time and each year is different. Additional information such as: crop rotations, soil sampling, crop sensing and irrigation add to the time involved in developing the management zones. A popular misconception about precision agriculture is about saving money, but precision agriculture is about managing money, balancing inputs to yield goals for maximum profits.

Program 3PA-2

The Use Of NDVI Sensors To Apply Variable Rate Nitrogen To Crops In Northeast Louisiana

Presented by Ralph Frazier
County Agent - Madison Parish, LSU AgCenter

Nutrient management of crops has been identified as a critical challenge affecting the quality of our nation's water resources in agricultural and rural watersheds. Water conservation and protection have become important parts of agricultural stewardship. Moreover, proper management of nitrogen can improve the soil and protect the environment without negatively impacting crop yield. Over-application of nitrogen fertilizer can serve as a potential non-point source of pollution for surface and ground waters. Excess amounts of applied nitrogen not utilized in the yield production of a crop can be leached from the soil to adjacent water sources such as farm ponds, recreational lakes or wetlands. Loss of nitrogen creates a negative financial impact on the farm through unnecessary expenditures, and changes the natural ecosystem in nearby water bodies causing excess vegetative growth with the potential for causing a negative impact on wildlife.

The adoption of precision agricultural techniques requires the use of specialized equipment and technology, some of which may already be on a producer's existing equipment. Understanding how to use the available precision agriculture equipment or to justify the purchase of equipment is a major factor in being able to realize any gains from having the equipment. As producers use the equipment more, it is only natural they would want to expand its use, thereby lowering the cost/return on the equipment.

Crops in Northeast Louisiana are grown in fields with many environmental variables, including soil type, soil fertility levels, temperature fluctuations, humidity levels and sometimes-inadequate rainfall. To maximize production across these variable environments without over or under application of nitrogen inputs, the use of precision agriculture equipment is vital.

An innovative approach to best management practices (BMPs) for fertilizer is the Right Source, Right Rate, Right Time, Right Place concept. This practice is also known as 4R nutrient stewardship. Precise management practices for fertilizer applications allow the farmer to manage crop fertilizer needs by selecting the right source-rate-time-place combination of the 4R Nutrient Stewardship practice. This project has demonstrated the 4R concept to help farmers understand how the right management practices for nitrogen fertilizer contribute to sustainability goals for agriculture. Active light sensors are used to measure NDVI, normalized difference vegetative index, which measures the health and vigor of plants. NDVI is a measurement of the relationship of red light which is absorbed by the plant and near infrared which is reflected back to the sensor. The greater the biomass and health of the plant the more red light is absorbed and the more NIR is reflected. The use of crop sensors mounted to fertilization equipment can aid the farmer in applying various rates of nitrogen and can significantly increase the efficiency of nitrogen-based fertilizers.

Site specific application of nitrogen based on crop sensor measurements is the next step in on-farm applications of research being currently conducted by LSU AgCenter scientists. The demonstrations were conducted in coordination with the producers' normal operations. The producer planted the crop in the demonstration field according to his normal operating plan, during the recommended planting window, and treated according to Best Management Practices. The producer applied nitrogen fertilizer to the demonstration field at the normal time. The sensor controlled portion of the field was treated with 50% of the farmers' standard 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
Associate Agricultural Engineer, Delta Research & Extension Center, MSU

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.