Mississippi Corn Promotion Board
2015 Progress Report

Project Title: Corn Verification Program

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Department: Plant and Soil Sciences and Biochemistry, Molecular Biology, Entomology and Plant Pathology

Project Summary (Issue/Response)

Corn is an integral component of Mississippi's agricultural production systems. During the last few years, corn has become the second most popular Mississippi row crop based upon planted acreage and value. Although corn productivity has increased more than any other Mississippi row crop during the past twenty years, we believe there is tremendous potential to improve our production systems. Thus, the Mississippi State University Extension Service has established a Corn Verification Program supported by the Mississippi Corn Promotion Board using your checkoff funds designed to assist with the implementation of better management practices and technology and to identify limitations in our corn production systems. We do so while keeping the foremost objective of increasing profitability of Mississippi's corn production systems – not just trying any and all methods, some of which may have little practical merit and ultimately be unprofitable. We seek to accomplish these goals through the gracious cooperation of producers who grant us the opportunity to provide guidance and implement improved practices in one field on their farm. We develop a management plan uniquely tailored for each field and cooperator. Verification fields are scouted on a weekly basis to monitor crop response, potential limitations and ensure timely and prudent implementation of in-season practices. This process allows us to demonstrate value of new or improved management practices that are currently not being utilized.

Project Results/Outcomes

Our Corn Verification team continues to focus efforts to improve corn water and irrigation management and work closely with our Irrigation Specialist, Dr. Jason Krutz. Crop productivity often suffers considerably when our climate dramatically shifts from abundant rainfall to drought. We recognize that soil saturation, as well as moisture deficit, has negative impacts on corn growth and development. Implementation of soil moisture sensors in Corn Verification fields have confirmed that soil saturation resulting from abundant rainfall or poorly timed irrigation severely limits corn root activity and depth, particularly during the early part of the season. This substantially restricts the water and nutrient availability required to support optimal corn growth and tolerance of adverse environmental conditions. Therefore, we are integrating soil moisture information with corn physiological needs to significantly improve irrigation scheduling for our corn production systems. For example, corn is very tolerant to water deficit during vegetative stages, when crop water needs are relatively low and soil moisture reserves are normally plentiful. Therefore, we suggest a very conservative irrigation schedule until just prior to tassel. Implementation of this strategy also encourages much deeper root growth, documented at least 36" deep in our Verification fields.

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Project Results

Similarly, as corn progresses through late reproductive stages, water demand tremendous possibility to improve crop response to irrigation, as well as greatly enhance efficiency of this valuable resource. Grower adoption of this technology and methods is rapid due to the efforts and results of our cooperative programs.

Verification fields have been closely evaluated for the past several years to document stand variability and identify causal factors. Uneven plant spacing as well as delayed seedling emergence are common corn yield limitations. These issues sometimes develop when planting extremely early or during adverse environmental conditions. Thus, we developed corn planting guidelines based upon soil temperature and moisture, rather than relying solely on calendar date for initiating planting. Corn Verification Program research evaluated crop response to planter speeds ranging from 3 to 6 mph and type of seed metering system. Results showed corn grain yield was reduced 4.2 bu/a for each mph increase in ground speed of a John Deere planter. Retrofitting a John Deere planter with a Precision Planting e-Set metering system increased corn yields an average of 5.9 bu/a and improved crop response to increasing ground speed by 17%. Furthermore, we are also evaluating the effect of delayed seedling emergence on productivity. Our preliminary research shows irregular seedling emergence will reduce corn yield about 30% for each leaf stage delay. This may result in substantial yield loss, which can be just as harmful as poor plant population or delayed planting. Thus, we intend to focus research and educational efforts on uniform stand development.

