



## Mississippi Corn Promotion Board 2016 Progress Report

Project Title: Non-Uniform Stand Assessment

PI: Erick Larson and Brien Henry

Department: Plant and Soil Sciences

---

### Project Summary (Issue/Response)

---

Mississippi's naturally abundant rainfall often drastically limits suitable days acceptable for corn planting during the spring. This often leads to planting in less than desirable conditions. In addition, cool temperatures may also retard corn seeding growth and elevate risk associated with seedling pathogens, insect pests, nematodes and other factors known to inhibit seedling health and survival. In most instances, the corn stand achieved is rarely absolutely perfect and contains issues and variability. Adverse environmental conditions frequently reduce Mississippi's corn stands and create considerable emergence variability, particularly during the past couple of years. Furthermore, numerous factors, such as hail damage, freeze injury, and topical liquid nitrogen application, may defoliate or stress young corn seedlings, which may also create similar disparity in corn plant development and potentially reduce productivity. Stand issues are a substantial problem because corn is very responsive to stand density, uniform spacing and synchronous development. Corn productivity is very dependent upon uniform growth because it possesses a determinate growth habit, which prevents stunted plants from catching up or utilizing resources as efficiently as normal plants. In addition, corn does not possess the compensatory reproductive ability of many other crops, including the ability to tiller, or greatly increase its number of fruit-bearing structures. Despite these well-known issues, most corn stand assessment guidelines are based nearly exclusively on plant population with little or no allowance for these limitations. As corn productivity and management capabilities continue to increase, we believe you must also take into account developmental disparity and other forms of stress which are known to limit plant competitiveness and will likely ultimately reduce productivity, when making replant decisions.



---

### Project Results/Outcomes

---

Corn growers faced substantial challenges during the planting season for the fourth consecutive year in 2016. Frequent rainfall from March through April delayed or restricted planting in most regions, and caused substantial stand failure and seedling emergence variability. Persistent rainfall during March and April, have also hindered Mississippi corn planting intentions 20 to 50% during recent years, and delays corn planting progress. Late planting is well-documented to likely reduce corn productivity. Heavy and persistent rainfall often create corn stand issues which warrant considerable replanting throughout the Mid-South region.

Our first objective of this research is to quantify corn yield reduction associated with variable emergence common in Mid-South corn fields. Field studies were grown in irrigated or dryland culture at numerous locations. Four patterns simulating various extent of affected plants and four different emergence delays were implemented in uniform corn plants grown at normal plant populations. These treatments were achieved by hand planting individual corn seeds in to achieve the desired patterns and delays we evaluated. Yield loss occurred when plants emerged later than others. Comprehensive yield loss associated with variable emergence ranged up to 22%, compared to a uniform corn stand. This yield reduction from emergence variability is substantial and needs to be accounted for when assessing poor stands, just as is commonly done with low plant population. Greater difference in emergence disparity

---

## Project Results

---

substantially increased the extent of yield reduction. Corn grown in dryland culture appeared to be more vulnerable to yield reduction resulting from variable emergence. Seedling corn plants were closely monitored to document emergence variability. Growth stages were measured in three different manners in order to identify the best field method to characterize corn stand variability. The “droopy leaf” method or plant height disparity best characterize growth stage differences in the field.

Another objective was to evaluate practical replanting methods for Mid-South corn growers. Mississippi growers normally grow corn on prepared, raised beds, so when stand issues occur, they must choose between killing a partial stand with herbicides or intra-planting into the partial stand. Our research treatments included four plant populations planted at a normal time and replant interval. Two different series of replanting methods were imposed to evaluate the productivity of intra-planting seed into a partial stand. Intra-planting produced a huge growth disparity between the two stands of corn growing on the same bed. This 3-4 leaf stage disparity created considerable competition between plants in the intra-planted treatments. Corn grain yield was 11% higher when replanting in a clean seedbed, compared to any intra-planting method. The seeding method employed when intra-planting did not influence the productivity of the replanted corn crop.

## Project Impacts/Benefits

---

Corn growers in the Mid-South region face challenges during the spring which often limit their ability to achieve perfect stands. This research assesses the impact that emergence disparity has on corn productivity and relates those findings to replant decisions. Our goal is to also identify a field-based method which growers, crop consultants and other advisory personnel can use to characterize corn developmental disparity they encounter, based upon research results. Furthermore, this research will also evaluate various replanting methods for corn grown in the South.

## Project Deliverables

---

### Professional Presentations and Outreach

Larson, E.J., (December 6, 2016). “Focal Points to Enhance Mississippi Corn Productivity.” Row Crop Short Course. Mississippi State University.

Pettit, K. A., Larson, E. J., Cox, M. S., Henry, W. B., Irby, J. T., Catchot, A. L., (November 3, 2016). "Evaluation of Corn Replanting Methods for the Mid-South." Plant and Soil Sciences Departmental Poster Contest, Department of Plant and Soil Sciences, Mississippi State University. Award: First place in Master’s Graduate Student Division.

