Monsanto Learning Center at Scott, Mississippi

2013 Demonstration Report

Dear Learning Center Visitor,

Hello from the Monsanto Learning Center at Scott, Mississippi. I want to thank you for your interest in our program during 2013. The 2013 growing season was "typical" in that it offered surprises unique to every crop production season.

Overall in 2013, we saw favorable environmental conditions which contributed to crop yields that significantly surpassed the record yields set in 2012.

We owe some of this to Mother Nature for offering bright, clear sun-filled days followed by cooler-than-normal nighttime temperatures, and periods of lower humidity.

Also contributing to record yields in 2013 were good agronomic decision making, strong genetics and technology-based tools.

The information that follows in this document is a summary of the work done at Scott during 2013. This work included the evaluation of agronomic practices across cotton, corn, and soybean production systems.

The goal of our work at Scott Learning Center is to provide information and guidance to help farmers use our products and technology to better capture yield potential to help make your farming operation more stable, successful and profitable year after year.

If our staff can help you in any way, please call or email me personally at 662-742-4282 or jay.s.mahaffey@monsanto.com.

Good luck to all for 2014!!!

Thanks,

Jay

Table of Contents

The Response of Corn Products to Row Configurations and Populations

Corn production has transitioned to narrower (30-inch) row widths in many Southern regions. The use of twin rows for corn production has gained popularity, especially in wide row (38-inch) raised bed systems which can help provide better drainage throughout the growing season. In response to continued grower requests, recently released corn products were planted in 30-inch single-row, 38-inch single-row, and 38-inch twin-row configurations at different planting populations. This demonstration evaluates the yield potential of these row configurations, corn product adoption to different production systems, and optimum planting populations for the different row configuration and corn product scenarios.

Study Guidelines

Four DEKALB® brand corn products (DKC62-09, DKC69-29, DKC66-40, and DKC67-57 brands) ranging from 112 to 119 day relative maturity were selected for this demonstration. Each product was planted in 30-inch single-row (SR), 38-inch SR, and 38-inch twin-row (TR) configurations at three populations (32,000, 36,000, and 40,000 plants per acre). The 30-inch SR plots were planted on March 7 and the TR plots were planted on March 8 in rows 7.5 inches apart on 38-inch beds. Standard agronomic practices for the area were implemented with irrigation provided as needed. Regionally appropriate fertility practices for corn were applied with a yield goal of 200 bushels per acre (bu/acre).

Results and Conclusions

Averaged across all corn products and planting populations, the 38-inch TR configuration out-yielded both the 38-inch SR and 30-inch SR configurations by 3.95 bu/acre and 22.55 bu/acre respectively. When averaged across corn products, yields for all three row configurations increased as planting population increased (Figure 1). When averaged across the three planting populations, all corn brands yielded more when planted in the 38-inch row configurations (Figure 2). DKC62-29 and DKC66-40 brands had the highest yield in 38-inch SR configuration and DKC62-40 and DKC67-57 brands had the highest yield in 38-inch TR configurations. Of the corn brands evaluated in this demonstration, DKC69-29 brand yield was least affected by row configuration and planting population.
When averaged across row configurations most corn products increased yield as population increased (Figures 3 and 4). In 30-inch SR configuration most corn brands increased yield potential when populations increased (Figure 5). The corn brands responded the least to planting population in the 38-inch SR configuration (Figure 6).

When planting in 38-inch TR configuration DKC62-09 brand and DKC69-29 brand yields decreased when planted at the 40,000 seeds/acre population (Figure 7).

In general, for the products evaluated in this demonstration, DKC62-09 brand, DKC66-40 brand, and DKC67-57 brand have the best opportunity to benefit from higher planting populations. DKC69-29 brand did not increase yield potential beyond 36,000 seeds/acre. When planting at the different planting populations the highest yields were primarily seen in the 38-inch SR and TR configurations (Figures 8, 9 and 10).

Summary

Results from 2013 testing showed 38-inch TR and SR configurations out-yielded the 30-inch SR configuration. These results are similar to testing conducted in 2010 and 2011 where 38-inch TR out-yielded single rows (Figures 11 and 12)[1,2,3].

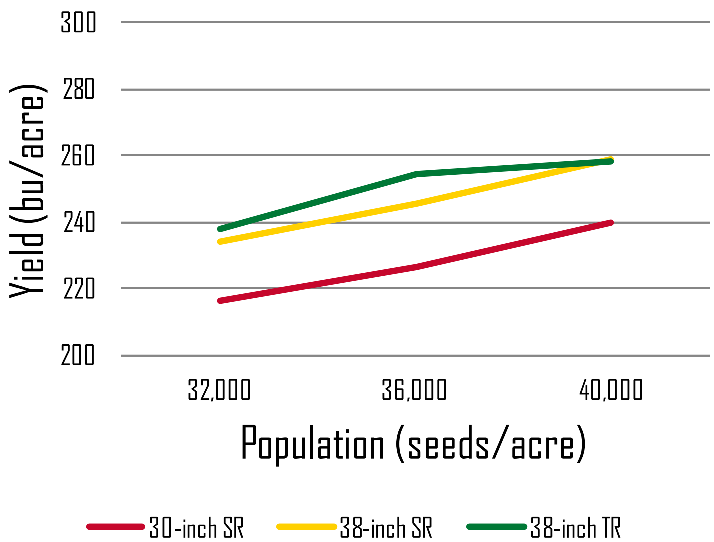


Figure 1. Effect of row configuration and planting population on corn yield averaged across four DEKALB® brand corn products in 2013.

The Response of Corn Products to Row Configurations and Populations

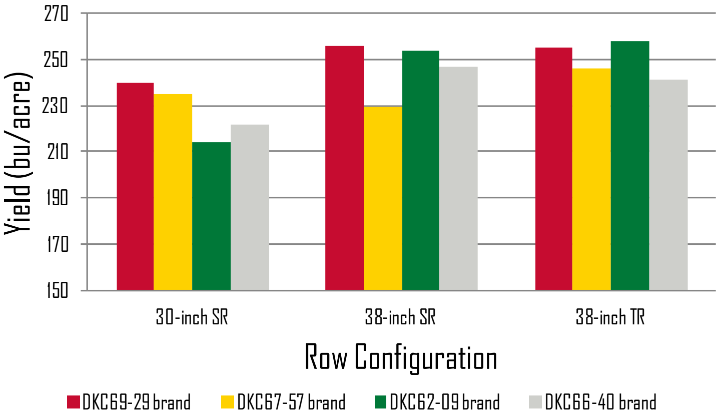


Figure 2. Effect of row configuration and DEKALB® brands on corn yield when averaged across three planting populations in 2013.

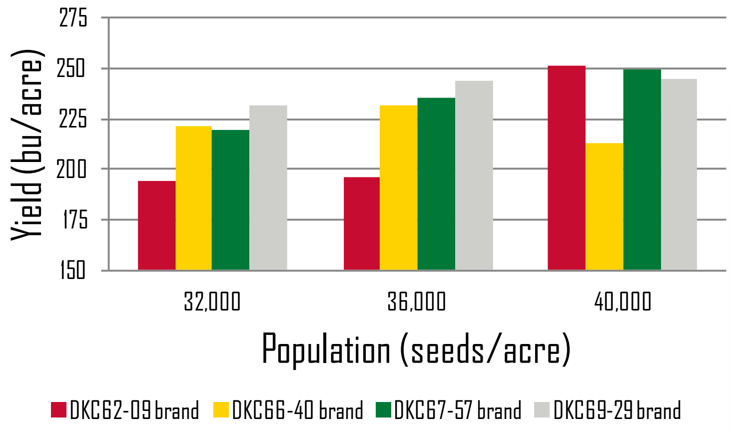


Figure 5. Effect of planting population and DEKALB® brands on corn yield when planted on 30-inch single rows in 2013.

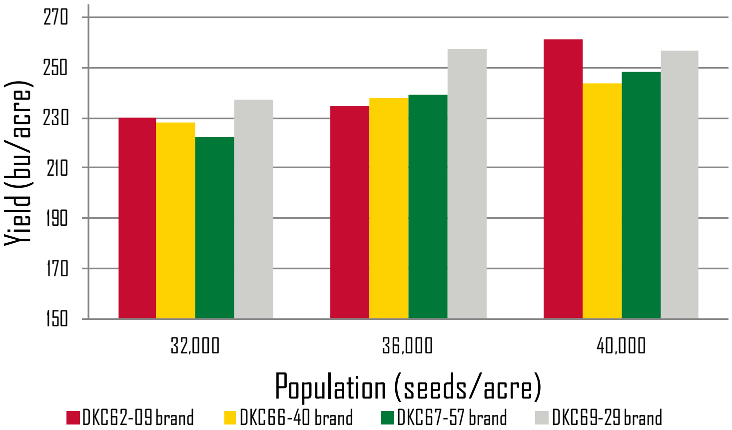


Figure 3. Effect of planting population and DEKALB® brands on corn yield when averaged across three row configurations in 2013.

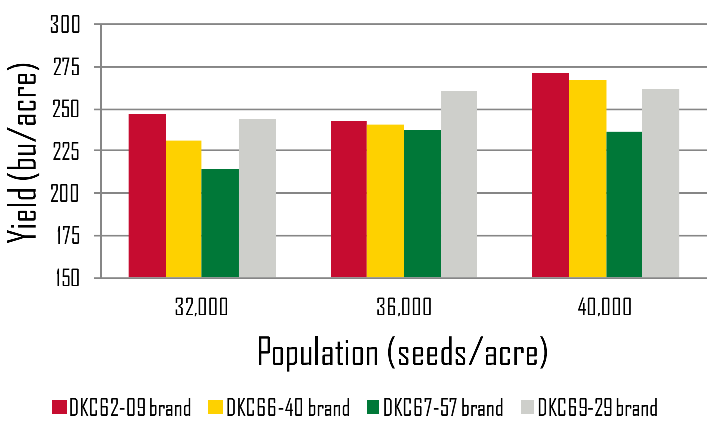


Figure 6. Effect of planting population and DEKALB® brands on corn yield when planted on 38-inch single rows in 2013.

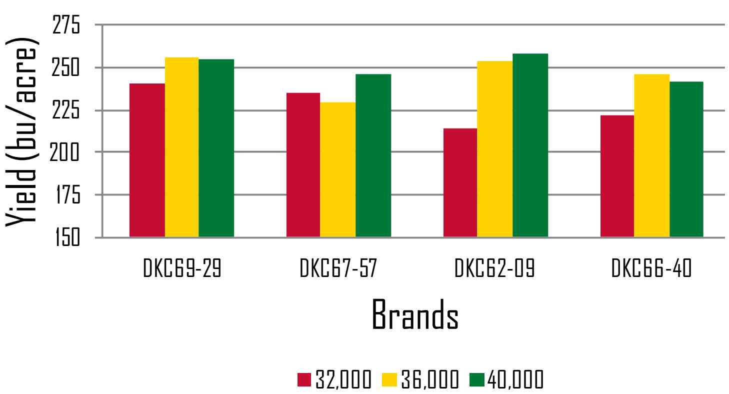


Figure 4. Effect of DEKALB® brand corn products and planting population on corn yield when averaged across three row configurations in 2013.

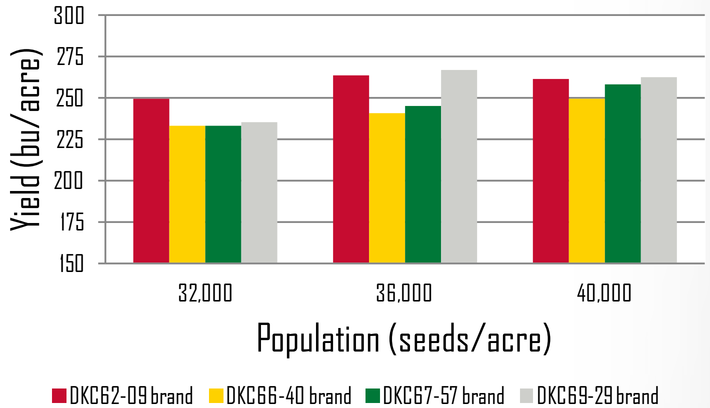


Figure 7. Effect of planting population and DEKALB® brands on corn yield when planted on 38-inch twin rows in 2013.

The Response of Corn Products to Row Configurations and Populations

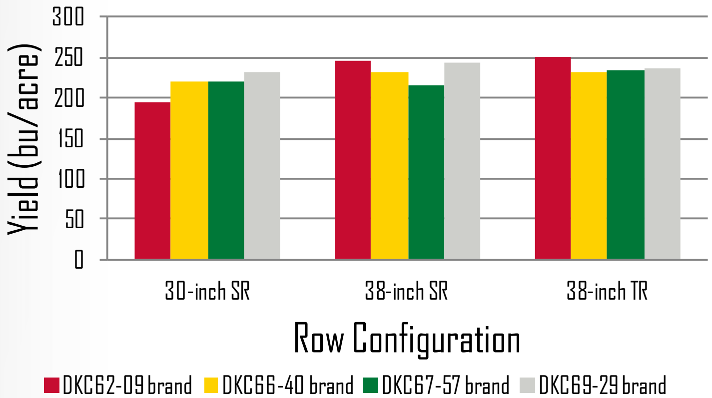


Figure 8. Effect of row configuration and DEKALB® brands on corn yield when planted at 32,000 seeds/acre in 2013.

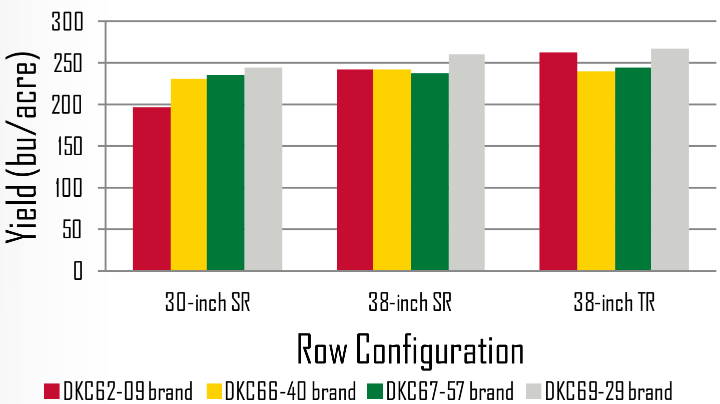


Figure 9. Effect of row configuration and DEKALB® brands on corn yield when planted at 36,000 seeds/acre in 2013.

