In 2011, Decagon EC-5 soil water content sensors and a Decagon EM50G cellular datalogger were installed in the middle of each of three irrigation sets. The dataloggers were placed in the drill within the canopy and below the height of the tool bar of cultivating and spray equipment. The sensors were placed at depths of 8, 16, and 24 inches in the drill. The dataloggers were set to collect data every 2 hours and to send data 4 times a day by cellular transmission to the Decagon server where data would be stored. The data would then be available for download on-line from this server to each participant's computer where it could be charted and summarized with Decagon's Data Trac software. We also installed Watermark soil water potential sensors ten rows over from the Decagon sensors, that data was downloaded weekly from the dataloggers.

We installed a new Irrometer wireless monitoring system with the Watermark soil water potential sensors in 2012. It radioed the data from the field to a central receiver and stored it, then by cellular gateway this data was sent to the Irrometer server as changes occurred in the data. At the server, the data is put in tabular and graphical form and can be accessed with a username and password. We installed the same Decagon sensors, dataloggers and wireless systems described above, that were used in 2011. Both wireless sensors were installed in the middle of each run of each set, the Decagon was 10 rows over from the Watermark sensors. The Watermark sensors and the Decagon sensors were both installed at depths of 8, 16, and 24 inches.

The Irrometer transmitter modules in the field were modified slightly by adding an extension cable (LMR 195 coaxial cable with RSMA connectors) between the unit and its antenna, so the unit could be placed low enough in the drill to miss being damaged by tractors and their implements. The antenna was placed on the top of a six foot fiberglass pole that was flexible enough to not be damaged.

The cellular transmission of these two systems worked well when there was a good signal and the correct SIM card is installed for your area. The dataloggers for each unit worked well unless the batteries became dislodged or there was a bad connection to the sensors. In any of these systems, if moisture gets into the enclosure there will be problems and there are some issues still to be investigated.

Results from the Decagon EC-5 and the Watermark sensors in 2011 and 2012 were similar. The later initiations, where there was more water removal at initiation at the 24-inch depth, had the highest yield samples collected. Rainfall occurring soon after an irrigation in 2011 and some timely rainfall in 2012 during the growing season reduced the demand for irrigation.

Chris monitored the data regularly throughout both seasons, and felt the later initiations would save him an irrigation in most cases on these soils. Chris especially liked the rainfall data that was reported remotely.

Program 2PA-2

▸ Variable Nitrogen Rate Technology In Cotton Production Using An Integrated Optical Sensing System

Presented by Dr. Brenda S. Tubaña

Assistant Professor, LSU AgCenter

The adoption of site-specific management of nitrogen fertilizer has resulted in increased use efficiency and improved net profit in many crop production systems. Variable rate technology (VRT) is among the precision farming techniques that can be employed to carry out site-specific application of nitrogen fertilizer. This is considered an established and well-adopted technology mainly in U.S. grain crops acres utilizing parameters such as electrical conductivity to create nutrient prescription maps, and optical sensing to run the more sophisticated-variable nitrogen rate application system which sense and treat crops on-the-go. A multi-state on-farm demonstration project was initiated in 2012 at different locations in Louisiana, Mississippi, Tennessee, and Missouri to evaluate the performance of VRT based on optical sensing system in cotton production. The overall goal of this project is to encourage producers' adoption of this new precision nitrogen management technology and system on their farms to reduce nitrogen fertilizer consumption and potential nitrogen losses, improve cotton productivity, and thus improve water quality and growers' profitability in the Mississippi River Basin. In Louisiana, this project was established on three producers' fields in Tensas Parish (Fields A, B, and C) where soil texture within field was highly variable. Initial deep core soil samples were collected prior to planting for determination of soil nitrogen in the form of nitrate and ammonium, and other chemical properties. A total of 45 cores were collected from each field; each core was separated into 0-6, 6-12, 12-18, 18-24, and >24 inches depths. Coordinates of these 45 cores from each field were recorded to retrieve the locations during the post-harvest deep core sampling. Three different N management systems were compared in large strip plots (40-ft wide run x 1000-ft long): producer's current N management system (N1), a VRT based on GreenSeekerTM optical sensing system and a fertilizer rate algorithm derived from multiple years of previous research data (N2), and similar VRT optical sensing system as N2 but adjusted for soil productivity zones (N3). The N1 represented the standard practice of the participating producers in terms of nitrogen fertilizer management; the application rates for Fields A, B, and C were 100, 125, and 135 lbs N ac-1, respectively applied one time at or immediately after planting. Strip plots under the N2 and N3 treatments received the first nitrogen application at rates of 50, 75, and 65 lbs N ac-1 for Fields A, B, and C, respectively. The second application was done at early bloom stage. The nitrogen rate recommended by the VRT optical sensing system (N2) ranged from 2-30, 5-90and 2-50 lbs N ac-1 but when adjusted by soil texture (N3), the nitrogen application rates ranged from 0-60, 0-120, and 0-80 lbs N ac-1 for Fields A, B, and C, respectively. For in-season field data collection, each strip plot was divided into 10 subplots wherein normalized difference vegetation index (NDVI) readings and leaf tissue samples were collected at early square, early bloom and mid bloom growth stages. At harvest, grab samples of seed cotton were collected for lint yield percentage determination. The parameters that will be presented and discussed to compare the performance of these three nitrogen management systems include cotton lint yield, total nitrogen fertilizer applied, agronomic nitrogen use efficiency, and net return to nitrogen fertilizer use. The relationships among leaf nitrogen content, NDVI readings, post-harvest soil nitrate and ammonium, and lint yield will be also presented.

Program 4PA-2

Development Of Sensor Based Detection Of Crop N Status For Utilization In VRN Fertilization

Presented by Dr. Jac J. Varco

Professor of Agronomy, MSU

Early season detection of corn and cotton N status as an in-field indicator of spatial N availability and fertilizer N demand has been difficult with proximal sensors. Fields containing significant variability in soil properties which influence variation in soil N availability are the best candidates for variable adjustment in the optimum fertilizer N rate across fields. A variable rate application of fertilizer N should be strongly tied to matching supply and demand for available N. Excess use of purchased N fertilizers can lower profitability as well as result in environmental consequences due to leaching of nitrates into groundwater or transport to surface waters as well as potential gaseous losses . Our objective has been to evaluate selected vegetation indices for their ability to detect early season crop N status. Relating canopy reflectance back to N content of plant tissue allows for the establishment of a quantitatively linked indicator. Published indices have the ability to detect biomass, greenness, and chlorophyll with varying degrees of success and known ranges in tissue N sufficiency are useful in determining adequacy of available N or fertilizer supplied N. Four fertilizer N rates were applied to cotton (0, 40, 80, and 120 lb/a) and corn (0, 80, 160, and