Pettit, K. A. and Larson, E. J., (August 11, 2016). "Evaluation of Corn Replanting Methods." North Mississippi Research and Extension Center Row Crops Field Day, Verona, MS.

Larson, E. J., (August 9, 2016). "Corn Stand Issues and Replant Decisions." Oral Presentation. Mid-South Association of Wheat and Feed Grain Scientists, Madison, AL.

Pettit, K. A., Larson, E. J., Cox, M. S., Henry, W. B., Irby, J. T., Catchot, A. L., (Feb. 4, 2016.) "Evaluating Replanting Methods for Corn." 3rd Annual MSU Future of Ag Graduate Student Competition, Mississippi State University.

### Educational Training

Graduate Student K. Allen Pettit is conducting this research project in conjunction with his training associated with pursuing a Master’s degree in Agronomy at Mississippi State University.

Three undergraduate students at Mississippi State University work with activities needed to support this research project.



**MISSISSIPPI STATE**  
UNIVERSITY™

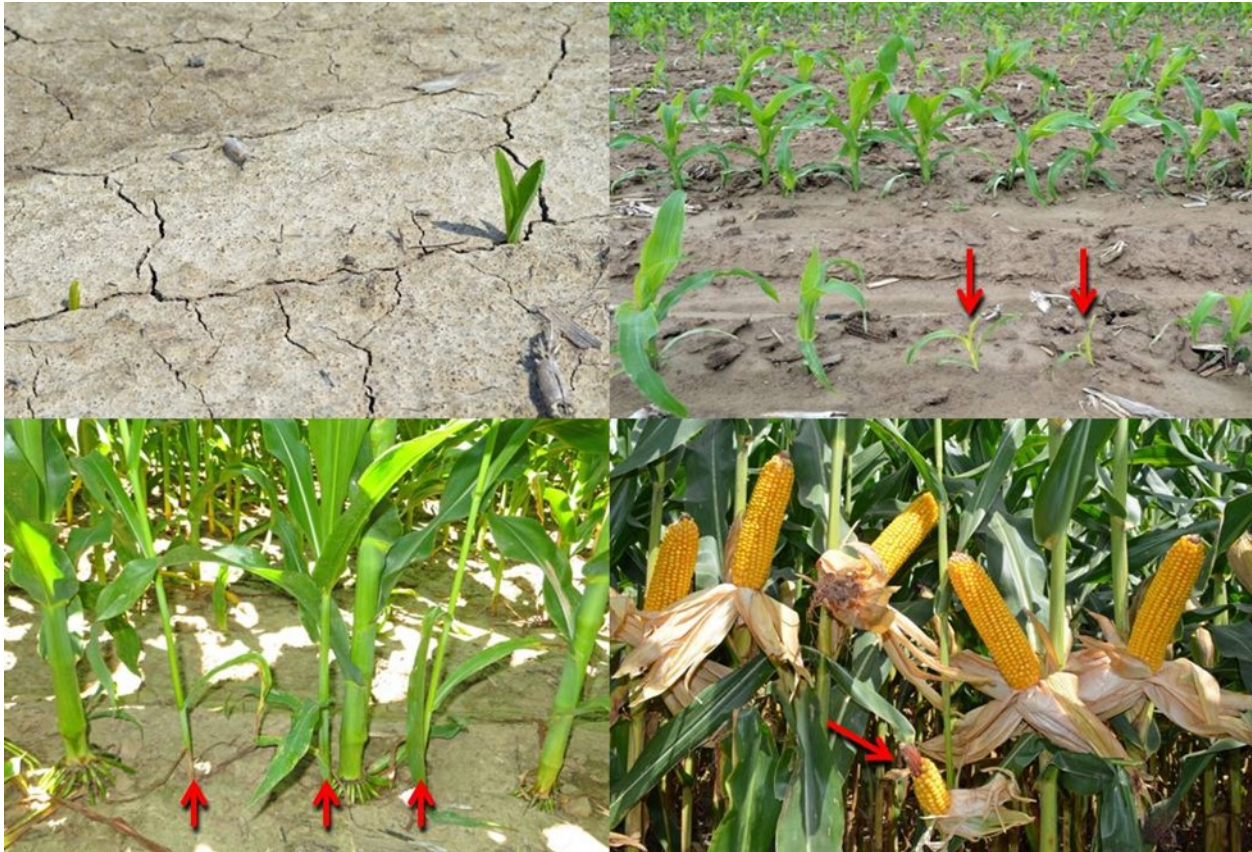
MS AGRICULTURAL AND  
FORESTRY EXPERIMENT STATION



**MISSISSIPPI STATE**  
UNIVERSITY™

**EXTENSION**





Caption: Emergence variability is a common corn stand issue in the Mid-South that will limit productivity and competitiveness of late-developing plants.



Caption: This project evaluates productivity of late-emerging corn plants, compared to normal plants, so that growers can better assess plant stand quality and make better replant decisions.