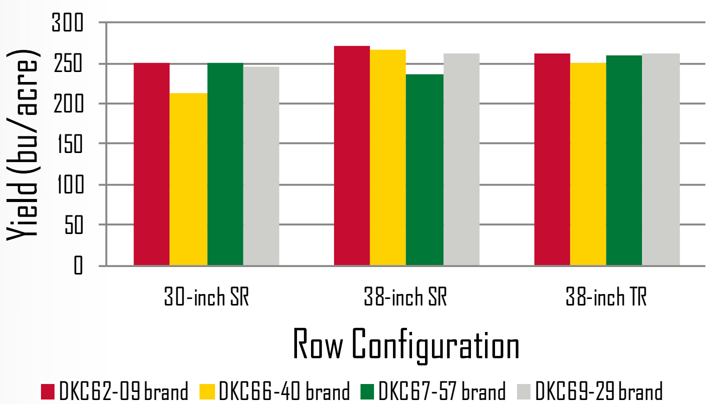


Figure 10. Effect of row configuration and DEKALB® brands on corn yield when planted at 40,000 seeds/acre in 2013.

In 2012, the 30-inch SR configuration out-yielded the 38-inch TR configuration (Figure 14).[4] Changes in which configuration supports the highest yield may be due to environmental conditions. In 2013, wet early season conditions may have contributed to reduced yield potential in the 30-inch SR configuration due to reduce drainage when compared to the 38-inch row configurations. Examining multiple-year results can help to show how management and environmental factors can alter the yield potential of corn planted in different row configurations.

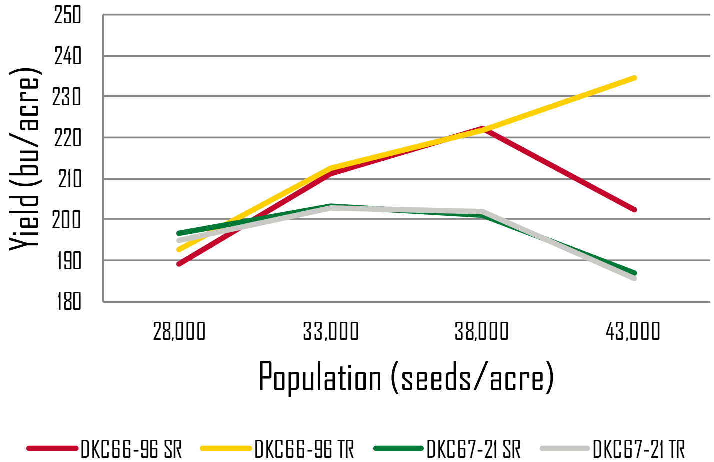


Figure 11. Yield results of different corn products and row configurations at different planting populations in 2010.

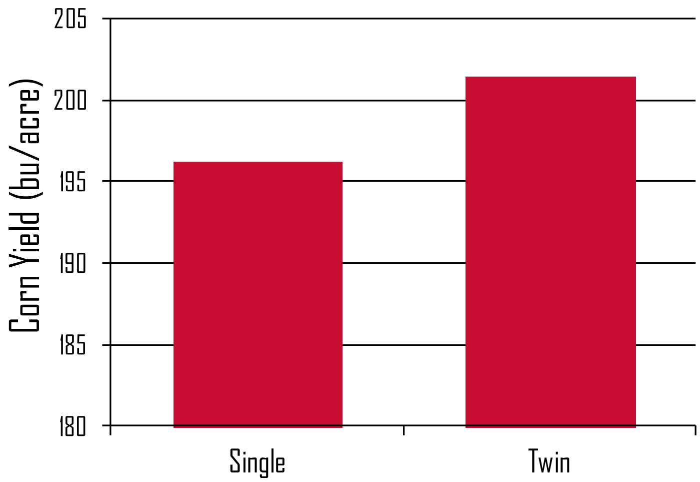


Figure 12. Yield results by row configurations when averaged across three corn products in 2011.

The Response of Corn Products to Row Configurations and Populations

With proper field preparation and management, both row spacing configurations can work well in Southern corn production systems. The 30-inch SR, 38-inch TR, and 38-inch SR configurations can offer many of the advantages of narrower rows, allowing for earlier and better light interception and utilization of water and nutrients through better plant distribution. These three configurations spread plant uniformity across the field, and twin rows can spread uniformity down the corn row as well.

Seedbed integrity and drainage can be a challenge with 30-inch SR, and should be given careful consideration in planning 30-inch production systems. Likewise, 38-inch raised bed preparation is critical with 38-inch TR and 38-inch SR, and planter adjustment is necessary for proper staggering of twin-rows. All of these factors should be considered when choosing a row configuration, when choosing products for planting, and when preparing or adjusting equipment for planting.

Overall, these demonstrations illustrate the importance of selecting products that consistently perform in an area. The response of a corn product to population is generally the same for all three row configurations. After selection, understanding how the individual products respond to different populations, row spacings, and configurations can help maximize corn yield potential.

Sources and Legals

[1] Corn response to population, row configuration, and soil type. Monsanto Learning Center 2011 Demonstration Report. [2] Evaluation of new corn brands x population. Monsanto Learning Center 2011 Demonstration Report. [3] Cotton, corn and soybean row width and planting configuration comparison. Monsanto Learning Centers 2010 Demonstration Report. [4] Corn yield response to row spacing configuration and population. Monsanto Learning Center 2012 Demonstration Report.

The information discussed in this report is from a single site, two rep demonstration. This informational piece is designed to report the results of this demonstration and is not intended to infer any confirmed trends. Please use this information accordingly.

Individual results may vary, and performance may vary from location to location and from year to year. This result may not be an indicator of results you may obtain as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible.

DEKALB® is a registered trademark of Monsanto Technology LLC. Leaf Design® is a registered trademark of Monsanto Company. All other trademarks are the property of their respective owners. Always read and follow IRM, where applicable, grain marketing and all other stewardship practices and pesticide label directions. ©2013 Monsanto Company.10152013 CRB.

Insect Resistance Management
Planting Refuges, Preserving Technology

Before opening a bag of seed, be sure to read, understand and accept the stewardship requirements, **including applicable refuge requirements for insect resistance management,** for the biotechnology traits expressed in the seed as set forth in the Monsanto Technology/Stewardship Agreement that you sign. By opening and using a bag of seed, you are reaffirming your obligation to comply with the most recent stewardship requirements.

Roundup Ready 2 Technology

Respect the Refuge

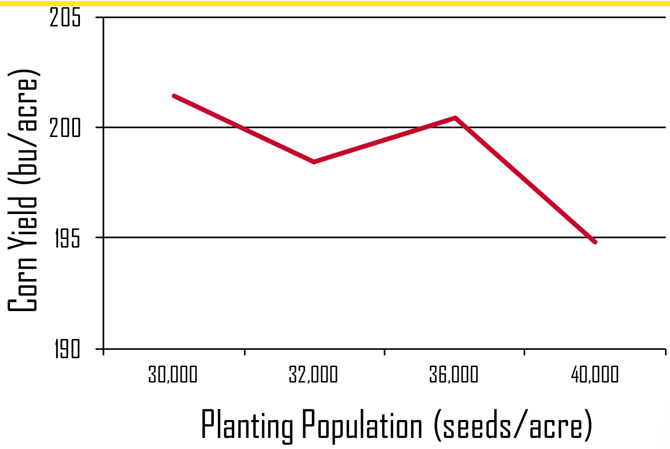


Figure 13. Yield results by planting population when averaged across three corn products in 2011.

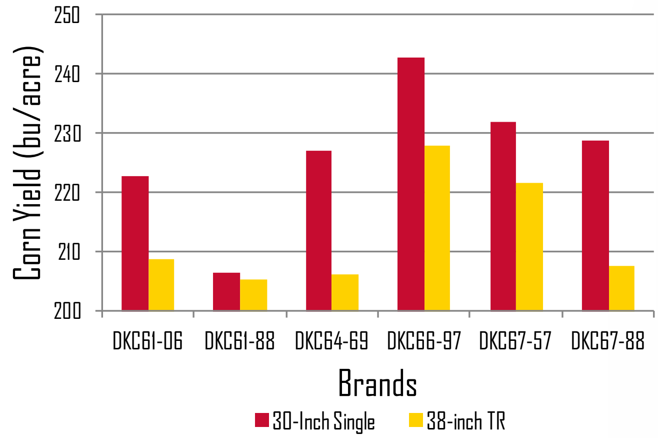


Figure 14. Effect of row configuration and DEKALB® brands on corn yield when averaged across three planting populations in 2012.

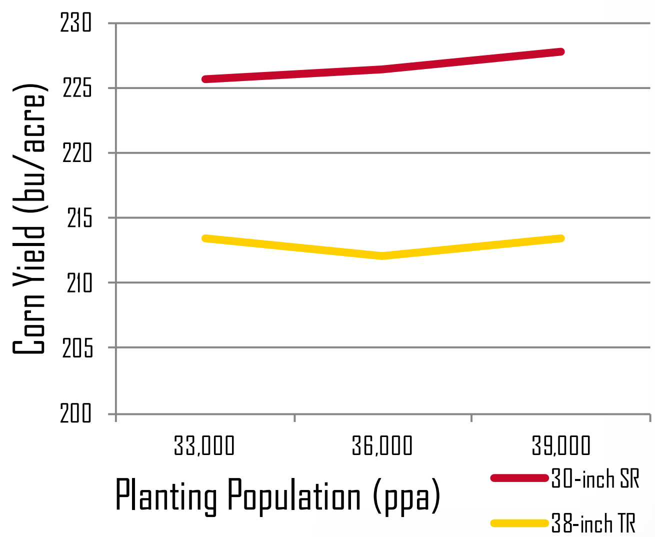


Figure 15. Effect of row configuration and planting population on corn yield averaged across six DEKALB® brands in 2012.

The Response of Refuge Corn Products to Population Density

Study Guidelines

A corn demonstration trial was planted on April 16, 2013 at the Monsanto Learning Center near Scott, MS to:

- Evaluate the response of refuge (non-*B.t.*) corn products to low, medium and high populations.
- Determine the population that optimizes the yield potential for each refuge corn product.
- Show growers how to optimize performance of refuge corn products in their corn refuges.
- Encourage improved grower compliance with refuge requirements

Twelve DEKALB® corn brands (DKC57-22, DKC58-81, DKC59-89, DKC61-86, DKC64-69, DKC64-82, DKC66-94, DKC66-97, DKC67-86, DKC68-04, DKC69-43, and DKC69-72) were each planted at populations of 31,000, 34,000, and 37,000 seeds/acre.

Results and Conclusions

- Growers should select locally adapted refuge corn products with similar maturity and agronomic characteristics to the corn products with insect protection traits.
- There is a wide selection of non-*B.t.* corn products that may be planted in a refuge.
- DEKALB® brand refuge corn products are bred for strong roots and strong stalks.
- Refuge corn products should be scouted and treated if target insects reach threshold levels.
- With proper selection and management, refuge corn products have very good yield potential.

Summary

- All corn growers in the Cotton-Growing Area who plant any corn products with *Bacillus thuringiensis* (*B.t.*) technology are required by the EPA to plant a non-*B.t.* corn refuge.
- A non-*B.t.* corn refuge will help reduce the risk of insects developing resistance to the *B.t.* insect-protection trait.
- Specific refuge requirements for *B.t.* corn products can be found in the IRM Grower guide at: http://www.genuity.com/stewardship/Pages/InsectResistanceManagement.aspx
- To help ensure compliance, growers can use the IRM Refuge Calculator, which can be found at: http://www.refuge.irmcalculator.com.
- Contact your DEKALB® brand seed representative for questions about specific corn products and refuge requirements.

Corn Brands		Average Yield (Bushel/Acre)
DKC57-22	Roundup Ready 2 Technology	176
DKC58-81	Roundup Ready 2 Technology	178
DKC59-89	Roundup Ready 2 Technology	166
DKC61-86	Roundup Ready 2 Technology	172
DKC64-69	genuity VT TRIPLE PRO CORN	199
DKC64-82	Roundup Ready 2 Technology	186
DKC66-94	Roundup Ready 2 Technology	187
DKC66-97	genuity VT TRIPLE PRO CORN	212
DKC67-86	Roundup Ready 2 Technology	203
DK 68-04	Roundup Ready 2 Technology	186
DKC69-43	Roundup Ready 2 Technology	163
DKC69-72	Roundup Ready 2 Technology	175
Overall Average		184

Figure 1. Refuge corn products in this demonstration produced an overall average yield of 184 bu/acre, with individual product yields ranging from a low of 163 bu/acre to a high of 212 bu/acre.

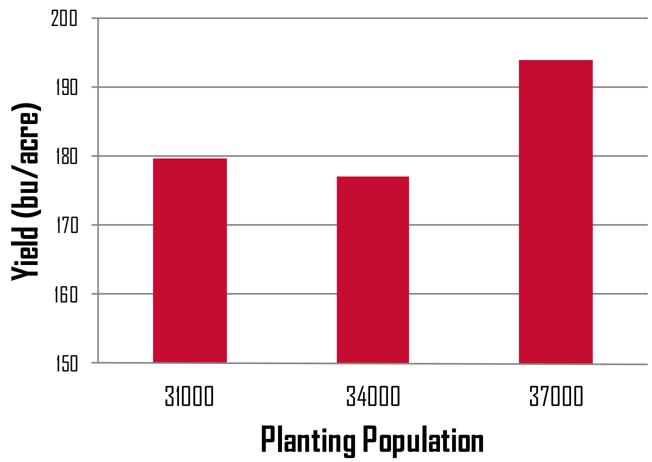


Figure 2. Refuge corn products produced higher yields at higher plant populations.

