Variable Rate Irrigation of Corn (Field 5C)

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Objectives:

1) To describe the interactive biological effects of site-specific water, nutrient, and pest management on crop growth and production in an irrigated corn system in rotation with cotton.
2) Quantify the economic and environmental cost-benefit of managing multiple stresses in site-specific agriculture compared to conventional systems.

Methodology: Following the methods described in the 2002 Helms report, crop management zones (CMZ) were prescribed in field 5 C in early 2003. However, in analyzing the 2002 yield data, it became apparent that comparisons between the CMZ did not give all the information needed to make informed decisions on the use of CMZ. Therefore, in 2003, the water rates were replicated within each span and the CMZ were merely theoretical (Fig. 1). This method gave the ability to compare water management strategies within CMZ to determine which water rates gave the best results. The base rate (BR) water treatment received 16.15 inches of water over the entire growing season while BR+20% received 18.36" and BR-20% received 13.94" of irrigation. Electrical conductivity (EC) and texture data from previous years was utilized in making the CMZ delineations which are outlined in red in figure 1.

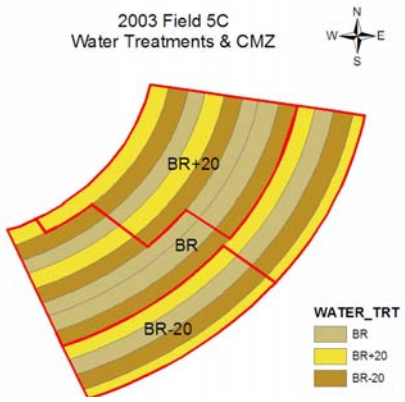

Figure 1. Water rates and theoretical crop management zones on 2003 corn crop.

Corn variety Pioneer 3223 was planted on April 24, 2003 at a rate of 28,000 seed ac^{-1}. Crop growth and soil moisture measurements were monitored throughout the growing season until harvest. These measurements included soil moisture readings, reflectance, and plant samples were collected to measure leaf area index, nitrogen and carbon content, and dry matter accumulation. Yield samples were taken on September 5 along with ratings for lodging and southwestern corn borer damage. The entire field was harvested with a John Deere Greenstar yield monitor combine on September 6, 2003.

Results: Overall the yields were as expected with the BR+20% irrigation rate yielding significantly more than the BR and the BR-20% yielded significantly less than the BR (Figure 2). That trend continued within each CMZ, which was expected, however, it is doubtful that the increase in yields in the BR+20% CMZ were high enough to offset the losses in the BR-20% CMZ (Figure 3). We are continuing to analyze the data to determine if this strategy for defining CMZ and irrigation needs is the most profitable management strategy.

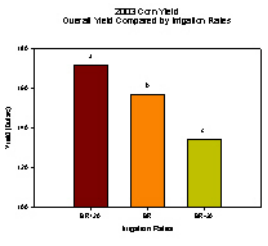

Figure 2. Yield differences between irrigation rates.

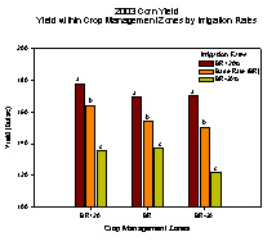

Figure 3. Yield differences between irrigation rates within each CMZ.