in plant plus soil ranged from 50 to 74%. Unaccounted for ¹⁵N was presumably lost through denitrification. Applying N right before and or during irrigation (simulating fertigation) precluded NH₃ volatilization losses.