The Response of Refuge Corn Products to Population Density

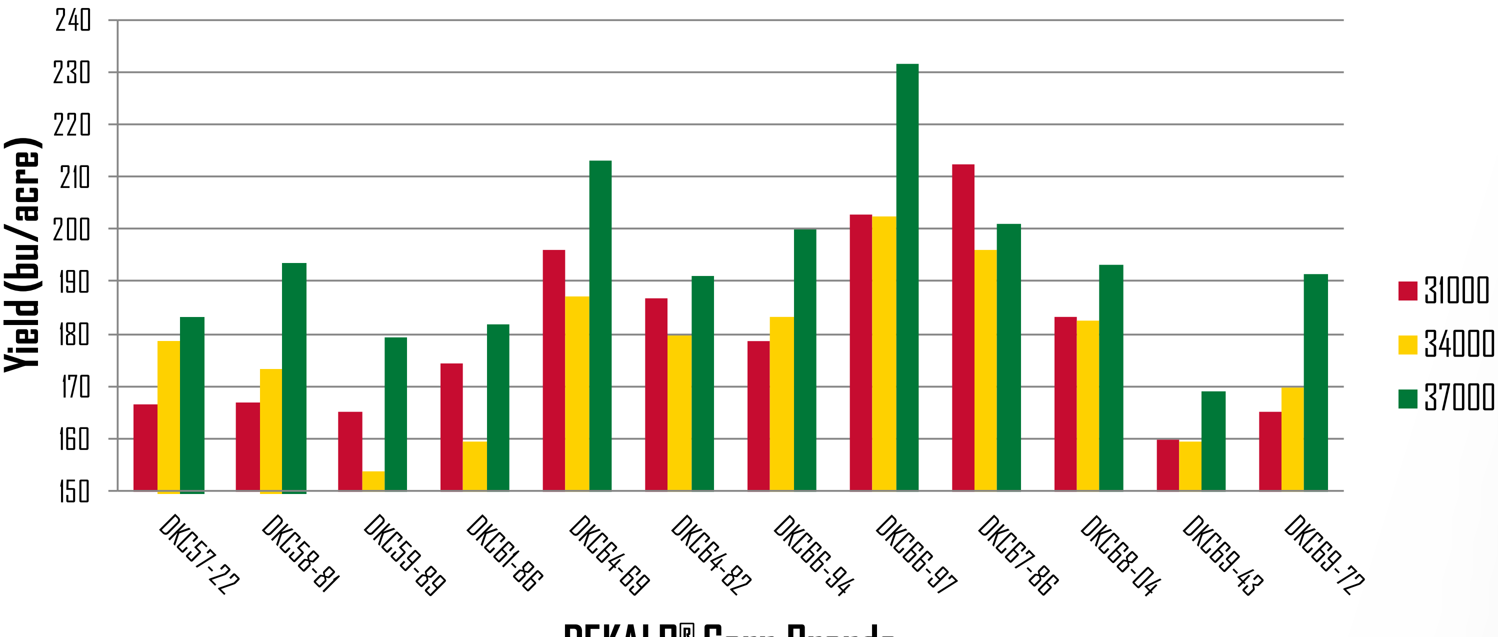


Figure 3. Response of refuge corn brands to population. Growers should evaluate refuge corn product characteristics, and yield potential, as well as their own agronomic decisions, as they select refuge corn products.

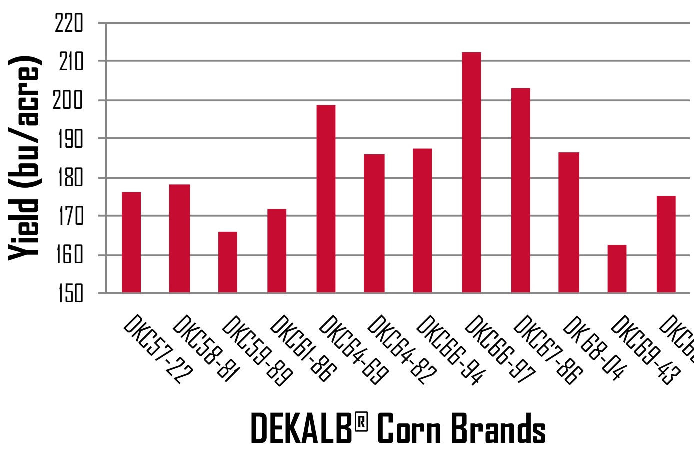


Figure 4. All refuge corn products tested produced average yields of more than 160 bushels per acre at all population levels.

Figure 5. Cotton-Growing Area

Legals

The information discussed in this report is from a single site, 2 rep demonstration. This informational piece is designed to report the results of this demonstration and is not intended to infer any confirmed trends. Please use this information accordingly.

Monsanto Company is a member of Excellence Through Stewardship® (ETS). Monsanto products are commercialized in accordance with ETS Product Launch Stewardship Guidance, and in compliance with Monsanto's Policy for Commercialization of Biotechnology-Derived Plant Products in Commodity Crops. This product has been approved for import into key export markets with functioning regulatory systems. Any crop or material produced from this product can only be exported to, or used, processed or sold in countries where all necessary regulatory approvals have been granted. It is a violation of national and international law to move material containing biotech traits across boundaries into nations where import is not permitted. Growers should talk to their grain handler or product purchaser to confirm their buying position for this product. Excellence Through Stewardship® is a registered trademark of Biotechnology Industry Organization.

***B.t.* products** may not yet be registered in all states. Check with your Monsanto representative for the registration status in your state.

Individual results may vary, and performance may vary from location to location and from year to year. This result may not be an indicator of results you may obtain as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible.

Always read and follow IRM, where applicable, grain marketing and all other stewardship practices and pesticide label directions. Roundup Ready® crops contain genes that confer tolerance to glyphosate, the active ingredient in Roundup® brand agricultural herbicides. Roundup® brand agricultural herbicides will kill crops that are not tolerant to glyphosate. DEKALB and Design®, DEKALB®, Genuity Design®, Genuity Icons, Genuity®, Roundup Ready 2 Technology and Design®, Roundup Ready®, Roundup® and VT Triple PRO® are trademarks of Monsanto Technology LLC. Respect the Refuge and Corn Design® and Respect the Refuge® are registered trademarks of National Corn Growers Association. All other trademarks are the property of their respective owners. ©2013 Monsanto Company. 10112013JEH.

Before opening a bag of seed, be sure to read, understand and accept the stewardship requirements, **including applicable refuge requirements for insect resistance management,** for the biotechnology traits expressed in the seed as set forth in the Monsanto Technology/Stewardship Agreement that you sign. By opening and using a bag of seed, you are reaffirming your obligation to comply with the most recent stewardship requirements.

The Influence Of Planting Depth And Seed Firmers On Corn Stands And Yield

Study Guidelines

A trial was conducted at the Monsanto Learning Center at Scott, MS, to investigate the influence of planting depth and Keeton® seed firmers on corn crop establishment and yield potential. The trial was planted on April 23, 2013 with the corn product DKC62-08 brand Genuity® VT Double PRO® Corn. The treatments consisted of DKC62-08 brand corn planted at three depths: 1.5", 2.25" and 3.0", with and without seed firmers. The planting population was 37,000 kernels per acre. The plots consisted of 4 rows that were 125' long with three replications. Conventional tillage was used and the trial was irrigated.

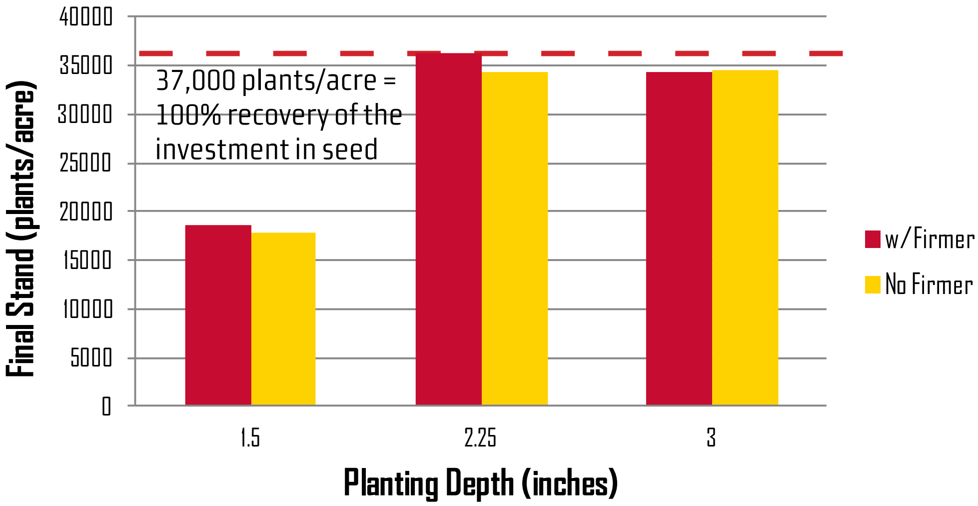


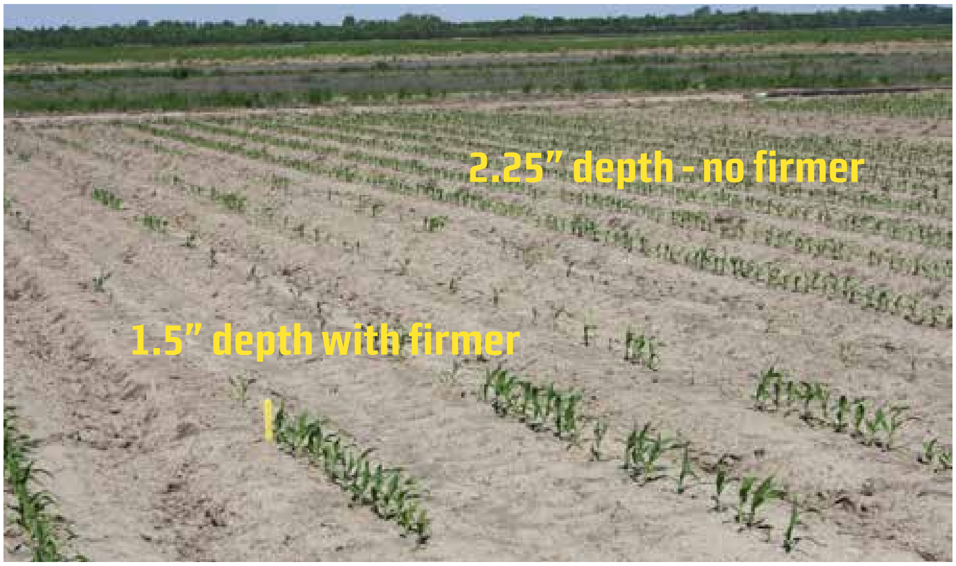
Figure 1. Influence of planting depth and seed firmers on final corn stand.

Results and Conclusions

A Final Stand

Figure 1 shows the final stand based on planting depth with and without firmers. The corn 1.5" deep had a final stand approaching 50% of the seed planted. The 2.25" and 3.0" depths had stands close to the targeted population and were similar to each other. At 1.5" depths, stands were similar with and without seed firmers; however, stands in plots with the firmer treatment were numerically higher. Using seed firmers provided good seed-to-soil contact, thereby allowing more plants to establish in the 2.25" with firmer treatment. At 3" depths, stands were similar across treatments. Figures 2-3 show photographs of treatment comparisons.

When averaged across depths, Keeton® seed firmers improved stands by approximately 1,000 plants per acre. At 2.25"depths, stands were improved by almost 2,000 plants per acre when seed firmers were used and almost 100% of the planted seeds established a plant in the firmer plot. This is a 7% increase in plants established.



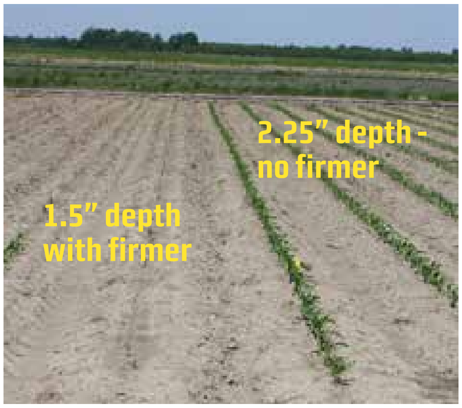


Figure 2. Different replications of the treatment comparison of 1.5" planting depth with firmer versus 2.25" planting depth with no firmer.

Fit X by Y

Figure 4 is a graph and regression equation that indicates 1000 seeds per acre, in the

The Influence Of Planting Depth And Seed Firmers On Corn Stands And Yield

Figure 3. Treatment comparison of 3.0" planting depth, with firmer verses 1.5" planting depth, no firmer.

range tested, had an average yield value of 5.7 bushels of corn per acre. If 5.7 bu/acre is multiplied by the price of corn, it can equal approximately $30 per acre.

Yield Effects

An average 47 bushel/acre improvement in yield was observed between 1.5" and 2.25" deep planting (Figure 5). This is primarily due to bird predation in the shallow planting. Across depths, an average 11 bushel/acre improvement in yield was observed in the firmer plots. The firmer treatment improved yields at both the 1.5" and 2.25" depths. The firmer treated 2.25" depth, which had the highest population, also had the highest yield. The 3" depth with the firmer treatment yielded less than the non-firmer treated. This indicates that seeds can be pushed too deep and points out the need for proper equipment adjustment.

Summary

Seed firmers help in recovering the investment in seed and help in promoting uniformity across the field. The 2.25" depth with firmer treatment had the highest stands, due to optimal depth and good seed-to-soil contact created by the firmer. The firmer treatment improved yields at both 1.5" and 2.25" depths. The lower yields in the 3" depth with firmer treatment compared to 3" with no firmer, indicate seeds can be pushed too deep and points out the need for proper equipment adjustment.

Seeding depth is an effective tactic to minimize bird predation. If the seed is placed deep enough that birds cannot pull up the kernel, plants are likely to survive and establish a stand. Corn must be planted deeper than soybeans and cotton. Planting corn a little deeper can be better than planting a bit shallower. If corn seed is planted too shallow, the roots can end up on or at the soil surface, which can influence nutrient and water uptake and also standability.

The information discussed in this report is from a single site, 3 replicate demonstration. This informational piece is designed to report the results of this demonstration and is not intended to infer any confirmed trends. Please use this information accordingly.

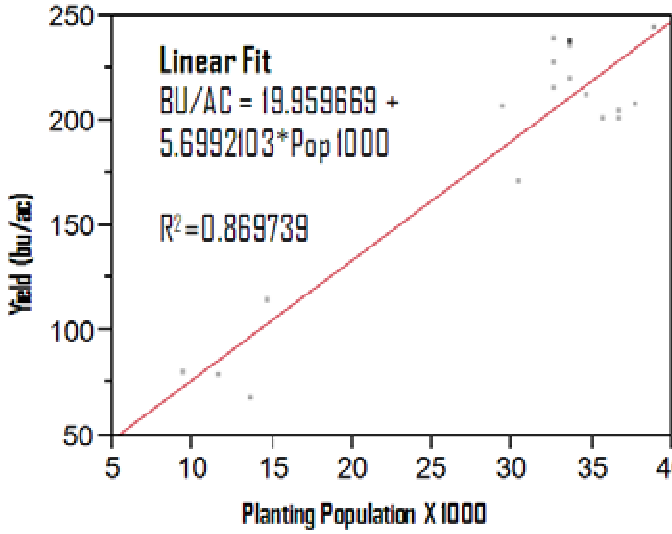


Figure 4. Graph and regression of Planting Population X 1000 by Yield (bu/acre).

