Cotton Fertility and Soil Test Calibration

By Glen Harris

Cotton has made a comeback in Georgia in recent years. Planted acres have increased from a low of 120,000 in 1983 to 1,440,000 in 1997. Most of this resurgence can be attributed to the boll weevil eradication program that was initiated in 1987 and successfully completed in 1991. Cotton yields in Georgia are also on the rise. Lint yields were equal to or above the 750 lb/A mark in most years since 1991. This increase is also due largely to the boll weevil eradication program. Improved varieties (including Bt), increased irrigation, integrated pest management, nutrient management, and overall better management have also contributed greatly to entering this higher production level.

Increasing acreage and yields of cotton are causing renewed interest in fertilization and soil test calibration. In Georgia, fertilizer recommendations for cotton are now given according to yield goal, based partly on soil type and previous history.

The recent increase in both acreage and yields has focused much attention on fertilization of Georgia cotton and soil test calibration. Unfortunately, budget cuts and lack of interest in soil fertility for production agriculture have eroded the research support in this area. Nonetheless, progress is being made. Starting in the fall of 1997, fertilizer recommendations from the University of Georgia Soil Test Laboratory will be given according to yield goal levels of 750, 1,000, 1,250 and 1,500 lb lint/A. Total nitrogen (N) rates recommended for these yield goals are 60, 75, 90 and 105 lb N/A, respectively. Realistic yield goals based on soil type and previous history are emphasized. In addition, guidelines for adjusting the N rate according to previous crop, insect control, and use of growth regulators are included. Modest increases in phosphorus (P) and potassium (K) recommendations based on crop removal will be made. All liming, secondary nutrient and micronutrient recommendations will remain unchanged and will be the same for all yield goals. An N-P-K fertilization experiment is being conducted to support these recommendations.

As a result of the recent popularity of cotton and waning interest in corn and peanuts, more cotton is being planted following cotton in Georgia (versus following another crop). An on-going field study, initiated in 1993, indicates that N rates need to be increased when cotton is followed by cotton. The optimum N rate for second-year cotton was 80 lb N/A...for third-and fourth-year cotton it was 100 lb N/A. Yield levels for all years of the study were between 1,250 and 1,500 lb lint/A. This study is also being used to verify nutrient sufficiency levels for the current petiole and tissue testing programs.

Increased cotton acreage in Georgia

has created the need for development of fertilizer recommendations on soil types in new growing areas. For example, cotton acreage has recently expanded into the Atlantic Coast Flatwoods soil region. These soils are deep sands that may or may not have a seasonably high water table. Traditional crops in this area include tobacco, corn and soybeans. The second-year of a two-year field study investigating N and K rates for these soils will be completed in 1998. First-year results indicated that N rates, in the 120 lb N/A range, may be needed regardless of depth to water table. Current K recommendations appear to be adequate for this region.

Despite some setbacks, cotton production has increased in Georgia and other areas. On-going research in soil fertility is needed to evaluate practices and guide recommendations.

Coinciding with the recent increase in cotton production in Georgia, the poultry industry has also expanded throughout the state. As a result, millions of tons of poultry litter are available as a fertilizer source for agronomic crops, including cotton. Both on-farm and experiment station research conducted during the last three years indicates that poultry litter is a viable and useful fertilizer. Currently, a preplant incorporated rate of 2 tons/A is recommended. In-season adjustments of additional N and K fertilizer can then be made at sidedress. Higher rates (up to 4 tons litter/A) can be used to meet all the N requirement in some situations. Phosphorus and zinc (Zn) buildup are long-term concerns. Late-season rank growth due to N was an initial concern but does not appear to be a major problem. Having poultry litter analyzed for nutrient content, using a nutrient management plan, and using in-season plant nutrient monitoring are all highly recommended when using poultry litter on cotton.

During recent growing seasons, a significant number of K deficiency problems in Georgia cotton have been reported. This soil fertility problem was really brought to attention by the increased presence of related secondary leafspot diseases. While some leafspot is common in Georgia cotton late in the season, a good number of severe cases have been reported early in the season (around fourth week of bloom). In addition to leafspot fungal organisms common to Georgia, even a relatively new species (Stemphylium), not seen in Georgia since the 1960s, was isolated. Dry weather and drought stress during the last two years has no doubt contributed to the K deficiency problems observed. However, a number of cases have also been reported with irrigation. In these cases, higher yield production with newer varieties is thought to play a significant role. The current strategy to help avoid this problem is to soil test, split the K rate (half at planting and half at sidedress) and possibly apply foliar applications of K. Foliar K sprays are being encouraged when soils test low in K, on deep sands, under high-yield conditions and where K deficiency has been a problem in the past. Field studies to address this fertility problem are currently being planted.

In addition to the soil fertility research indicated above, a number of new practices, or old practices being used under new conditions, need to be addressed. A significant portion of Georgia cotton is currently being grown using conservation-tillage and that will likely increase. This production practice creates unique challenges for soil sampling and fertilization that need to be investigated. Due to recent increases in landfill costs, more and more by-products are becoming available for land application. These materials may be from agricultural, municipal or industrial sectors and may have value as fertilizer, lime or soil amendments for cotton. The soil fertility aspect of precision agriculture is certainly an important and popular topic that will continue to require attention, especially after the development of a cotton yield monitor. Finally, profitable cotton production in Georgia has resulted in the development of a great number of non-traditional growth regulator and nutritional in-furrow and foliar treatment products. These products need to be tested under randomized, replicated, and unbiased conditions to verify their effectiveness. BC

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In Memory of Eugene D. Dixon, 1917-1998

Mr. Eugene D. Dixon, a retired longtime employee of PPI, passed away January 18, 1998. Mr. Dixon, who was 81 years of age at the time of his death, began his career with the Institute in 1937.

Eugene D. Dixon

A native of Brunswick, Maryland, he graduated from Strayer College in Washington, D.C., with a degree in accounting. He served in the U.S. Army Air Corps in 1945 to 1946.

Mr. Dixon officially retired from PPI as Assistant Treasurer in 1986, but continued on a part-time basis through 1988. In his more than 50 years of dedicated service, he held a variety of responsibilities, spanning the terms of the first four presidents of the Institute.

"Gene Dixon was always interested in the well-being of the Institute and its programs of research and education," said Dr. David W. Dibb, PPI President. "He thoroughly enjoyed the association with his colleagues as well as those he met through other activities. Gene will be dearly missed by his family and by all who were fortunate to know him." BC