Similar to the cotton system, the soybean palmer pigweed control system requires good management and timely applications. The POST1 application must be applied prior to any pigweeds exceeding 3 inches in size.

These weed control systems allow farmers to choose their cotton and soybean varieties based on yield and overall net return.

Program 8C-2

▸ Irrigation And Nitrogen Fertility Effects On Cotton YieldAnd Fiber Quality

Presented by Dr. William T. Pettigrew

Plant Physiologist, USDA-ARS, Crop Production Systems Research Unit

Although the price for cotton has appreciated to historically high levels in recent years, the cost for productions inputs has also steadily increased over the past few years. Rising costs have been particularly problematic with petroleum based inputs, such as nitrogen fertilizers and diesel fuel needed to run irrigation pumps. Because of these increasing input costs, it is important for producers to understand how to make the most efficient use of any input they incorporate into their production strategies. This research investigated the effectiveness of three rates of nitrogen fertilization under both irrigated and dryland conditions for 4 different cotton varieties.

Cotton was grown at Stoneville, MS in the years 2009-2011. The four varieties grown were 'DPL 0935B2RF', 'FM 840B2RF', 'PHY 485WRF', and 'STV 4554B2RF'. These varieties represented a range of maturities and breeding programs. Half the plots were furrow-irrigated and half the plots were grown under non-irrigated dryland conditions. All plots received one of three nitrogen fertility treatments (0 kg N ha-1, 56 kg N ha-1, or 112 kg N ha-1). Plots consisted of 4 rows spaced 1-m apart. The plots were 18.3 m long in 2009 – 2010 and 15.2 m long in 2011. The experimental design was a randomized complete block design with a modified split plot treatment arrangement and 6 replicates. The irrigation regimes were the main plots and the split plots were the variety by nitrogen treatments arranged factorially. Dry matter partitioning, canopy light interception, lint yield, yield components, and fiber quality data were collected.

The 2009 growing season was characterized by rains occurring on a regular basis such that the few irrigation events were needed, and those irrigations provided no beneficial effects on yield. Therefore, the 2009 data will not be presented. 2010 and 2011 were both dry years where a strong positive effect from the irrigation was observed. All the varieties responded similarly to both the nitrogen fertilization and irrigation. Although nitrogen fertilization produced a yield increase each year, the extent of that yield response was dependent upon whether the plots were irrigated or not. In 2010, the yield response to the highest nitrogen treatment under irrigated conditions was over twice as much as that observed under dryland conditions (270 kg ha-1 vs. 649 kg ha-1). The yield response to the highest nitrogen level in 2011 was only 208 kg ha-1, but under dryland conditions no significant response to nitrogen fertilization was detected.

Both irrigation and nitrogen fertilization impacted the quality of the fiber produced in 2010. Irrigation increased fiber length and micromaire by 3% and 8%, respectively. In contrast, irrigation caused a 1% decrease in fiber strength. Nitrogen fertilization increased fiber length by 1% and increased fiber strength by 3%. However, the fiber micronaire was 5% lower when the highest level of nitrogen fertilization was applied. Although these fiber quality differences caused by irrigation and nitrogen fertilization are statistically significant, most of those differences were relatively small and would generally not trigger a premium or discount on the price received for the fiber produced.

As the costs and availability of inputs becomes more challenging for cotton producers going into the future, producers will have to make difficult decisions as how to best allocate their input dollars. This research indicates that when water is limited during the growing season (through the lack of precipitation, insufficient irrigation capabilities, or restrictions on the ground or surface water supply available for irrigation), then the nitrogen fertilizer that is applied will not be used as efficiently by the plant to produce yield.

Program 9C-2

Effectiveness Of Variable Rate Fertilizer Applications On Cotton Fields

Presented by Matthew Rhine
Research Associate, University of Missouri

From 1996 to 2004, we conducted cotton field experiments at the Delta Center and on growers' fields to evaluate the effectiveness of variable rate lime and fertilizer. Results showed trends towards higher yields with variable rate technology (VRT) compared to uniform applications, but often the differences were not dramatic or statistically significant. The most important information that we determined was that less fertilizer was applied with VRT in most fields. Variable rate applications generally rely on Veris electro conductivity technology to identify differences in soil texture. This can be helpful when nutrient deficiencies may be attributed to soil type. However, VRT may not accurately identify differences that may be man-made. In many cases, grid sampling may be better suited to identify man-made problems. Fertilizer dealers usually charge farmers $10 to $15 per acre for grid soil sampling and $1 to $3 per acre for variable rate applications. Soil test results are good for 3 to 4 years, but the variable rate charge is an annual expense. In the past, with relatively cheap fertilizer prices, many farmers were not willing to pay the extra costs for variable rate applications. However, over the years, fertilizer costs have dramatically increased, causing the need to reevaluate the cost effectiveness of variable rate technology.

The objective of this research was to evaluate the soil test results of cotton fields on Missouri farms that have had variable rate applications in the past. Fields were chosen that had received variable rate phosphorus (P) and potassium (K) fertilizer applications for several years, as well as fields that had been uniformly applied for comparison. Soils samples were taken on 0.25 acre grids and analyzed for P and K levels at the University of Missouri's Soil Testing Lab in Portageville, MO. Soil P and K levels were evaluated based on whether or not they surpassed critical levels. Critical P and K levels were determined for each field based on cotton production and cation exchange capacity. Different fields were used in both years.

In 2009, many fields under variable rate applications of P and K were found to be below critical nutrient levels compared to uniformly applied fields. The general trend found in most of these fields was that P and K variability appeared to be man-made rather than due to soil type. Our research concurred with previous published studies showing nutrient variability was highest across rows and lowest within rows. Fertility tended to be highest in rows closest to the field entrance and decline in rows farther away. This suggests that spreader trucks in the past may have adjusted the gates down or the chain drives delivered less as they had less fertilizer in the trucks at the far side of the fields. Another pattern that we found was "streaks" of high P or K in rows surrounded by lower P and K in rows to the right and left. This pattern may have been caused by improper swath width spacing and not enough overlap in the spreaders. Since P and K is residual in the soil, application uniformity mistakes may have occurred many years in the past with obsolete spreader technology but being observed in the cotton fields today.

In 2010, soil samples taken from fields under variable rate P and K applications were found to be above soil critical levels in most situations. Only minor problems of one to eight samples per field were recorded if there were any problems at all. In total, cotton fields with variable rate applications averaged 0.4 % of samples low in P and 1.0% of samples low in K. In all but one of the uniformly applied fields, however, widespread areas were found to be below critical levels for P, K, or both nutrients. Uniformly applied fields averaged 10.5% of samples low in P and 36.5% of samples low in K. As recorded in our research in 2009, several fields showed man-made P and K variability rather than soil type variability. Streaks of