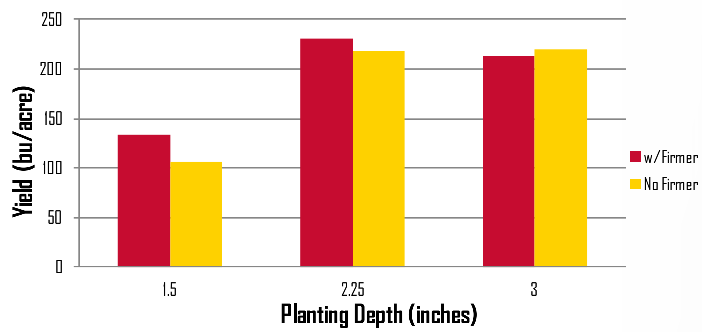


Figure 5. Influence of planting depth and seed firmers on corn yield.

Legal

Monsanto Company is a member of Excellence Through Stewardship® (ETS). Monsanto products are commercialized in accordance with ETS Product Launch Stewardship Guidance, and in compliance with Monsanto's Policy for Commercialization of Biotechnology-Derived Plant Products in Commodity Crops. This product has been approved for import into key export markets with functioning regulatory systems. Any crop or material produced from this product can only be exported to, or used, processed or sold in countries where all necessary regulatory approvals have been granted. It is a violation of national and international law to move material containing biotech traits across boundaries into nations where import is not permitted. Growers should talk to their grain handler or product purchaser to confirm their buying position for this product. Excellence Through Stewardship® is a registered trademark of Biotechnology Industry Organization. **B.t. products may not yet be registered in all states.** Check with your Monsanto representative for the registration status in your state.Individual results may vary, and performance may vary from location to location and from year to year. This result may not be an indicator of results you may obtain as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible. **ALWAYS READ AND FOLLOW PESTICIDE LABEL DIRECTIONS**. Roundup Ready® crops contain genes that confer tolerance to glyphosate, the active ingredient in Roundup® brand agricultural herbicides. Roundup® brand agricultural herbicides will kill crops that are not tolerant to glyphosate. DEKALB and Design®, DEKALB®, Genuity Design®, Genuity Icons, Genuity®, Roundup Ready 2 Technology and Design®, Roundup Ready®, Roundup® and VT Double PRO® are trademarks of Monsanto Technology LLC. Leaf Design® is a registered trademark of Monsanto Company. Respect the Refuge and Corn Design® and Respect the Refuge® are registered trademarks of National Corn Growers Association. All other trademarks are the property of their respective owners. Keeton® is a registered trademark of Precision Planting LLC ©2013 Monsanto Company. AMB100313

Before opening a bag of seed, be sure to read, understand and accept the stewardship requirements, **including applicable refuge requirements for insect resistance management**, for the biotechnology traits expressed in the seed as set forth in the Monsanto Technology/Stewardship Agreement that you sign. By opening and using a bag of seed, you are reaffirming your obligation to comply with the most recent stewardship requirements.

The Impact Of Planting Variability On Corn Yields

Study Guidelines

A corn demonstration trial was conducted at the Monsanto Learning Center at Scott, MS to investigate how variability in seed placement affects corn yield. The intent of the testing was to contribute to the body of knowledge on how variability affects yield, and to demonstrate a technique that can be used to collect the data. DEKALB® Genuity® VT Triple PRO® DKC62-08 brand corn was used in the testing. Plots were planted using various combinations of planter plates, vacuum pressures, and planting speeds to produce a range of variability in seed placement. After plot establishment and corn emergence, data was collected using a standard barcode reading system. A 1-centimeter resolution barcode ruler and a Motorola Symbol reader was used to count the corn plants that emerged and the placement in two, 2-meter (2 rows X 6 feet) samples from each plot (Figure 1). The data was transferred to a spreadsheet allowing further analysis, which included evaluations of established population (counting the number of observations) and calculating both standard deviation and average spacing. Data was collected to investigate the impact of variability on yield as measured by standard deviation.

Figure 1. Barcode ruler and Motorola Symbol reader used to record the variability in uniform and non-uniform planting and seed placement.

Results and Conclusions

Data analysis was used to help answer the question on how variability in seed placement affects corn yield. Using the data recorded, a regression was run on standard deviation versus yield (Figure 2). Standard deviation represents a variability measurement that encompasses 68.2% of the population. A standard deviation of 2 means that 68.2% of the population is ± 2 inches from where it should be from the mean distance in the testing.

The Impact Of Planting Variability On Corn Yields

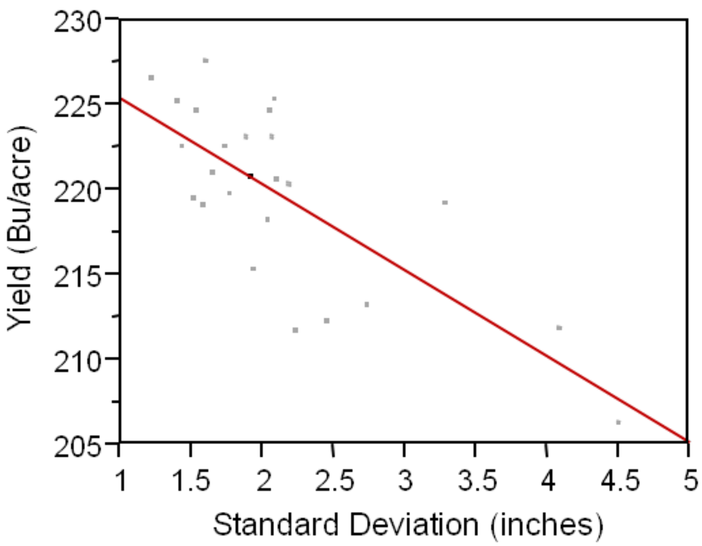


Figure 2. Bivariate fit of Yield by standard deviation (Linear Fit: Yield = 230.43 - 5.05 x Standard Deviation).

Standard deviations ranging from 1.2 to 4.4 inches were generated in this test environment where average seed spacing should ideally be 4.72 inches at a population of 35,000 plants per acre on 38-inch row spacing. With an R square of 56% and a plot mean yield of 220 bushels per acre, it was fairly accurate to regress yield and standard deviation.

The regression analysis indicated that a 1-inch increase in standard deviation gives a 5.05 bushel per acre decrease in yield (Figure 2). Planting equipment, planting speed, and field conditions can all interact to determine the ultimate variability of a planted population. Data analysis can show the impact of variability on yield as measured by standard deviation.

Summary

Data can be collected relatively easily using the techniques described in this testing. A regression on yield versus standard deviation can be run using the data collected. The methodology developed at the Monsanto Learning Center at Scott, MS can be used to quickly take this type of data and summarize results. Research conducted in the Midwest over previous years has attempted to quantify the impact of increasing variability (as measured by standard deviation) on corn yield. This testing was conducted to contribute to that body of knowledge, which can have implications on how agronomic decisions are made.

Legals

The information discussed in this report is from a single site, 2 rep demonstration. This informational piece is designed to report the results of this demonstration and is not intended to infer any confirmed trends. Please use this information accordingly.

Monsanto Company is a member of Excellence Through Stewardship® (ETS). Monsanto products are commercialized in accordance with ETS Product Launch Stewardship Guidance, and in compliance with Monsanto's Policy for Commercialization of Biotechnology-Derived Plant Products in Commodity Crops. This product has been approved for import into key export markets with functioning regulatory systems. Any crop or material produced from this product can only be exported to, or used, processed or sold in countries where all necessary regulatory approvals have been granted. It is a violation of national and international law to move material containing biotech traits across boundaries into nations where import is not permitted. Growers should talk to their grain handler or product purchaser to confirm their buying position for this product. Excellence Through Stewardship® is a registered trademark of Biotechnology Industry Organization.

B.t. products may not yet be registered in all states. Check with your Monsanto representative for the registration status in your state.

Individual results may vary, and performance may vary from location to location and from year to year. This result may not be an indicator of results you may obtain as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible.

ALWAYS READ AND FOLLOW PESTICIDE LABEL DIRECTIONS. Roundup Ready® crops contain genes that confer tolerance to glyphosate, the active ingredient in Roundup® brand agricultural herbicides. Roundup® brand agricultural herbicides will kill crops that are not tolerant to glyphosate. DEKALB and Design®, DEKALB®, Genuity®, Roundup Ready 2 Technology and Design®, Roundup Ready®, Roundup® and VT Triple PRO® are registered trademarks of Monsanto Technology LLC. Leaf Design® is a registered trademark of Monsanto Company. Respect the Refuge and Corn Design® and Respect the Refuge® are registered trademarks of National Corn Growers Association. All other products or service names are the property of their respective owners. ©2013 Monsanto Company. 10122013TED

Insect Resistance Management
Planting Refuges, Preserving Technology

Before opening a bag of seed, be sure to read, understand and accept the stewardship requirements, **including applicable refuge requirements for insect resistance management,** for the biotechnology traits expressed in the seed as set forth in the Monsanto Technology/Stewardship Agreement that you sign. By opening and using a bag of seed, you are reaffirming your obligation to comply with the most recent stewardship requirements.

The Impact Of Individual Planting Errors On Corn Yield

Study Guidelines

A trial was conducted at the Monsanto Learning Center at Scott, MS to demonstrate the impact of potential planting errors on corn yield in a mid-southern production system. This trial supports several other studies conducted during 2013 and will help to support the benefits of precision planting equipment.

The trial was planted on April 25, 2013 using the corn product DKC62-08 brand Genuity® VT Triple PRO® Corn. In an effort to generate highly variable populations, the least and most accurate planting equipment was used for planting in this demo. Four treatments were planted to represent a control and three different planting errors:

- 5 uniformly planted plants (the control) – x x x x x –
- 5 plants with a double and a skip – x x xx x –

  This generally occurs when two double planted seeds catch in the seed tube, which can be due to bouncing associated with planter speed.
- 4 plants with a true skip – x x x x –

  This configuration results in a reduction in plant population.

  This skip may be a seed that did not come up or it may not have been planted due to planting equipment malfunction.
- 6 plants with a true double – x x xx x x –

  This configuration results in an increase in plant population.

  In this case two seeds were not singulated by the planting equipment.

Figures 1 and 2 show examples of planting errors. The planting population was 32,000 seeds per acre. Calculations were made to estimate yield potential at populations of 35,000 and 38,000 seeds per acre. Thirty-six replicates of the four listed treatments were harvested from the trial. Ears were hand shelled, weighed by ear, and then compiled and analyzed by treatment. Data was corrected for moisture each day that shelling occurred.

Results and Conclusions

To determine potential yield differences from planting errors, corn ears were harvested from an area in each plot representative of 5 uniformly spaced corn plants. The corn ears were hand harvested, shelled, and weighed. The average weight of the corn varied by treatment, which was a function of plant spacing and/or plant population. The percent weight difference for each treatment was compared to the check.

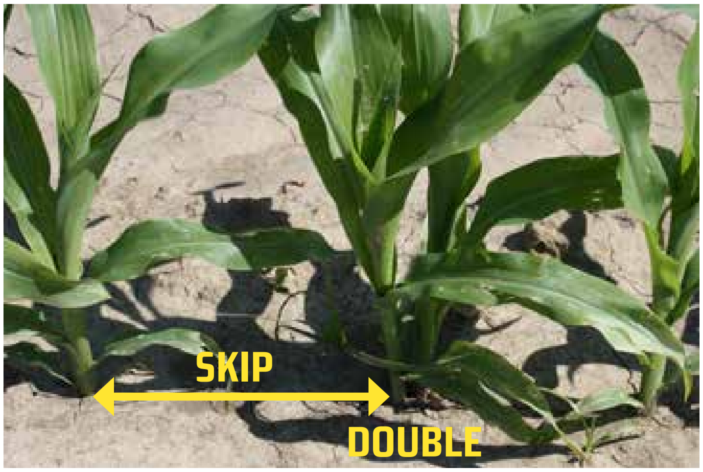


Figure 1. The planting error treatment with a double and a skip.

Figure 2. The planting error treatment with a true double.

When comparing the two treatments with 5 plants, since population is constant, the 3% weight difference is a result of plant spacing (Table 1). The weight decrease in the treatment with 4 ears and a skip is a result of the decrease in population compared to the control with 5 plants. The 4% weight increase in the treatment with 6 plants and a true double is a result of more ears per acre and a higher population.

Next, the number of 5 grouped plants found in an acre with 38-inch rows for each treatment at different populations was calculated (Table 2). The original planting population was divided by 5, to determine the number of 5 grouped plants/acre:

- Planting population ÷ 5 = groups of 5 plants/acre
- 32,000 ÷ 5 = 6,400 groups of 5 plants/acre

The Impact Of Individual Planting Errors On Corn Yield

Bushels of corn lost per 1/1000 of an acre due to type of planting error (treatment), incidence of planting errors (1-5), and population at a yield level of 225 bu/acre is shown in Tables 3 - 5. Two of the treatments show a yield loss due to planting error: 5 plants with a double and a skip as well as the 4 plants with a true skip. The treatment with 6 plants with a true double had a slight yield increase due to higher plant population (more ears per acre), which is common when yield conditions are good.

Yield calculated in the control treatment plots with 5 uniform plants equaled 221.5 bu/acre: (879 grams per 5 uniform plants X 6400 groups of 5 uniform plants per acre) ÷ 453.6 grams per acre ÷ 56 lbs/bu = 221.5 bu/acre.

In an associated check plot, the same DKC62-08 brand yielded an average of 226 bu/acre at 32,000 seeds/acre and an average of 237 bu/acre at 37,000 seeds/acre. If a yield calculation is made based on an average of 237 bu/acre at 37,000 to estimate the yield at a population of 32,000, the yield potential estimate is 204.97 bu/acre at a population of 32,000.

1. 237 ÷ 37,000 = yield potential estimate ÷ 32,000

2. Yield potential estimate = (237 X 32,000) ÷ 37,000

3. Yield potential estimate = 204.97 bu/acre

The difference in the two calculations of yield response accounts for the ability of the corn product to "flex". Regardless, the estimate of potential yield response to planting errors is relative and should apply reasonably well within a population that is within the normal planting range.

