On-pivot Sensing System for Site-Specific Cotton Management (Field 5BDE)
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Objective: The objective of this research is to implement and test a device, installed on a center-pivot irrigation system, for collecting remote sensing data for use in controlling variable-rate irrigation of crop in that field.

Methodology: The remote sensing system has been installed on a center-pivot irrigation system operated by the Texas Agricultural Experiment Station at the Helms Farm. The system consists of a set of miniature sensors mounted on arms that reach out from the top of the irrigation system in the direction of its normal travel (as shown in the figure below). Three sensors are mounted on each arm so that they observe the crop as the irrigation system moves along. One of the three sensors operates in the thermal infrared spectral band (approximately 10 microns) to measure the temperature of the crop. The two other sensors operate in the red (approximately 660 nm) and near-infrared (approximately 800 nm) spectral bands and are used to correct the measured temperature for the effects of incomplete ground cover. These observations, along with measurements of air temperature, solar radiation, humidity and wind, can be used to assess the water status of the observed crop plants and calculate the amount of irrigation water that should be applied by each emitter in the irrigation system.

Results: Several sets of plant canopy temperature measurements were collected during the 2003 growing season using the thermal infrared sensors. Problems with the design of the protective housings containing the red and near-infrared sensors prevented collection of crop ground cover data. New protective housings are being fabricated and tested to prevent rainwater from damaging these sensors. The complete system should be ready for data collection at the start of the 2004 growing season.

Summary: Initial results during the 2003 growing season demonstrated that plant canopy temperature could be mapped using the on-pivot sensing system. Correction of plant canopy temperatures for crop ground cover should be achieved in 2004 when data will be acquired from the red and near-infrared components of the system. These data will be combined to assess crop water status and develop procedures for estimating site-specific irrigation requirements of the crop.