# NITROGEN ACCUMULATION IN COTTON FERTILIZED BY SUBSURFACE IRRIGATION AND GOSSYM/COMAX MANAGEMENT

**P.G. Hunt, C.R. Camp, P.J. Bauer, T.A. Matheny**
**Coastal Plains Soil, Water,**
**and Plant Research Center**
**USDA-ARS**
**Florence, SC**

## Abstract

Cotton (Gossypium hirsutum L.) production has become more extensive in the eastern Coastal Plain during the past 10 years. Management of nitrogen is important for water quality as well as for seed and lint production. Insufficient nitrogen can prevent the plant from setting and retaining adequate bolls. Excess nitrogen can cause the plant to produce an exorbitant amount of vegetative growth and cause nitrogen leaching into shallow groundwater. GOSSYM/COMAX (GC) is a cotton growth model coupled with an expert system that has been used for management of cotton. Microirrigation is a precise method of water and nitrogen placement. Buried microirrigation does not interfere with normal production procedures; it can be placed under alternate furrows, and it can be used for more than 10 years. Thus, microirrigation could increase precision, reduce nitrogen requirements, and reduce expenses.

A four-year field study was initiated in 1991 to evaluate buried microirrigation and the GOSSYM/COMAX model for improved nitrogen management of cotton. Half of the experimental site was planted in continuous cotton, and the other half of the experimental site was planted in a cotton/peanut two-year rotation. Water and nitrogen fertilizer were applied via microirrigation tubing buried 12 inches below the soil surface. Irrigation tubing was placed under rows or under alternated furrows. For the no irrigation treatment, nitrogen was applied through microirrigation tubing lying on the soil surface. Cotton (cv. PD3) was planted in May of 1991-1994. Nitrogen application consisted of either a recommended application rate of 100 lbs N/acre [Std], five weekly applications of 20 lbs N/acre [Inc], or an application rate determined by GOSSYM/COMAX [GC]. All nitrogen treatments received an additional 10 lbs N/acre as preplant fertilizer. During all four years, the model calculated that 60 lbs/acre of nitrogen was sufficient to meet the needs of the cotton plant. This represented a 36% reduction in nitrogen application as compared to the standard recommended rate.

With in-row irrigation, plants receiving the standard nitrogen treatment (100 lbs N/acre) had more nitrogen removed in the seed relative to plants with the GOSSYM/COMAX or the weekly nitrogen application treatments. With the alternate furrow and no-irrigation treatments, nitrogen application treatments had no effect on seed nitrogen.

With all three irrigation treatments, the percentage of fertilizer-applied nitrogen in the cotton seed was highest with the GOSSYM/COMAX nitrogen treatment. With the GOSSYM/COMAX treatment, an average of 70% of fertilizer-applied nitrogen was removed by the cotton seed as compared to 51% nitrogen removal for the other nitrogen treatments. Differences in percentage of fertilizer-applied nitrogen in the cotton seed at harvest among all treatments were consistent with both continuous cotton and the cotton/peanut rotation.

Seed-lint yields were similar for plants receiving the single 100 lbs N/acre application and the five weekly applications of 20 lbs N/acre. Seed-lint yields for plants that received nitrogen as determined by GOSSYM/COMAX were similar to those that received the standard recommended nitrogen rate of 100 lbs N/acre. Yields were not affected by irrigation treatment, nitrogen treatments, or previous crop. The results of this study indicate that the use of the GOSSYM/COMAX model can produce similar seed-lint yields while reducing nitrogen fertilizer usage by 36% as compared to standard recommended practices. Producing similar yields with less nitrogen fertilizer results in lower production cost and reduced potential for groundwater contamination.

Reprinted from the *Proceedings of the Beltwide Cotton Conference*
Volume 2:1353-1354 (1996)
National Cotton Council, Memphis TN