Table 1. Percent difference of treatments compared to control.

Treatment	Weight of corn represented in an area that 5 ears would be planted uniformly in a field (grams)	% Weight Difference Compared to Control
5 uniformly planted plants (control)	879	100%
5 plants with a double and a skip	868	97%
4 plants with a true skip	711	79%
6 plants with a true double	930	104%

Table 2. The number of plants found in an area of 5 uniform plants at different populations.

Treatment	Example 1: The number of plants found in an area of 5 uniform plants within an acre having 38" rows and a population of 32,000	Example 2: The number of plants found in an area of 5 uniform plants within an acre having 38" rows and a population of 35,000	Example 3: The number of plants found in an area of 5 uniform plants within an acre having 38" rows and a population of 38,000
5 uniformly planted plants (control)	6400	7000	7600

The Impact Of Individual Planting Errors On Corn Yield

Table 3. Bushels of corn lost per 1/1000 of an acre due to type of planting error (treatment), incidence of planting errors (1-5) at a population of 32,000 at a yield level of 225 bu/acre.

Treatment	Bushels lost per acre from 1 planting error on 1/1000 of an acre at population of 32,000 and a yield level of 225 bu/acre	Bushels lost per acre from 2 planting errors on 1/1000 of an acre at population of 32,000 and a yield level of 225 bu/acre	Bushels lost per acre from 3 planting errors on 1/1000 of an acre at population of 32,000 and a yield level of 225 bu/acre	Bushels lost per acre from 4 planting errors on 1/1000 of an acre at population of 32,000 and a yield level of 225 bu/acre	Bushels lost per acre from 5 planting errors on 1/1000 of an acre at population of 32,000 and a yield level of 225 bu/acre
5 uniformly planted plants (control)	-	-	-	-	-
5 plants with a double and a skip	0.11	0.21	0.32	0.42	0.53
4 plants with a true skip	0.74	1.48	2.21	2.95	3.69
6 plants with a true double	-0.14*	-0.28*	-0.42*	-0.56*	-0.70*

* The negative value indicates the yield increase that occurred when 6 plants were planted instead of the 5 uniformly spaced plants.

Table 4. Bushels of corn lost per 1/1000 of an acre due to type of planting error (treatment), incidence of planting errors (1-5) at a population of 35,000 at a yield level of 225 bu/acre.

Treatment	Bushels lost per acre from 1 planting error on 1/1000 of an acre at population of 35,000 and a yield level of 225 bu/acre	Bushels lost per acre from 2 planting errors on 1/1000 of an acre at population of 35,000 and a yield level of 225 bu/acre	Bushels lost per acre from 3 planting errors on 1/1000 of an acre at population of 35,000 and a yield level of 225 bu/acre	Bushels lost per acre from 4 planting errors on 1/1000 of an acre at population of 35,000 and a yield level of 225 bu/acre	Bushels lost per acre from 5 planting errors on 1/1000 of an acre at population of 35,000 and a yield level of 225 bu/acre
5 uniformly planted plants (control)	-	-	-	-	-
5 plants with a double and a skip	0.10	0.19	0.29	0.39	0.48
4 plants with a true skip	0.68	1.35	2.03	2.70	3.38
6 plants with a true double	-0.13*	-0.26*	-0.39*	-0.51*	-0.64*

* The negative value indicates the yield increase that occurred when 6 plants were planted instead of the 5 uniformly spaced plants.

The Impact Of Individual Planting Errors On Corn Yield

Table 5. Bushels of corn lost per 1/1000 of an acre due to type of planting error (treatment), incidence of planting errors (1-5) at a population of 38,000 at a yield level of 225 bu/acre.

Treatment	Bushels lost per acre from 1 planting error on 1/1000 of an acre at population of 38,000 and a yield level of 225 bu/acre	Bushels lost per acre from 2 planting errors on 1/1000 of an acre at population of 38,000 and a yield level of 225 bu/acre	Bushels lost per acre from 3 planting errors on 1/1000 of an acre at population of 38,000 and a yield level of 225 bu/acre	Bushels lost per acre from 4 planting errors on 1/1000 of an acre at population of 38,000 and a yield level of 225 bu/acre	Bushels lost per acre from 5 planting errors on 1/1000 of an acre at population of 38,000 and a yield level of 225 bu/acre
5 uniformly planted plants (control)	-	-	-	-	-
5 plants with a double and a skip	0.09	0.18	0.27	0.36	0.44
4 plants with a true skip	0.62	1.24	1.87	2.49	3.11
6 plants with a true double	-0.12*	-0.24*	-0.36*	-0.47*	-0.59*

* The negative value indicates the yield increase that occurred when 6 plants were planted instead of the 5 uniformly spaced plants.

Summary

- The most significant planting error was the true skip with a 79% reduction in yield compared to the uniformally spaced control.
- The skip resulted in a lower planting population than was intended.
- The evenly spaced true double and the double with a skip were statistically similar in yield.
- The data from this trial can help to determine yield loss associated with planting errors.
- This trial should help growers realize that uniformity and seed placement are very important in determining yield potential.

Legals

The information discussed in this report is from a single site, 36 replicate demonstration. This informational piece is designed to report the results of this demonstration and is not intended to infer any confirmed trends. Please use this information accordingly.

Monsanto Company is a member of Excellence Through Stewardship® (ETS). Monsanto products are commercialized in accordance with ETS Product Launch Stewardship Guidance, and in compliance with Monsanto's Policy for Commercialization of Biotechnology-Derived Plant Products in Commodity Crops. This product has been approved for import into key export markets with functioning regulatory systems. Any crop or material produced from this product can only be exported to, or used, processed or sold in countries where all necessary regulatory approvals have been granted. It is a violation of national and international law to move material containing biotech traits across boundaries into nations where import is not permitted. Growers should talk to their grain handler or product purchaser to confirm their buying position for this product. Excellence Through Stewardship® is a registered trademark of Biotechnology Industry Organization.

B.t. products may not yet be registered in all states. Check with your Monsanto representative for the registration status in your state.

Individual results may vary, and performance may vary from location to location and from year to year. This result may not be an indicator of results you may obtain as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible.

ALWAYS READ AND FOLLOW PESTICIDE LABEL DIRECTIONS. Roundup Ready® crops contain genes that confer tolerance to glyphosate, the active ingredient in Roundup® brand agricultural herbicides. Roundup® brand agricultural herbicides will kill crops that are not tolerant to glyphosate. DEKALB and Design®, DEKALB®, Genuity Design®, Genuity Icons, Genuity®, Roundup Ready 2 Technology and Design®, Roundup Ready®, Roundup® and VT Double PRO® are trademarks of Monsanto Technology LLC. Leaf Design® is a registered trademark of Monsanto Company. Respect the Refuge and Corn Design® and Respect the Refuge® are registered trademarks of National Corn Growers Association. All other trademarks are the property of their respective owners.©2013 Monsanto Company. AMB101013

Insect Resistance Management
Planting Refuges, Preserving Technology

Before opening a bag of seed, be sure to read, understand and accept the stewardship requirements, **including applicable refuge requirements for insect resistance management,** for the biotechnology traits expressed in the seed as set forth in the Monsanto Technology/Stewardship Agreement that you sign. By opening and using a bag of seed, you are reaffirming your obligation to comply with the most recent stewardship requirements.

The Impact of Planting Speed on Corn Seed Distribution and Yield

Study Guidelines

A corn demonstration trial was conducted at the Monsanto Learning Center at Scott, MS. DEKALB® Genuity® VT Triple PRO® DKC67-57 brand corn was planted on April 16, 2013. The trial was designed to provide growers information on how planting speed can effect the corn population and yield potential. It was also designed to evaluate differences in planter meters and what impact they may have on corn yield potential.

The trial consisted of four replications, evaluating two planter meters (Precision Planting® eSet® and John Deere® 30 cell meters) at five planting speeds (2, 3, 4, 5, and 6 MPH). The established population of corn plants after emergence was measured using a barcoded ruler system developed at the Learning Center at Scott, MS (Figure 1). A 1-centimeter resolution barcode ruler and a Motorola Symbol reader was used to count the corn plants that emerged and their placement in the row. The corn was harvested to determine grain yield.

Bivariate fit statistical analyses were conducted on the data. A bivariate fit is an analysis in statistics to determine if two sets of paired data are correlated. The data is plotted on a graph to make a linear regression line between the data points. An R-square (R^2) analysis was used to measure the likelihood that the paired data is dependent on one another. If R^2 is equal to 1, all observations would fall on the regression line, indicating it is a good linear model. If R^2 is equal to 0, this would indicate the absence of any linear relationship between the sets of data. R^2 adjusted is a value that corrects to more closely reflect how good the linear model fits the data population.

Figure 1. Barcode ruler and Motorola Symbol reader used to record corn plants that emerge and their distribution in the row.

Results and Conclusions

Corn was planted targeting a population of 36,000 plants per acre on 38-inch rows, with an ideal plant spacing at 4.59 inches apart. The plot mean yield in this demonstration trial was 202 bushels per acre.

When analyzing the data across planter meter types, there was a relatively good correlation of established corn plants to yield. The linear regression of the data showed that a 1,000 plant reduction in corn stand would cost about 3 bushels per acre across the trial (Figure 2). The R^2 value of 0.5 means that the variation in plant population explains roughly 50% of the variation in yield in this trial.

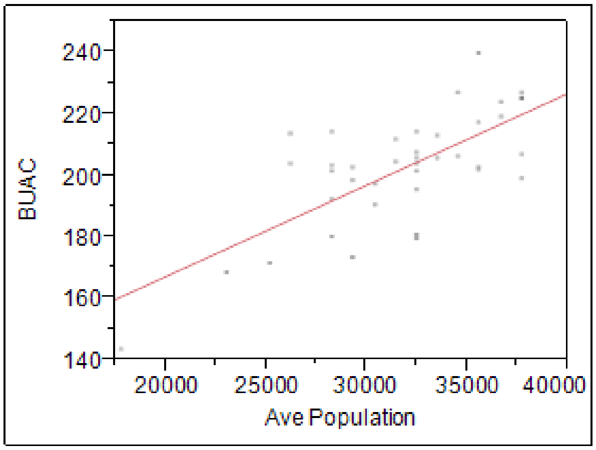


Figure 2. Bivariate fit of corn yield (BUAC) by average (Ave) population when analyzed across planter meter types and planting speeds [Linear Fit: BUAC = 107.33702 + (0.0029793 x Ave Population); Summary of Fit: R^2 = 0.495906, R^2 adjusted = 0.48264].

The data showed that as planting speed increased, the average plant population decreased. There was a relatively good correlation of planting speed to corn stand in this testing when analyzing the data across planter meter types (Figure 3). The linear regression of the data showed that the population decreased by 1,738 plants per acre for each 1 MPH increase in planting speed. Although the correlation of planting speed to yield was not as good (R^2 = 0.2), the data indicates that each 1 MPH increase in planting speed resulted in a 4.3 bushel per acre decrease in yield under the conditions of this testing (Figure 4).

The Impact of Planting Speed on Corn Seed Distribution and Yield

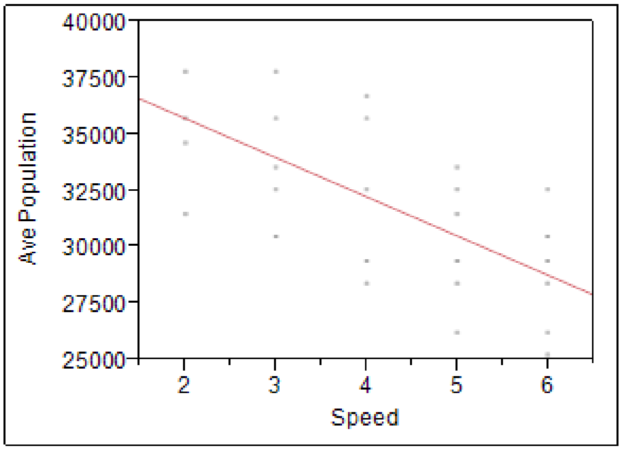


Figure 3. Bivariate fit of average (Ave) plant population by planting speed (MPH) when analyzed across planter meter types [Linear Fit: Ave Population = 39177.534 – (1738.1107 x Speed); Summary of Fit: R^2 = 0.483492, R^2 adjusted = 0.468734].

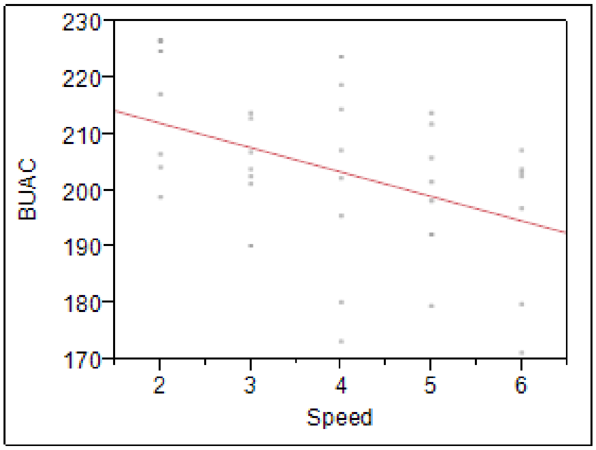


Figure 4. Bivariate fit of corn yield (BUAC) by planting speed (MPH) when averaged across planter meter types [Linear Fit: BUAC = 220.65484 – (4.3405704 x Speed); Summary of Fit: R^2 = 0.189582, R^2 adjusted = 0.166427].

The regression of planting speed to standard deviation in inches indicates that a 1 MPH increase in speed gives a standard deviation increase of 0.2 inches (Figure 5). Standard deviation represents a variability measurement that encompasses 68.2% of the population. A standard deviation of 2 means that 68.2% of the population is ±2 inches from where it should be from the mean distance (plant spacing) in the testing.

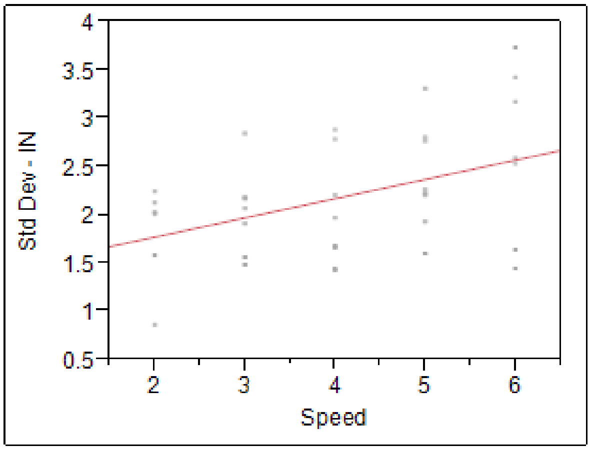


Figure 5. Bivariate fit of standard deviation in inches by planting speed (MPH) when averaged across planter meter types [Linear Fit: Std Dev – IN = 1.3689439 + (0.1994928 x Speed); Summary of Fit: R^2 = 0.192392, R^2 adjusted = 0.169318].

