Interaction Of Seeding Rates And Nitrogen Rates For Twin-Row Corn Production In The Mississippi Delta

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Twin-row crop production systems have begun to appear in many row-crop fields in the Mississippi Delta especially in corn and soybean systems. Producers have made the decision to invest in equipment that is capable of planting corn or soybean in dual rows (8 to 10 in apart) on the crown of traditional raised beds spaced at 38 to 40 inches. A multiple-year program was initiated in 2005 with an innovative producer near Stoneville, MS to evaluate the interaction of nitrogen (N) rates (180, 220, and 260 lb N/ac) and seeding rates (24,380 to 40,360 seeds/ac) for twin-row corn on 38-in beds. The producer-field study consisted of a 3x5 factorial arrangement of N rates and seeding rates with four replications. The study was planted each year on a Bosket very fine sandy loam soil (Mollic hapludalf), following cotton (2005-2007) or corn (2008), with a MonosemJ twin-row vacuum planter. The study was rotated to follow other crops in 2005, 2006, and 2007 and followed corn in 2008. Seeding rates were based on calibration tables supplied by the planter manufacturer and modified prior to the 2008 season. Stand counts, made each year near the time of sidedress N application, indicated that final stands were higher than expected each year. Damage from high winds and rainfall associated with Hurricane Katrina prevented any yield determinations in 2005. The dry conditions experienced in 2006 were offset by irrigation and corn yields were excellent. There was significant response to increasing N rates and increasing seeding rates. Grain yields averaged 249, 252 and 255 bu/ac for the increasing N rates when adjusted to 15.5 % moisture. Grain yields ranged from 222 bu/ac up to 272 bu/ac for the increased seeding rates. Each incremental increase in seeding rate provided a significant increase in grain yield. While both increased N rate and increased seeding rate significantly increased grain yield, only increased seeding rates provide a significant economic return. The 2007 growing season also produced excellent corn grain yields. There was a significant response to increasing N rates and seeding rates again in 2007. In 2007, the yields were 245, 246, and 249 bu/ac for the 180, 220, and 260 lb/ac N rates, respectively when averaged across seeding rates. These small differences, even though statistically significant, were not economically significant. In 2007, each increase in seeding rate resulted in a subsequent significant increase in grain yield. The yields were 229, 242, 249, 254, and 259 bu/ace for the respective seeding rates. Stand counts in both 2006 and 2007 showed that actual plant populations were higher than the planter book calibrations. With higher populations than anticipated based on calibration tables, producers could be spending more for planting seed than needed. However, based on this study for the cultivars considered, increased planting rates have been beneficial and cost effective. Lodging has not posed a problem since the 2005 growing season.

In 2008, corn was grown in the same field as 2007 which meant that corn followed corn rather than some other rotation crop. Monosem™ provided an updated calibration table for 2008 that showed about a 8 to10% increase in seeding rate with the same settings used in previous years. Stand counts taken in 2008 showed that these seeding rates more closely paralleled actual plant populations and ranged from 28,200 to 43,960 plants/ac. Corn yields in 2008 were lower than harvested in previous years and ranged from 208 to 225 bu/ac. Increasing seeding rates above 37,000 plants/ac did not significantly increase grain yields. Contributing factors probably included a different corn cultivar, corn following corn, and a different growing season. Slow field drying conditions and periods of unusually high humidity and cloudiness resulted in below average seed quality. There was also no yield advantaged to N rates above 220 lb N/ac as would be expected at the lower yield levels.

On-farm evaluations with twin-row corn production have led to several recommendations that are keys to successful implementation of the practice. Good beds that are shaped and firm provide the ideal situation for early, uniform stand establishment. Rollers equipped with middle busters are able to clean the furrows and firm the tops of the beds. The firm and level surface makes it easier to control the planting depth of each row and assures both rows emerging and growing at the same rate. A row off to the side of the row could emerge late or not emerge at all due to poor soil to seed contact. Delays in development are compounded through the growing season as one row becomes dominant to the other. Also, rows planted too near the edge of the bed, can have plants with mal-formed brace roots that can contribute to root lodging. Nitrogen applications are needed on both side of the row to insure adequate fertility to both rows. The same is true of irrigation with water needed down every row. In conventional systems, some producers choose to water non-traffic middles only, rather than each row middle. With twin-row planting systems, ground cover is achieved more quickly with less opportunity to cross the field after the crop is planted compared to traditional wide rows (38- to 40-in). In soybean production, the twin-row system provides yield advantages of 8 to 12% or more compared to single-row production systems. Research is still underway to determine how much yield advantage twin-row seeding has to single-row seeding for corn. Increasing seeding rates to increase grain yields has been shown in the Mississippi Delta on traditional cotton soils. In single-row, wide-row productions systems, increasing seeding rates tend to produce smaller stalks with less overall stalk strength that lodge more readily. Some cultivars have the ability to withstand higher plant populations that can produce higher yields. The next step in the process will be to identify commercially available cultivars that stand with higher plant populations. Δ