Evaluation of Twin Rows in Corn

Row spacing and plant population are two of several cultural management practices that can affect yield potential. Today's corn products are bred for greater optimum densities, which are a function of row spacing and plant populations. Twin row systems and greater plant populations are two tools available to help attain optimum plant densities to help maximize yield potential (Figure 1). Corn that is planted in twin rows has more equidistant plant spacing. Therefore, it has potentially greater access to water and nutrients, improved light interception, and enhanced ability to cope with stressful conditions. A coordinated approach to plant population and row spacing configurations may help to maximize potential profitability.

Plot Establishment

Yield response of corn to different combinations of row spacing and populations was evaluated from 20 locations across IA, IL, IN, MI, MN, MS, NE, OH, SD, and WI in 2009. Trials were established with two different row spacing configurations; a standard 30 inch and a twin row configuration. Four populations were used; 28,000, 33,000, 38,000, and 43,000 plants per acre. Some locations used a Great Plains® 4 row planter while other locations used an SRES 2 row research planter.

Effect of Twin Rows Across Variables

Across 20 locations, with 287 data points per row spacing configuration, the twin row system averaged 3 bushels per acre greater yield compared to 30 inch rows. Twin rows had a win percentage of 80%, as a result of higher yields at 16 of the 20 locations.

Effect of Yield Level

To help evaluate the response of corn yield to twin rows at different yield levels in 2009, the yield level at each location was categorized as low (<190 bushels per acre), medium (190 to 235 bushels per acre), or high (>235 bushels per acre). In each category, twin rows produced similar or more yield than 30 inch rows (Figure 2).

Effect of Population

A strong correlation between higher yield potential and higher populations has been seen over the last 100 years. Modern germplasm tends to have more consistent ear size and less barrenness under variable environmental conditions, and can maintain better stalk quality compared to older germplasm. These improvements can be attributed to advances in plant breeding as well as agronomic practices such as fertilization and improved weed control.

Figure 1. Twin row corn is planted in two rows spaced 7.5 inches apart and centered on 30 inch centers.

Across all variables, twin rows had a 3 bushel per acre advantage over 30 inch rows.

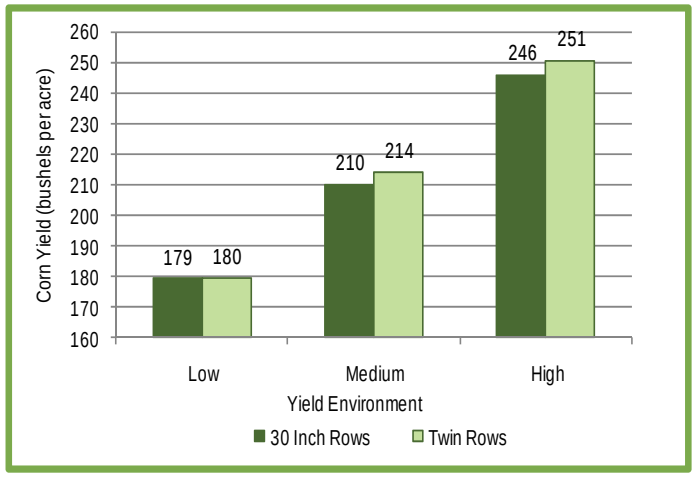

Figure 2. Corn yield response to 30 inch and twin row configurations in different yield environments. Low is less than 190 bushels per acre (87 comparisons). Medium is 190 to 235 bushels per acre (112 comparisons). High is greater than 235 bushels per acre (88 comparisons). Monsanto data, 2009.

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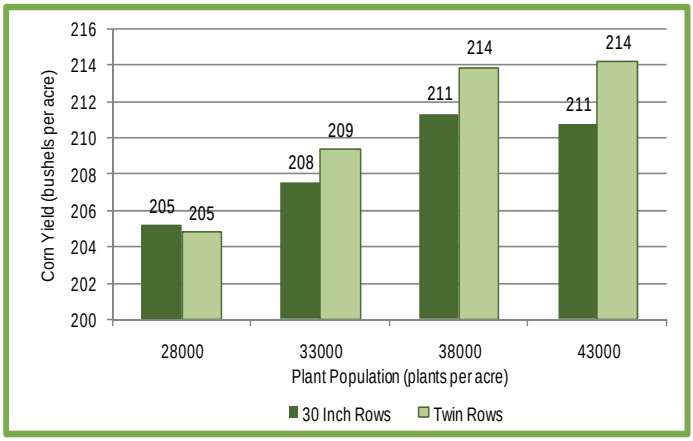


Figure 3. Corn yield response to different row spacing systems and populations (66 comparisons per population). Monsanto data, 2009.