There were differences when analyzing the data by planter meter type. The regression of speed to population was highly correlated with eSet meters, but not as well correlated with the John Deere 30 cell meters (Figures 6 and 7). For each 1 MPH increase in planting speed, the corn population decreased by 2,044 plants per acre with eSet meters, and 1,335 plants per acre with John Deere 30 cell meters. The data showed that as planting speed increased, plant population decreased with both planting meters. However, the John Deere meter units started out planting less corn seed and were less predictable than the eSet meter units.

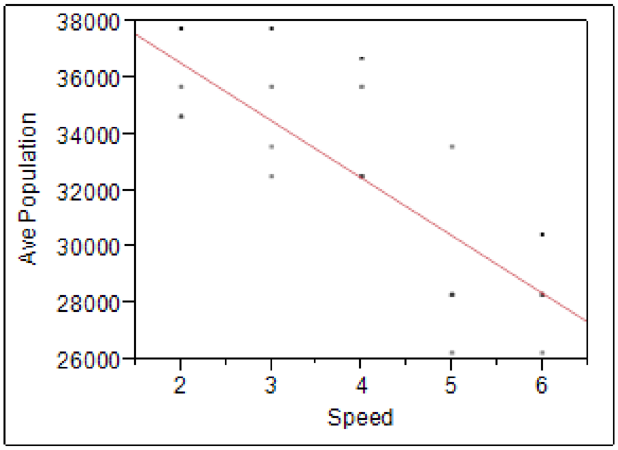


Figure 6. Bivariate fit of average (Ave) corn population by planting speed (MPH) with the Precision Planting® eSet® meters [Linear Fit: Ave Population = 40612.123 – (2043.7069 x Speed); Summary of Fit: R^2 = 0.626055, R^2 adjusted = 0.60528].

The Impact of Planting Speed on Corn Seed Distribution and Yield

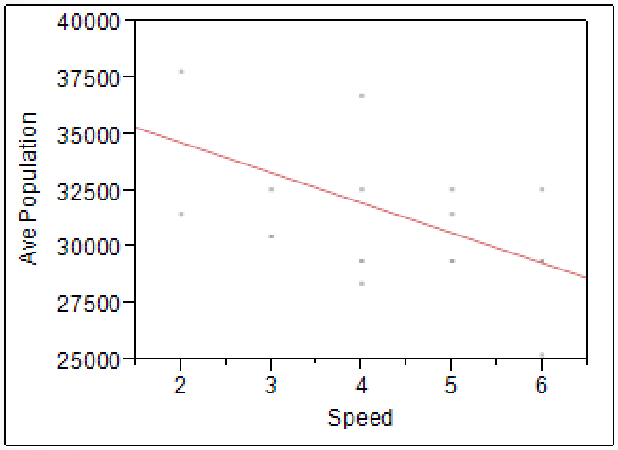


Figure 7. Bivariate fit of average (Ave) corn population by planting speed (MPH) with the John Deere® 30 Cell meters [Linear Fit: Ave Population = 37291.623 – (1334.9747 x Speed); Summary of Fit: R^2 = 0.317493, R^2 adjusted = 0.271993].

The regression of planting speed to corn yield was not as strong a correlation with either planting meter types (Figures 8 and 9). However, the data provided some indication of the impact of planting speed on corn yield. For each 1 MPH increase in planting speed, there was a yield decrease of 3.6 bushels per acre with eSet meters, and 5.4 bushels per acre with John Deere 30 cell meters.

The regression of speed to standard deviation in inches was also not a strong correlation with both planting meters (Figures 10 and 11). However, the data indicated that eSet meter units were somewhat more predictable in how they planted at a variety of speeds.

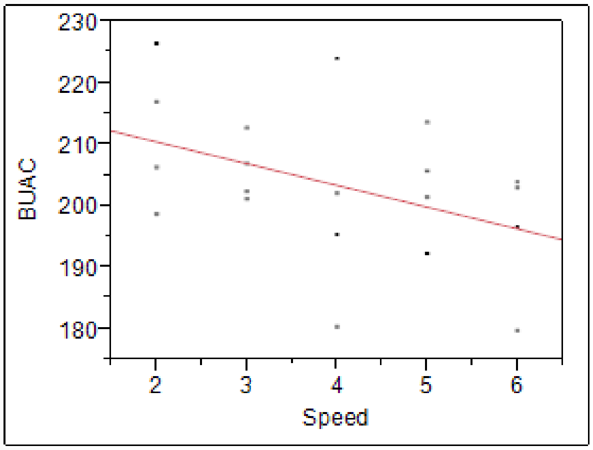


Figure 8. Bivariate fit of corn yield (BUAC) by planting speed (MPH) with the Precision Planting® eSet® meters [Linear Fit: BUAC = 217.53049 – (3.5445584 x Speed); Summary of Fit: R^2 = 0.183607, R^2 adjusted = 0.138252].

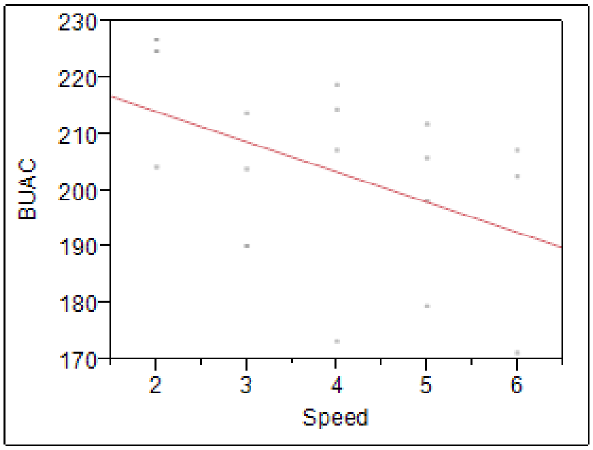


Figure 9. Bivariate fit of corn yield (BUAC) by planting speed with the John Deere® 30 Cell meters [Linear Fit: BUAC = 224.75218 – (5.3673654 x Speed); Summary of Fit: R^2 = 0.206587, R^2 adjusted = 0.153693].

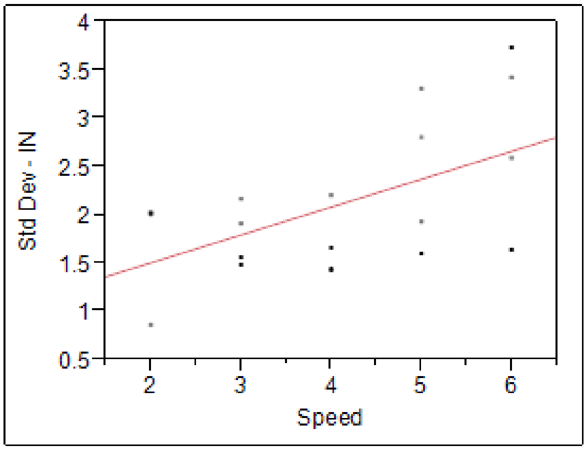


Figure 10. Bivariate fit of standard deviation in inches by planting speed (MPH) with the Precision Planting® eSet® meters [Linear Fit: Std Dev - IN = 0.9225412 + (0.2891693 x Speed); Summary of Fit: R^2 = 0.318155, R^2 adjusted = 0.280275].

The Impact of Planting Speed on Corn Seed Distribution and Yield

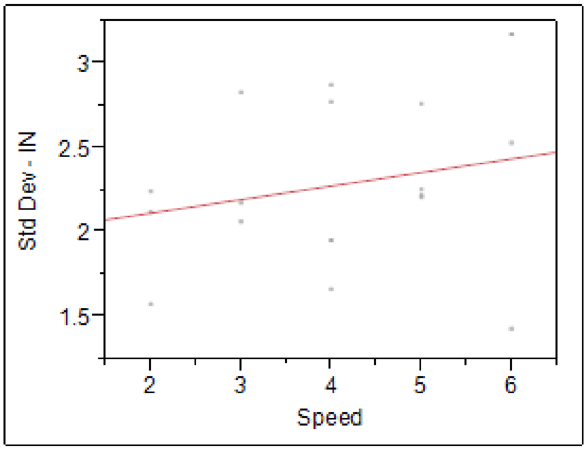


Figure 11. Bivariate fit of standard deviation in inches by planting speed with the John Deere® 30 Cell meters [Linear Fit: Std Dev – IN = 1.9561965 + (0.0802266 x Speed); Summary of Fit: R^2 = 0.052532, R^2 adjusted = -0.01063].

Summary Comments

Data analysis showed that as planting speed increased, the established plant stand decreased with both planter meter units. Across all plant populations, both planter meters yielded similarly. However, more plants were established at all planting speeds with the Precision Planting eSet meter units. This testing indicated that the eSet meter units were less variable than the John Deere 30 cell meter units. Slight decreases in yield, apparently due to increases in variability and seed placement, were observed between 3 and 4 MPH planting speeds. This decrease in yield became more significant somewhere between 4 and 5 MPH planting speeds with both meter types. For this reason, planting speed recommendations between 4 and 5 MPH should be dependent on field conditions. Monitoring tools are available to help in making decisions regarding field conditions that are needed for optimal seed placement. Planting equipment, planting speed, and field conditions can all interact to determine the ultimate variability of a planted corn population and its yield potential.

Legals

The information discussed in this report is from a single site, replicated demonstration. This informational piece is designed to report the results of this demonstration and is not intended to infer any confirmed trends. Please use this information accordingly.

Monsanto Company is a member of Excellence Through Stewardship® (ETS). Monsanto products are commercialized in accordance with ETS Product Launch Stewardship Guidance, and in compliance with Monsanto's Policy for Commercialization of Biotechnology-Derived Plant Products in Commodity Crops. This product has been approved for import into key export markets with functioning regulatory systems. Any crop or material produced from this product can only be exported to, or used, processed or sold in countries where all necessary regulatory approvals have been granted. It is a violation of national and international law to move material containing biotech traits across boundaries into nations where import is not permitted. Growers should talk to their grain handler or product purchaser to confirm their buying position for this product. Excellence Through Stewardship® is a registered trademark of Biotechnology Industry Organization.

B.t. products may not yet be registered in all states. Check with your Monsanto representative for the registration status in your state.

Individual results may vary, and performance may vary from location to location and from year to year. This result may not be an indicator of results you may obtain as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible.

ALWAYS READ AND FOLLOW PESTICIDE LABEL DIRECTIONS. Roundup Ready® crops contain genes that confer tolerance to glyphosate, the active ingredient in Roundup® brand agricultural herbicides. Roundup® brand agricultural herbicides will kill crops that are not tolerant to glyphosate. DEKALB and Design®, DEKALB®, Genuity®, Roundup Ready 2 Technology and Design®, Roundup Ready®, Roundup® and VT Triple PRO® are registered trademarks of Monsanto Technology LLC. Leaf Design® is a registered trademark of Monsanto Company. eSet® is a registered trademark of Precision Planting LLC. Respect the Refuge and Corn Design® and Respect the Refuge® are registered trademarks of National Corn Growers Association. All other products or service names are the property of their respective owners. ©2013 Monsanto Company. 11152013TED

Before opening a bag of seed, be sure to read, understand and accept the stewardship requirements, **including applicable refuge requirements for insect resistance management**, for the biotechnology traits expressed in the seed as set forth in the Monsanto Technology/Stewardship Agreement that you sign. By opening and using a bag of seed, you are reaffirming your obligation to comply with the most recent stewardship requirements.

Standability Evaluations of DEKALB® Brand Corn Products in the Midsouth

Delays in corn harvest can expose corn crops to an increased level of weather-related lodging. Weather-related lodging can result in significant yield loss and the severity can be influenced by planting population and other corn product characteristics[1]. This demonstration trial was conducted to evaluate the ability of DEKALB® brand corn products to stand in the field after the normal harvest window. These evaluations may aid growers in product placement and in-season management decisions. Standability and other product characteristics also serve as preliminary indicators of relative standability among the evaluated corn products.

Study Guidelines

A corn demonstration trial was conducted at the Monsanto Learning Center at Scott, MS to evaluate the ability of DEKALB® brand corn products to stand in the field over a month after the normal harvest time. Corn product standability has an influence on population decisions at planting. Eleven DEKALB® corn brands (DKC61-88, DKC61-78, DKC66-40, DKC62-08, DKC64-69, DKC66-87, DKC66-97, DKC67-57, DKC67-88, DKC68-03, and DKC69-29 brands) and one competitor product were chosen for this demonstration. The trial was set up as 600 ft strip plots and two subplots were harvested from within each strip at two different harvest timings to evaluate standability. One subplot was harvested in a timely manner and the second subplot was harvested 50 days later. Corn was planted on April 16th. The first harvest date was September 16th and the second harvest date was November 5th. The second harvest date was delayed even later than anticipated due to early November thunderstorms. Data was also recorded for ear height, weight, and momentum (average ear height X average ear weight). Standard agronomic practices for the region were implemented and plots were irrigated as needed.

Results

Six of the DEKALB brand corn products (DKC66-40, DKC62-08, DKC66-87, DKC66-97, DKC67-57 and DKC69-29 brands) had similar yields to the first harvest (Figure 1). When harvest was delayed, two DEKALB brand corn products (DKC61-78 and DKC68-03 brands) experienced moderate yield losses of 18% and 10%, respectively. DEKALB brand corn products DKC61-88 brand, DKC64-69 brand, DKC67-88 brand and the competitor product showed the highest yield losses from the delayed harvest of 25.6%, 20.8%, 26.2%, and 41.3%, respectively.

