nitrogen rate. A sensor controlled applicator was used to make a nitrogen application to the participating crop. This application was based on the NDVI readings. There was a nitrogen rich reference strip placed in each field for the calibration of NDVI sensor values. As no fields are the same a universally-standard NDVI cannot be established, thus the use of the calibration strips. The past yield history of the field in conjunction with yield goals and NDVI data were all information used in Dr. Tubana' s algorithm she is currently developing for Louisiana crops, in the establishment of the maximum and minimum nitrogen rates. At the correct growth stage for the participating crop, tissue samples were taken and used to determine a base level of nitrogen for the plants. Seven to ten days after the sensor controlled application plant samples were taken to determine the nitrogen levels present in the plants. All samples were taken from both the sensor controlled area and the farmer standard part of the field. The producer harvested the crop at maturity using equipment outfitted with yield monitors. The yield data was processed and analyzed using site specific techniques. The results from both treatment areas were compared according to soil zones or other criteria.

Program 3PA-2

On-Farm Irrigation Scheduling Demonstration Using Commercially Available Wireless Soil Moisture Systems In Cotton

Presented by H.C. (Lyle) Pringle, III

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An irrigation demonstration project, funded by Cotton Incorporated (CI), was initiated in 2011 in Mississippi to assess the usability of commercially available wireless soil moisture systems. Soil moisture sensors have been around for years, but adoption by producers has been almost non-existence in the mid-South, largely due to the amount of time and effort needed to collect a limited amount of data and process it into a usable product. The addition of electronic dataloggers allowed the collection of enough data that one could chart the drying of the soil between rains or irrigations as the crop uses the soil moisture or the wetting of the soil with rain or irrigation, a great improvement. Typically, data would be downloaded from the dataloggers once or twice a week, and then it would be transferred to a computer and put it into a chart and/or tabular form. Now, all the soil moisture sensor manufacturers are offering wireless solutions to send your data out of the field and into your computer or smart phone with associated software that will automatically put the data in chart and tabular form, greatly decreasing the time needed to obtain the data. For this to be accepted by producers, it will need to be user-friendly, fast, accurate, reliable, easily interpreted, and economical. CI has funded several demonstrations in the mid-South to assess the functionality of these systems.

An irrigation initiation demonstration was performed on Bush family farms in fields near Greenwood, MS in 2011 and fields near Money, MS in 2012. The youngest son, Chris, agreed to this project because he was concerned about potential water regulations in the Mississippi Delta and he was concerned about water conservation on his farm. He was also interested in getting information on soil moisture remotely, especially on fields located farther away from his headquarters.

In this project, I partnered with Ken Fisher, USDA, Darrin Dodds, Mississippi Cotton Specialist and Jerry Singleton, Area Extension Agent. We agreed to install sensors, dataloggers, and wireless equipment in these fields. In 2011, Chris was asked to initiate irrigations in each of three sets approximately a week apart if no rainfall occurred, starting the first set at the time he felt was proper. Once initiated, he was to determine the timing of subsequent irrigations to each set. As we collected soil sensor data, it was made available to all involved. We consulted with Chris on when to start the first initiation and when to start back with subsequent irrigations on each of four set using the soil moisture readings in 2012.

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

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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