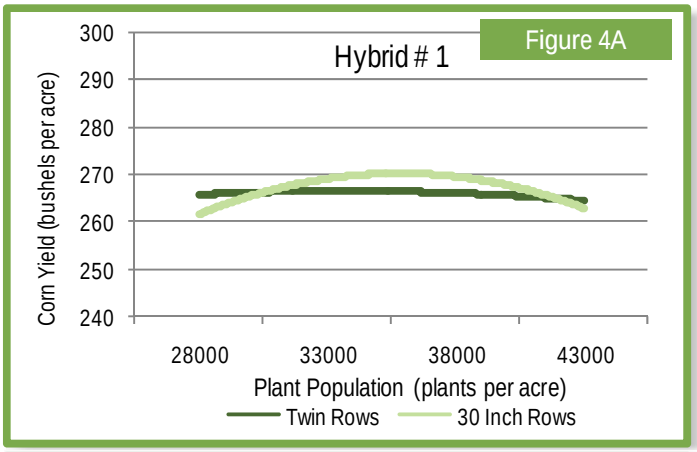
Figure 3 shows the average yield response of the four populations and two different row spacing configurations. Yields increased overall with both row spacing configurations as populations increased from 28,000 to 38,000 plants per acre. Twin rows produced greater yields than 30 inch rows at populations of 33,000, 38,000, and 43,000.

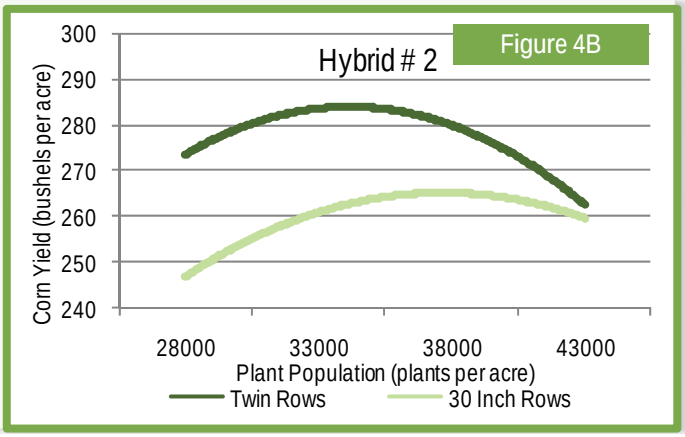
Interaction of Hybrid, Row Spacing, and Population

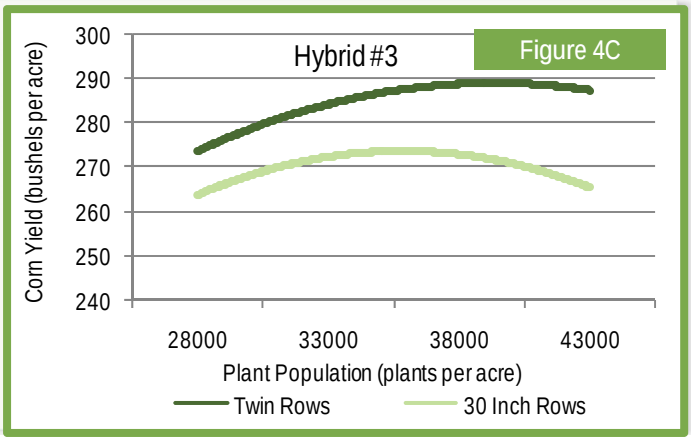
Hybrids handle stress differently. Stress can be anything that limits the basic needs of the corn plant such as water, nutrients, and light. Stress can be caused by poor environmental conditions or management practices such as high populations. How hybrids handle stress influences their optimum population and row spacing. It is important to know how the ear size of each hybrid will respond to different populations and try to maximize it while carefully weighing the potential of the hybrid for stalk lodging at higher populations.

