Variable Rate Cotton Irrigation with LEPA (Field 5BDE)

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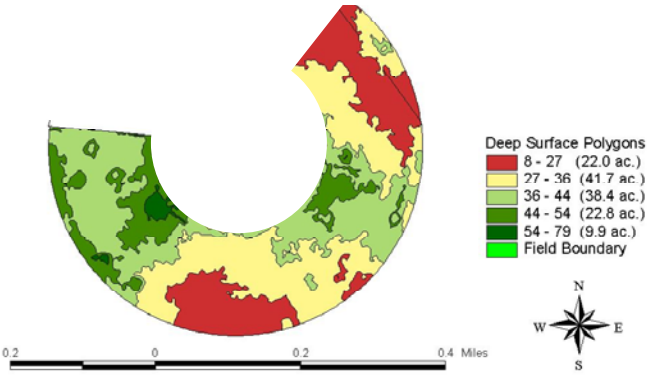
Objective: To correlate cotton lint yield to soil electrical conductivity at three levels of LEPA irrigation in order to establish irrigation management zone criteria and the potential value of site-specific irrigation on the High Plains.

Methodology: A field experiment was conducted to document cotton lint yield as a function of soil EC and irrigation level. Soil EC was measured using the Veris technique (Veris Technologies, Salina KS) on a 60-acre area of the distal four spans of a pivot constructed for variable rate irrigation (Figure 1). Cotton was grown on 45 acres of this area. Irrigations were applied at 80%, 100%, or 120% of a base irrigation rate (BI, Figure 2). Seasonal irrigations after 1 July totaled 7.86, 9.75, and 11.64" in areas irrigated at 0.8BI, 1.0BI (~80% ET), and 1.2BI levels, respectively. Cotton lint yields were determined from samples harvested at 98 geo-referenced sites from ~260 ft^2 areas using a JD 7450 stripper. Soil EC was determined by averaging EC data acquired on 28 Feb. 2003 within a ~10ft radius of each harvest location.

Figure 1. Deep soil electrical conductivity data from the distal 4 spans of the Helms pivot in the area used for site-specific irrigation.



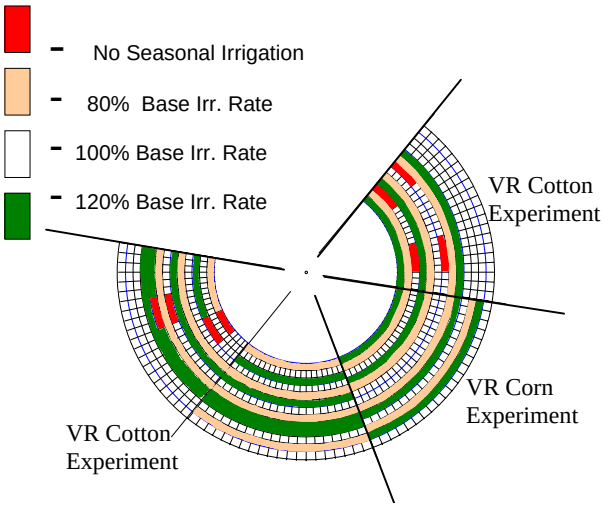


Figure 2. Locations of irrigation treatments within the VR irrigation experiments, 2003.

Results: In general, higher levels of irrigation increased yields, but did not increase water use efficiency. Within the 0.8BI irrigation level, yields increased as a function of deep soil EC (Figure 3). At the 1.2BI irrigation level, average lint yields were lower in areas of soil EC < 30dS/m. However, at the 1.0BI irrigation level, the range of soil EC at this location showed no effect on yield. Evaluations of water use efficiency were similar. This data tends to support the strategy of redistributing irrigation water to high EC areas when restricted by irrigation capacity and applying uniform irrigations when irrigation capacity can more closely meet the needs of a cotton crop.

Figure 3. Correlation of cotton lint yield to deep soil EC irrigated at the 0.8 BI level, Helms Farm, 2003.