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Variable Rate Irrigation System Development and Evaluation (Field 5d)
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Objective: The objective was to modify a center pivot irrigation system to provide variable quantities of water in a pre-programmed manner as the system circles a field and to evaluate the systems performance mechanically and in terms of crop response.

Methodology: The variable-rate system design required water to be supplied from the pivot lateral through pressure regulators and solenoid valves to each of three manifolds comprising the manifold unit. There are three manifold units per 160-ft pivot span. Hoses are used to direct water from the manifolds to the modified LEPA applicator. Nozzle sizes for each applicator provide flow rates of 1x, 2x, and 3x, which, in various combinations, will provide 6 discrete irrigation amounts ranging from 20 to 120% of a base irrigation rate. Manifold units, hoses, and LEPA applicators were installed on Spans 6, 7, and 8 of the Helms pivot. A controller actuated valves supplying water to manifolds at preplanned locations within the field with changes occurring at 3^{o} intervals around the 360^{o} pivot. Mechanical evaluations were made. A field experiment where cotton was irrigated in both VR and uniform fashion was also conducted in 2001. Management zones were established based on slope along the furrow and soil texture. Cotton growth characteristics and lint yield were obtained.

Figure 1. Evaluation of the hydraulic performance of a VR irrigation system, TAES, Helms Farm, 2001.

Figure 2. Remote terminal unit activating valves on Spans 7 and 8 of the VR irrigation system, TAES, Helms Farm, 2001

Results: The mechanical evaluation of the VR irrigation system resulted in modifications in valves and the LEPA applicator. The modifications resulted in very high correlations of actual to desired water volumes. Discrete water applications were made in areas as small as 0.1 acre. Cotton response data is currently being evaluated.

Expectations: Potential improvements in total water resource efficiency as affected by water holding capacities of soils, rainfall runoff, or other water related parameters will be evaluated with this water delivery system. Span 5 will be modified for VR application in 2002.