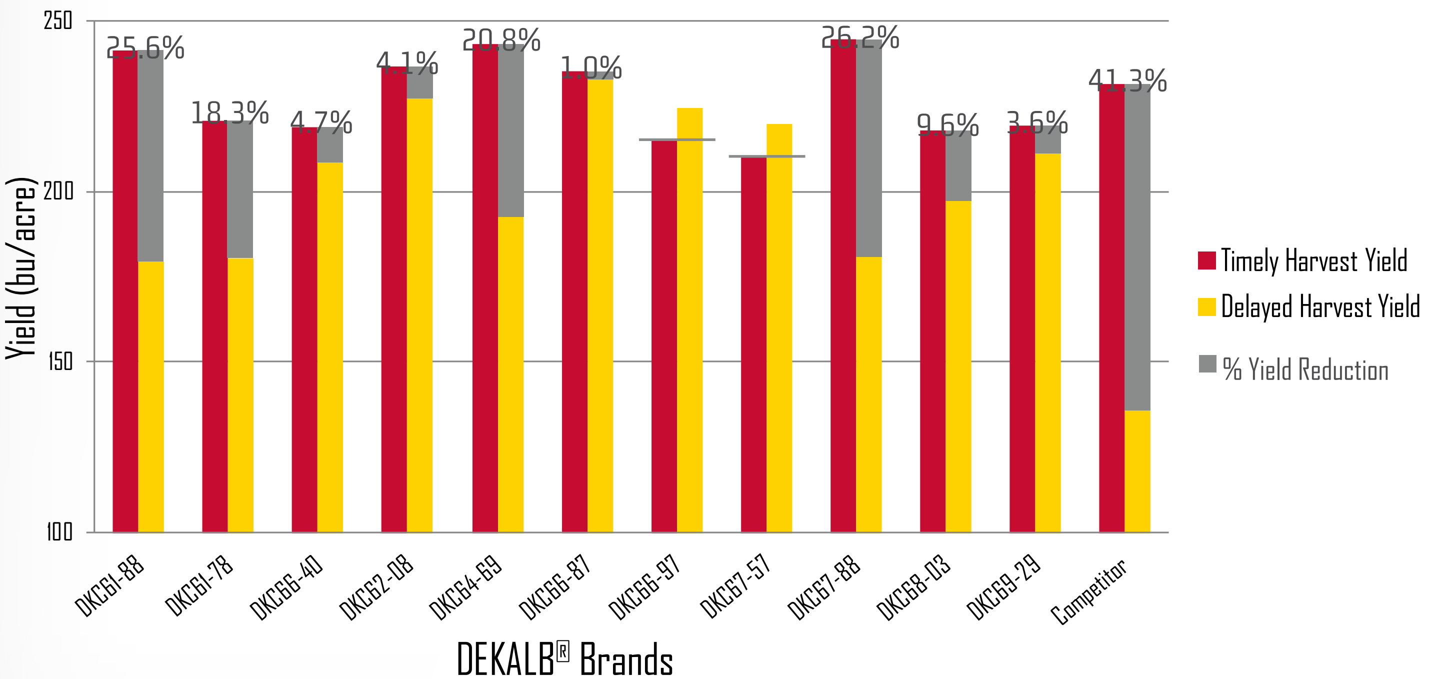


Figure 1. Timely and delayed harvest yield and % loss of delayed harvest for eleven DEKALB® brand corn products and a competitor product.

Standability Evaluations of DEKALB® Brand Corn Products in the Midsouth

Summary Comments

Table 1 lists the percent yield loss found between the timely and delayed harvest, as well as, corn product characteristics: ear height, ear weight, and momentum. Product characteristics can influence the standability of the corn products. Growers should use stalk and root strength ratings of each hybrid to adjust planting populations in the spring. The order of field harvest is often dictated by planting date and relative maturity, but farmers should use published stalk and root strength ratings and scouting to modify the schedule to obtain the best results.

In the event that taller corn products with high ear placement are planted, the following steps can help manage weather-related risks:

- Establish yield goals and provide fertility to maximize stalk quality and grain yield
- Plant low to mid populations (31,000-34,000 kernels per acre)
- Plant corn products with potential lodging risk first
- Manage for earliness
- Harvest these corn products first

Table 1. Standability Evaluations of DEKALB® Brand Corn Products in the Midsouth

Brands	Loss Between 1st and 2nd Harvest (%)	Average Ear Height (inches from the ground)	Average Ear Weight (grams)
DKC61-88	25.6%	51.5	289.3
DKC61-78	18.3%	44.2	285.9
DKC66-40	4.7%	53.8	281
DKC62-08	4.1%	52.6	297.4
DKC64-69	20.8%	48.9	329.6
DKC66-87	1%	47.3	317.2
DKC66-97	-4.4%	43.3	281.8
DKC67-57	-4.5%	46.3	332
DKC67-88	26.1%	63.8	288.5
DKC68-03	10.0%	46.9	267.6
DKC69-29	3.6%	44.4	297.5
Competitor	41.3%	51.7	288.8

Sources and Legals

[1] Thomison, P.R., et al. 2011. Corn response to harvest date as affected by plant population and hybrid. Agron. J. 103:1765-1772 (2011); [2] Evaluation of DEKALB® Brand corn products to planting density. Scott Learning Center Demonstration Report 2012.

Additional sources used to create this Learning Center Summary: Erickson, B. and Valentin, L. September 2008. Evaluating corn harvest timing. Purdue University. Top Farmer Crop Workshop Newsletter.

The information discussed in this report is from a single site, non-replicated, one-year demonstration. This informational piece is designed to report the results of this demonstration and is not intended to infer any confirmed trends. Please use this information accordingly.

Individual results may vary, and performance may vary from location to location and from year to year. This result may not be an indicator of results you may obtain as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible.

DEKALB and Design® and DEKALB® are registered trademarks of Monsanto Technology LLC. Leaf Design® is a registered trademark of Monsanto Company. All other trademarks are the property of their respective owners. Always read and follow IRM, where applicable, grain marketing and all other stewardship practices and pesticide label directions. ©2013 Monsanto Company. CRB111813.

Evaluation of Deep Tillage on Corn in the Midsouth

Corn production can be challenging on some of the less productive soils in the Midsouth. Deep tillage or subsoiling in the fall has been shown to improve the productivity of soils by reducing adverse effects caused by compaction. A demonstration was conducted to help define when conditions are most beneficial for deep tillage for corn production.

Study Guidelines

A demonstration trial was conducted by the Monsanto Learning Center at Scott, MS at a grower's farm to evaluate the effect of deep tillage on corn yield potential. A strip trial demonstration was established on Bertain or Calhoun silt loam soils with two replications. Treatments were deep tillage (Short Line Manufacturing parabolic subsoiler/buster to a depth of 19 inches) and no tillage (Figure 1). The field received tillage in October 2012 only for the deep tillage plots. Both treatments were bedded and rolled. DEKALB® brand corn products were planted the following spring in twin rows (spaced 7.5 inches apart) on a 38-inch raised bed system at 33,500 seeds/acre. Corn yield data from the no tillage and deep tillage treatments was collected by a Case IH Advanced Farming Systems™ yield monitoring system.

Figure 1. A parabolic subsoiler was used for deep tillage treatments.

Figure 2. Effect of deep tillage on corn emergence, corn emerged 5 to 7 days earlier in deep tillage plots (left) versus no tillage plots (right) - 2013 Scott Learning Center.

Results and Conclusions

The 2013 growing season started with abnormally wet conditions due to excessive rainfall. Even before the trial was planted, it was observed that the areas which received deep tillage allowed rainfall to better infiltrate the soil, reducing the ponding effect. The soil within areas that received deep tillage dried considerably faster than areas with no tillage. Plots with no tillage experienced more ponding after rainfall events. Corn plants in the deep tillage plots emerged approximately 5 to 7 days before the no tillage plots (Figure 2).

Corn yields were 237 and 244 bu/acre in plots that did not receive tillage, and 247 and 250 bu/acre in plots with deep tillage. When averaged across replications, deep tillage conducted in the fall resulted in a yield of 8 bu/acre more compared to no tillage (Figure 3). Corn stand counts were taken at the V6 to V8 growth stage; both no tillage and deep tillage plots were planted at 33,500 seeds/acre. The no tillage plots had an average stand count of 27,969 plants/acre and deep tillage plots had an average stand count of 31,316 plants/acre. The deep tillage plots averaged 3,347 plants/acre more than the no tillage corn plots (Figure 4). It was visually observed that plants in the deep tillage plots were substantially larger in height and girth and corn roots were larger when compared to plants in the no tillage plots (Figure 5).

Evaluation of Deep Tillage on Corn in the Midsouth

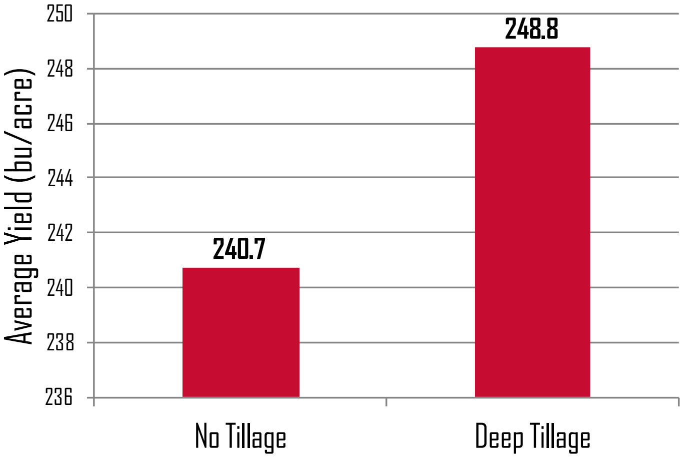


Figure 3. Effect of deep tillage on corn yield potential.

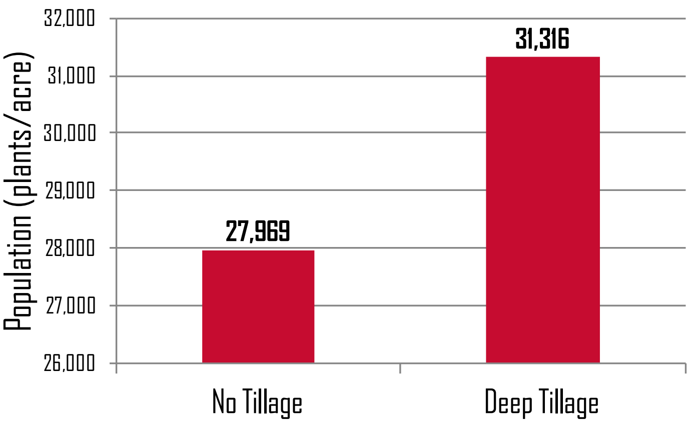


Figure 4. Average plant population at V6 to V8 growth stage in no tillage and deep tillage systems.

Figure 5. Difference in corn plant size and root system between no tillage and deep tillage treatments.

In 2007, a similar study was conducted by the Monsanto Learning Center near Leland, MS to evaluate the effect of soil compaction on corn yield.[1] To evaluate soil compaction within the plots; a penetrometer was used to determine the resistance in pounds per square inch (PSI) of the compacted and non-compacted soils. Water infiltration and root growth are highly inhibited when PSI is above 300.[2] Results from the study showed that soil compaction decreased corn yield under both irrigated and non-irrigated agronomic conditions. Even in irrigated plots yields were reduced by 30% when compared to the non-compacted plots.

Summary

Compaction of soil from large equipment or other causes can alter soil structure and reduce its productivity. Compaction can also adversely affect the amount and movement of air, water, heat, and nutrients in the soil, thereby affecting plant growth.[3] Deep tillage in the fall can help minimize the adverse effects of soil compaction. By loosening up the soil material, deep tillage can enhance water infiltration and allow for higher rates of internal water movement. Loose soil can help store more water, allow for better drainage of excess water, improve soil aeration, and allow soils to warm more quickly in the spring. Surface runoff and soil erosion can also be reduced.[4]

This demonstration showed that deep tillage conducted in the fall can help enhance soil productivity and corn yield potential under Midsouth growing conditions. Testing should continue in future growing seasons to further define the benefits of deep tillage, and under what conditions subsoiling would be beneficial in corn production.

Sources and Legals

[1] Effect of soil compaction on corn yield. 2007. Monsanto Learning Center Research Summary. Leland, MS. [2] Rooney, D., M. Stelford, and D. Landolt. Site-specific soil compaction mapping using a digital pentrometer. Site-specific Management Guidelines. SSMG-34. Potash and Phosphate Institute. [3] Raney, W.A. 1971. Compaction as it affects soil conditions. In K.K. Barnes et al. (ed.) Compaction of agricultural soil. p. 125-222. ASAE, St. Joseph, MI. [4] Wesley, R.A., Smith, L.A. and Spurlock, S.R. 2000. Residual effects of fall deep tillage on soybean yields and net returns on Tunica clay soil. Agronomy Journal 92:941-947.

The information discussed in this report is from a replicated, one-year demonstration. This information piece is designed to report the results of this demonstration and is not intended to infer any confirmed trends. Please use this information accordingly.

Individual results may vary, and performance may vary from location to location and from year to year. This result may not be an indicator of results you may obtain as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible.

DEKALB and Design®,Leaf Design® and DEKALB® is a registered trademark of Monsanto Company. All other trademarks are the property of their respective owners. Always read and follow IRM, where applicable, grain marketing and all other stewardship practices and pesticide label directions. ©2013 Monsanto Company CRB12052013.

The Response Of Corn Products To Increasing Populations

Introduction

Generally, corn yield potential will increase with increasing populations.[1,2] However, the optimum plant population density can vary depending on product genetics.[3,4,5] As a hedge against weather related lodging risk and to account for the plant structure and ear placement of most older, southern adapted products, many Southern producers have traditionally planted corn at lower than optimal plant populations. This is because lodging can occur with increased plant populations and can be magnified when insect or weather damage is introduced.[6]

A trial was conducted at the Monsanto Learning Center at Scott, MS to evaluate the response of DEKALB® brand corn products to planting populations that represent low, medium, and high densities. The objectives of the trial were to determine: the optimal population for a given corn product and the characteristics (ear height, ear weight, momentum, yield by population) of the corn products compared to the older corn products. This trial has been conducted in previous years, including 2012.

The trial was planted on April 18, 2013 utilizing 9 corn brands, 3 populations (31,000, 34,000, 37,000), and 2 row configurations (Table 1). The plots were also irrigated as needed.

