

Title: Developing Best Management Practices for N Fertilization in Arkansas Corn Production.

Investigators: T.L. Roberts, Project Coordinator UADAF, N.A. Slaton, UADAF, and Jason Kelley, UACES.

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2014 Report:

Fertilization continues to be a large portion of a producer's input costs and with lower prices predicted for the next growing season it is essential that proper steps are taken to maximize nutrient use efficiency. Producer profitability is the focus of these research projects and centers around identifying the most efficient and economical use of N fertilizer inputs. Previous research has shown that preplant N fertilizer has very low uptake and N use efficiency, but is essential for getting the crop started on the right track. The primary focus of this year's project was to determine the fertilizer N uptake efficiency (FNUE) of preplant N fertilizer based on N rate and N fertilizer placement. This will allow recommendations to be made concerning the most efficient use of preplant N fertilizers to maximize yield and producer profitability. In addition to preplant FNUE work was conducted to determine how pretassel N applications influence corn yield and develop management practices for the most efficient use of N fertilizer.

The second year of a trial featuring ¹⁵N-labeled urea was established at the Pinetree Research Station (PTRS) near Colt, AR. To better understand the N use efficiency of preplant N fertilizer in furrow-irrigated corn, four N rates 0, 30, 60 and 90 units of N/acre and three application strategies were used. The application strategies for preplant N included incorporation into the bed, surface broadcast and an in-furrow treatment where the N was placed on the soil surface in the bottom of the furrow. Corn was sampled at V6 to determine the FNUE, which is near the time when most producers would begin applying their sidedress N applications. Fertilizer N use efficiency (FNUE) is defined as the percentage of applied fertilizer that is actually taken up by the corn plant. Results of this year's trial indicates that very little of the preplant N fertilizer has been taken up by the corn at the V6 growth stage. The highest FNUE was seen when 60 units N/acre was incorporated into the bed and only reached 13% which equates to about 8 units N/acre of fertilizer in the plant prior to sidedress N application. At the

highest rate of 90 units N/acre incorporated, the FNUE was much lower only reaching 8% with roughly the same mass of N fertilizer making it into the plant as the 60 unit N/acre treatment. In terms of application strategy the incorporated treatment resulted in significantly higher FNUE for the 30 and 60 unit N/acre treatment. Surface broadcast was the second best application strategy, with in-furrow application resulting in the lowest FNUE regardless of the N rate applied. Although more of this N can be taken up throughout the growing season, the corn plant could better use this N if applied later in the season rather than preplant. This data strongly suggests that preplant N fertilizer should be applied at rates near 60 units N/acre and incorporated in order to maximize yield, fertilizer N uptake efficiency and producer profitability.

Over the past three seasons N rate trials have been implemented to focus on the benefits of pretassel N for increasing corn yield. Previous research indicated that the pretassel N application was taken up by the corn plant with very high efficiency, but at this point in the season three of the four primary yield components in corn are already set and therefore only kernel weight can be influenced by the pretassel N application. Results from 10 site-years of data indicated that pretassel N can be a valid component of a N fertilization program, but yield increases should not be expected from this application time compared to early sidedress N applications made prior to V8. Producers who consider implementing the pretassel application time into their N fertilization program should remove this from either the preplant or sidedress N application rates and not add it above the standard N rate recommendation. Current N rate recommendations for corn can be applied as either a 2-way or 3-way split. Producers who want to use a pretassel N application time would use the 3-way split with 45 units N/acre at pretassel, ~60 units N/acre preplant and ~115 units N/acre sidedress. Increasing N rates above 220 units N/acre for silt loams and 290 units N/acre for clays by adding an additional 45 units N/acre at pretassel will not result in increased corn yields.

In addition to N response trials, a Zn fertilization study was conducted at PTRS and the Rice Research Center near Stuttgart. This study is focused on preplant and early-season (>V4) Zn applications and their influence on Zn tissue concentration and corn yield. For the Stuttgart location there was a significant response to Zn fertilization and suggested that banding low rates of Zn in-furrow were as good as the traditional 10 lb Zn/acre broadcast and incorporated. Banding Zn in-furrow could provide a substantial cost savings for producers that require Zn fertilization to maximize corn yield.