Some hybrids maintain a similar ear size over a range of populations and are unlikely to show a response to different row spacing configurations (Figure 4A). However, hybrids like the one represented in Figure 4A tend to respond more favorably to higher populations than what is indicated by Figure 4A. Other hybrids have the potential to increase their ear size under low stress situations, such as lower populations or reduced interplant competition with twin row

Figure 4. (graphs A, B, and C below) Effect of spacing and plant population on 3 hybrids shown with polynomial trend lines. Monsanto data, 2 strip trials (Atlantic, IA and Rochelle, IL), 2009.







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spacing configurations, while maintaining a respectable ear size under high stress situations such as high plant populations. These hybrids are likely to show a more dramatic response to row spacing (Figure 4B). Several of the hybrids currently available, such as the one represented in Figure 4C, show an intermediate response between the hybrids represented in Figures 4A and 4B. For hybrids such as these, the goal is to redistribute the source of the competition to optimize yield potential. For example, putting the hybrid represented in Figure 4C in twin rows can reduce interplant competition, which can help the hybrid adequately handle the increased stress from higher plant populations. While higher populations generally result in slightly smaller ears, there are more ears per acre, resulting in more kernels per acre, and ultimately increased yield potential. The interaction between hybrid and environment can be significant. It is important to consider how hybrids respond to stress in your area and take that into consideration when determining planting populations.

Case study at Farina, IL

Data from the trial established at Farina, IL were not used in the overall summary but have merit as a case study. A Kinze® planter with the row widths adjusted was used at Farina for twin rows. A 4 row John Deere® 7000 series planter was used for 30 inch row plots. Excessive rain two days after planting and challenging soil conditions resulted in poor stand establishment. Harvest populations deviated too much from the intended planting populations to be analyzed with the rest of the data. Due to circumstances such as location in the field, the stand establishment in the twin row plots was more negatively affected than in 30 inch row plots. However, despite more challenging soil conditions and lower plant populations, twin rows averaged 4 more bushels per acre than 30 inch rows (Figure 5). While this is only one location and one trial, the outcome is consistent with the experiences of the researcher who established the trial. Over multiple years, the agronomist has observed that more equidistant plant spacing, resulting in less interplant competition, allows the twin rows to produce higher yields, even under adverse conditions such as soil compaction early in the season, as seen in 2009, or drought conditions at various parts of the growing season, as seen in previous years.

Limited Comparison of Twin Row, 30 inch and 20 inch Row Spacing Configurations

Trials were established at Monmouth and Rochelle, IL, to evaluate 20 inch rows, twin rows, and 30 inch rows. The strip trial at Rochelle evaluated the three row spacing configurations at 28,000, 33,000, 38,000, and 43,000 plants per acre. The replicated trial at Monmouth tested the three row spacing configurations at 33,000, 38,000, 43,000, and

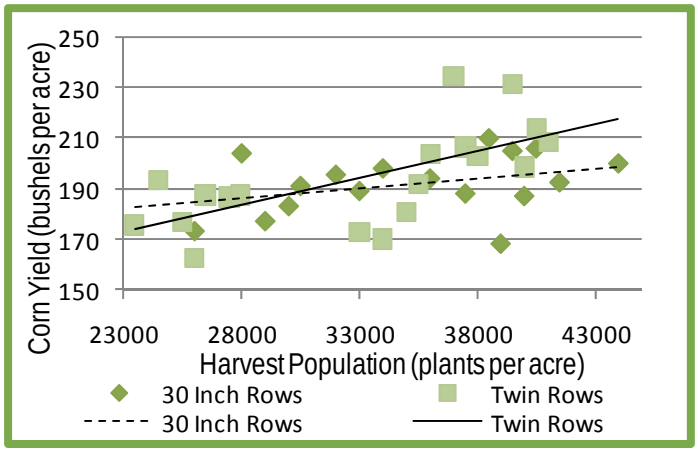

Figure 5. Corn yield response to different row spacing systems at various harvest populations. 2009774052 Farina, IL. 2009

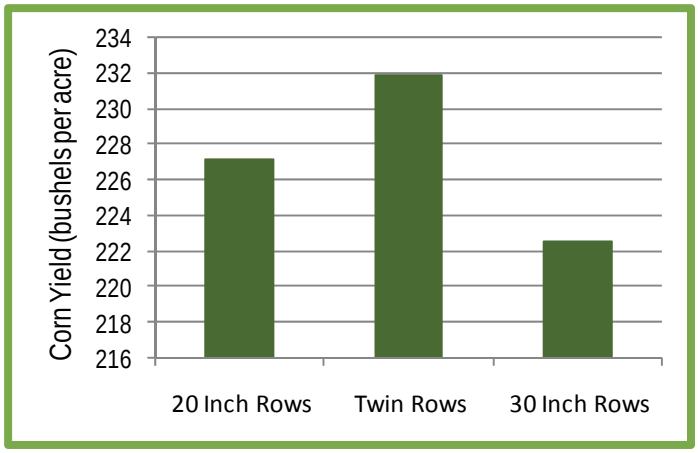

Figure 6. Corn yield response to different row spacing systems at Monmouth and Rochelle, IL. Monsanto data, 2009.