Glyphosate and ALS resistant ryegrass populations initially developed in the Delta have now rapidly encompassed nearly the entire state, presenting significant challenges for corn production. The Corn Verification Program has documented that emerged ryegrass is extremely competitive with young corn, and our ryegrass populations, which are often resistant to both glyphosate and ALS herbicides, cannot be reliably controlled after corn plants emerge. Therefore, MSU scientists have developed a specific management plan for controlling ryegrass competition in Mississippi's corn production systems. The three-part system includes the use of a fall-applied residual herbicide designed to limit population of resistant ryegrass, followed by two separate spring-applied postemergence herbicides with different modes of action to completely control ryegrass before corn emergence. Thus, our successful implementation and demonstration of this specific plan has proven to be imperative to successful control, and has greatly enhanced widespread adoption of this plan.

The Corn Verification team often finds substantial insect damage during early corn vegetative stages. Plant damage has occurred, despite the presence of insecticide seed treatments designed to limit seedling injury. One of the pests identified causing damage is the Sugarcane beetle, which is a unique pest found in our region. Awareness created from the Corn Verification Program has led to considerable MSU research investigating these issues. We have evaluated enhanced levels of seed treatment insecticides and documented merit in many cases. We have also identified an alternative and potentially more viable pest control alternative (liquid in-furrow insecticide) and improved our understanding of Mississippi's corn seedling insect pests. The Corn Verification Program fields are being used to evaluate and build a data base documenting the value of liquid in-furrow insecticides for use in Mississippi corn production systems.

The Corn Verification Program offers tremendous opportunity to identify limitations and develop more productive cropping systems.

The integration of soil moisture sensors, technology, and crop water needs offers tremendous potential to improve corn profitability for Mississippi growers.

Project Impacts/Benefits

The Corn Verification Program provides first-hand opportunity to identify many factors limiting corn productivity in Mississippi, so that we can better direct research efforts and develop strategies or implement new technologies pertinent to our region and specific systems. Each of the issues identified in the previous section have developed into major research projects conducted by Mississippi State researchers training graduate students. Of course, an on-farm verification program also is a tremendous method to demonstrate value associated with adoption of improved strategies and new technology. For example, our efforts have helped increase corn yield to record levels, while reducing irrigation water usage over 40%. We believe the cumulative adoption of improved practices addressing multiple issues identified through this program offer tremendous possibility to improve production systems and reduce risks which influence profitability and sustainability of growing corn in Mississippi.

Project Deliverables

Professional Presentations and Outreach

National Conservation Systems Corn and Soybean Conference, 2 presentations, Memphis, TN. 1/13-14/2016.

Delta Agricultural Exposition, 3 presentations, Cleveland, MS. 1/20-21/16.

MSU Row Crop Short Course, MSU, MS. 12/1/15

Alabama Corn and Wheat Short Course, Auburn, AL. 12/14/15.

Mississippi Agricultural Industry Council Certified Crop Advisor Training Session, Orange Beach, AL. 7/22/15.

Mississippi Farm Bureau Federation Corn and Soybean Commodity Conference, Grenada, MS. 7/9/15.

Mississippi Agricultural Consultants Association Annual Meeting. Mississippi State, MS. 2/03/15.

Delta Agricultural Exposition, Cleveland, MS. 1/21/15.

National Conservation Systems Southern Corn and Soybean Conference, Baton Rouge, LA. 1/15-16/15.

National Corn Growers Association Commodity Classic – University Extension Specialists' Roundtable, San Antonio, TX. 2/27/2014.

National Conservation Systems Corn and Soybean Conference, 2 presentations, Robertsdale, MS. 1/15-16/2014.

Farm Journal Corn College, 2 presentations, Murfreesboro, TN. 1/7/2014.

National Corn Growers Association Commodity Classic – University Extension Specialists' Roundtable, Kissimmee, FA. 2/28/2013.

Arkansas Crop Management College, 2 presentations, Little Rock, AR. 1/22/2013.

Farm Journal Corn College, Vicksburg, MS. 1/8/2013.

National Corn Growers Association – Corn Utilization and Technology Conference, Indianapolis, IN 6/4-6/2012.

Published Materials

Published regularly on www.Mississippi-Crops.com

Educational Training

Research Associate Jenny Bibb assists with the Corn Verification Program in conjunction with her training associated with pursuing a Doctor of Philosophy degree at Mississippi State University.

Three undergraduate students at Mississippi State University work part time to assist activities in the Corn Verification Program.