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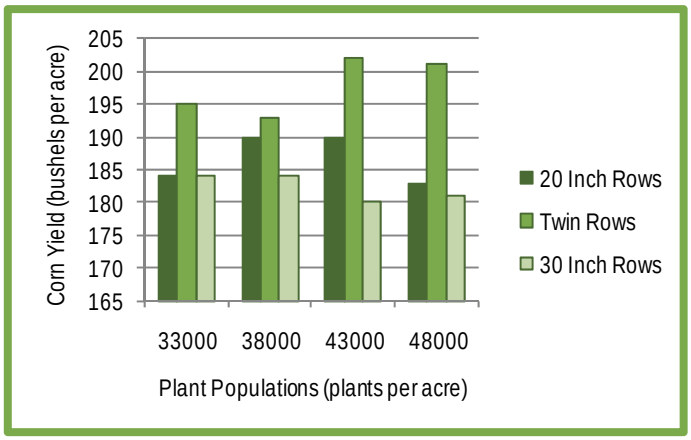

Figure 7. Corn yield response to different row spacing systems and populations at Monmouth, IL, 2009.

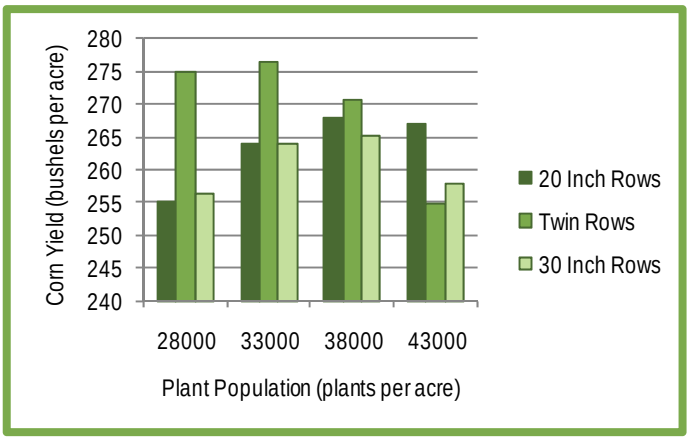

Figure 8. Corn yield response to different row spacing systems and populations at Rochelle, IL, 2009.

48,000 plants per acre.

When averaged across trials, populations, and hybrids, twin rows had a 5 bushel advantage over 20 inch rows and a 9 bushel advantage over 30 inch rows (Figure 6). The response to population was slightly different at the two locations. At Monmouth, twin rows were the highest yielding for all four populations with a yield curve that leveled out at the two highest populations (Figure 7). Twin rows at the Rochelle location produced the highest yields at three of the four populations (Figure 8). These results are only from two locations and should be used appropriately. The differences between them highlight the importance of looking at several locations and trials before making a conclusion.

Conclusion:

- Across 20 locations, twin rows averaged 3 bushels per acre more than 30 inch rows.
- Twin rows produced similar or higher yields than 30 inch rows at high, medium, and low yield levels.
- Twin rows produced higher yields than 30 inch rows at 33,000, 38,000, and 43,000 plants per acre, while producing similar yields at 28,000.
- The twin row configuration allows for more equidistant plant spacing, and thereby reduces interplant competition.
- Less interplant competition may allow corn to better handle stress from poor environmental conditions or compensate for higher plant populations, resulting in higher yield potential.
- Twin rows appear to be able to utilize resources more efficiently to allow for higher yield potential in high yield environments as well as yield limiting environments.
- Hybrids respond differently to stress, whether it is from environmental conditions or higher plant populations. Discussing hybrid characteristics with a local agronomist can help determine appropriate placement and population recommendations.

Further research is needed to evaluate the effect of population by row spacing on the yield potential of different hybrids to continually refine recommendations.

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