Table 1. Treatments used in the trial

Corn Brands	Population	Row Configuration
DKC61-78	31,000	Single
DKC61-88	34,000	Twin
DKC62-08	37,000	
DKC64-69		
DKC66-40		
DKC66-87		
DKC66-97		
DKC67-57		
DKC67-88		

The measurements taken from each replicated plot included:

- Height to ear shank from ground, 10 ears per plot
- Weight per ear in grams, 10 ears per plot
- Momentum calculated as height in inches X weight in grams
- Yield in bushels per acre from the 4 row X 150 ft plot adjusted to 15.5% moisture

Results and Conclusions

Average ear height varied by corn brand, but generally did not vary by population for each corn brand (Figure 1). Therefore, average ear height across populations is presented. Average ear weight was generally consistent across brands, but varied by population. Momentum is a measurement of the combined force from ear weight (grams) and ear placement (inches from the ear shank to the ground), where higher placed heavier ears have the potential to contribute to lodging characteristics for a given corn product. Average momentum values varied by both corn brand and population of each corn brand (Figure 2). DKC61-78 brand had similar average momentum values at all populations. DKC61-78 also had the lowest momentum values, which indicates it had some of the lower lodging potential at all tested populations. DKC67-88 brand had the highest average momentum value; therefore, had the highest potential of lodging. In some cases, average momentum values were higher at lower populations, which is due to bigger ears. This indicates there is not more risk associated with planting at higher populations for some corn brands. Average yields varied by both corn brand and population of each corn brand (Figure 3). In general, average yields increased at the two higher populations (34,000 and 37,000 seeds/acre). DKC67-88 brand had a higher momentum than other products (Figure 4). DKC61-78 brand and DKC66-97 brand had lower momentum than other products.

Summary

In past years growers have planted low populations for the sake of standability. The elimination of stalk feeding pests by YieldGard® products and the Genuity® family of traits along with the change in plant structure is helping to manage harvest lodging risk. Corn brands are now different in their structure which allows increasing populations without greatly increasing risk. This is mostly measured in the momentum calculation. As populations increase, generally the ear moves a bit higher and is smaller on average. These characteristics can allow growers to increase yield potential without greatly increasing harvest related lodging risk.

The Response Of Corn Products To Increasing Populations

Sources and Legals

[1] Thomason, W. 2005. Corn plant populations and yield goals. Virginia Tech Cooperative Extension. Crop and Soil Environmental News, March 2005. Available online: www.ext.vt.edu/;

[2] Williams, W.A., et al. 1968. Canopy architecture at various population densities and the growth and grain yield of corn. Crop Sci. 8:303-308;

[3] Collins, W.K., et al. 1965. Performance of two-ear type of Corn Belt maize. Crop Sci. 5:113-116;

[4] Cox, W.J. 1996. Whole-plant physiological and yield responses of maize to plant density. Agron. J. 88:489-496;

[5] Widdicombe, W.D. and Thelen, K.D. 2002. Row width and plant density effects on corn grain production in the northern Corn Belt. Agron. J. 94:1020-1023;

[6] Sorensen, R.B. et al. 2006. Row pattern, plant density, and nitrogen rate effects on corn yield in the Southeastern US. Plant Management Network;

Standability evaluations of DEKALB® brand corn Ppoducts. Scott Learning Center Demonstration Report 2012.

The information discussed in this report is from a single site, non-replicated demonstration. This informational piece is designed to report the results of this demonstration and is not intended to infer any confirmed trends. Please use this information accordingly.

Monsanto Company is a member of Excellence Through Stewardship® (ETS). Monsanto products are commercialized in accordance with ETS Product Launch Stewardship Guidance, and in compliance with Monsanto's Policy for Commercialization of Biotechnology-Derived Plant Products in Commodity Crops. This product has been approved for import into key export markets with functioning regulatory systems. Any crop or material produced from this product can only be exported to, or used, processed or sold in countries where all necessary regulatory approvals have been granted. It is a violation of national and international law to move material containing biotech traits across boundaries into nations where import is not permitted. Growers should talk to their grain handler or product purchaser to confirm their buying position for this product. Excellence Through Stewardship® is a registered trademark of Biotechnology Industry Organization.

B.t. products may not yet be registered in all states. Check with your Monsanto representative for the registration status in your state.

Individual results may vary, and performance may vary from location to location and from year to year. This result may not be an indicator of results you may obtain as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible.

ALWAYS READ AND FOLLOW PESTICIDE LABEL DIRECTIONS. Roundup Ready® crops contain genes that confer tolerance to glyphosate, the active ingredient in Roundup® brand agricultural herbicides. Roundup® brand agricultural herbicides will kill crops that are not tolerant to glyphosate. DEKALB and Design®, DEKALB®, Genuity® and YieldGard® are registered trademarks of Monsanto Technology LLC. Leaf Design® is a registered trademark of Monsanto Company. Respect the Refuge and Corn Design® and Respect the Refuge® are registered trademarks of National Corn Growers Association. All other trademarks are the property of their respective owners. ©2013 Monsanto Company. AMB100313

Insect Resistance Management — Planting Refuges, Preserving Technology

Before opening a bag of seed, be sure to read, understand and accept the stewardship requirements, **including applicable refuge requirements for insect resistance management,** for the biotechnology traits expressed in the seed as set forth in the Monsanto Technology/Stewardship Agreement that you sign. By opening and using a bag of seed, you are reaffirming your obligation to comply with the most recent stewardship requirements.

Roundup Ready 2 Technology · Respect the Refuge

Ear Weight by Population compared to Average Ear Height

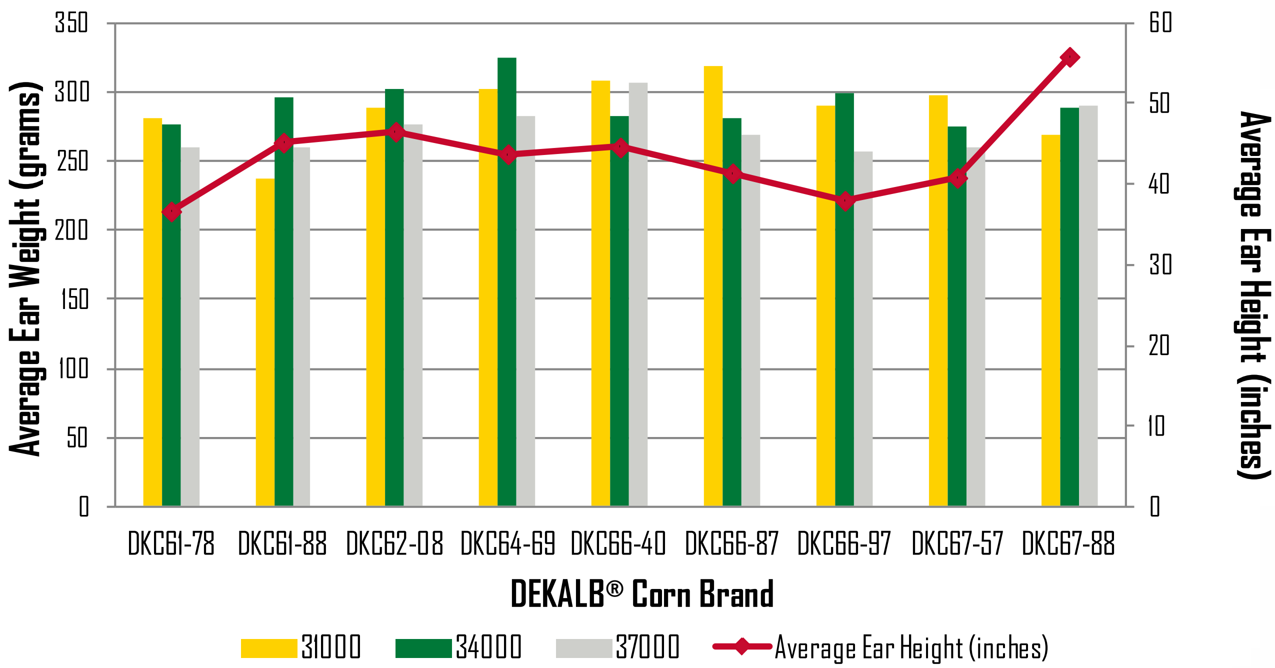


Figure 1. Average ear weight (grams) by population compared to average ear height (inches).

The Response Of Corn Products To Increasing Populations

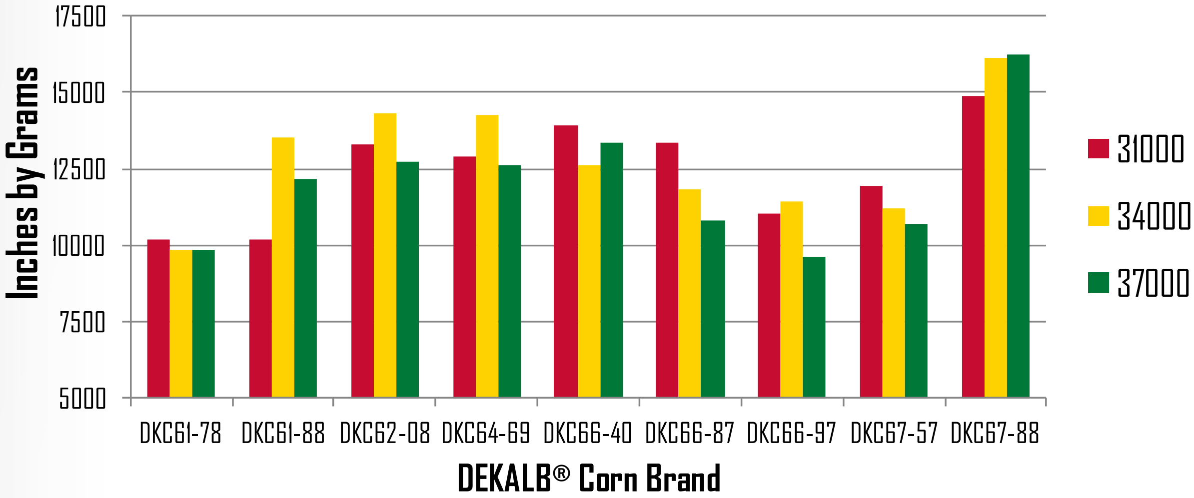


Figure 2. Average momentum (inches x grams) by population.

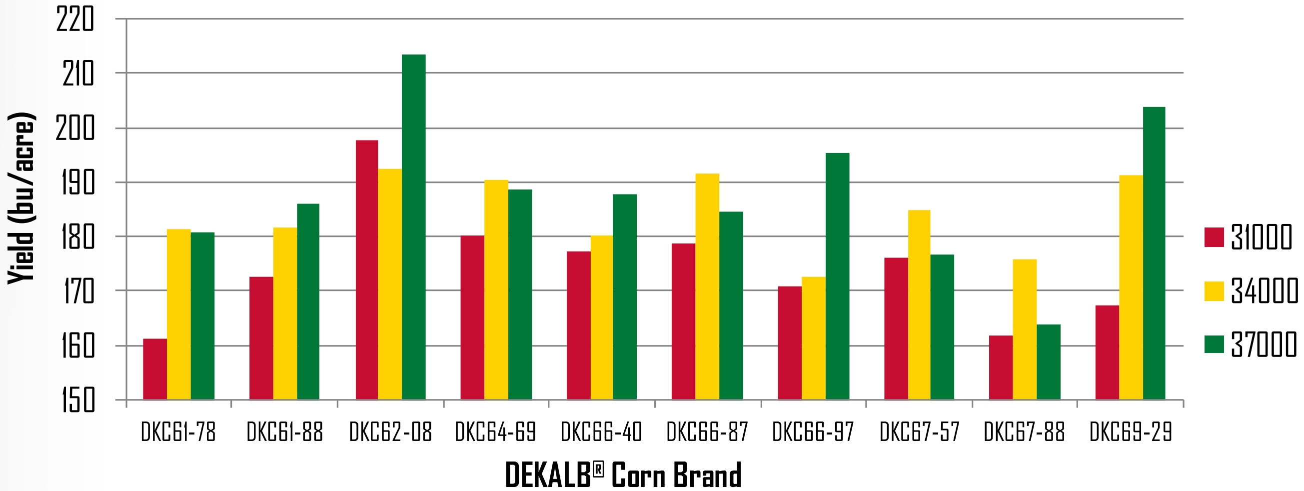


Figure 3. Average yield (bu/acre) by population.

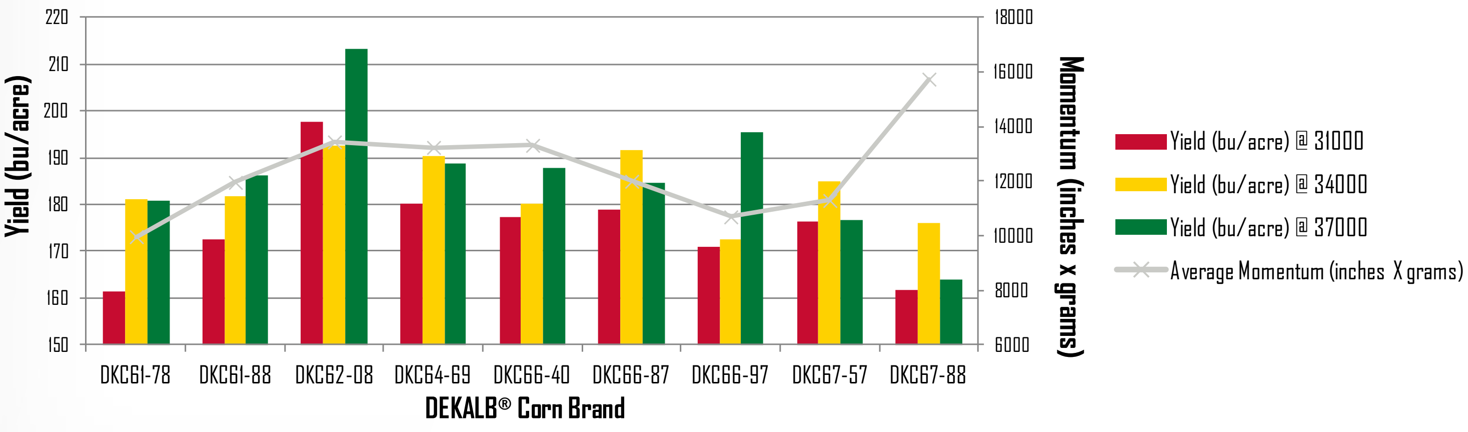


Figure 4. Average yield (bu/acre) by population compared to momentum.

2013 Weather Summary

Environmental conditions at the Monsanto Learning Center at Scott, MS during the 2013 growing season contributed to above average yields for all crops. Temperatures were moderate to below average for the region with no periods of extreme heat. Precipitation for the season was below the 10-year average. Heat units for crop growth and development during 2013 accumulated at a steady, but somewhat reduced rate versus the 2012 growing season.

Temperature, Humidity and Rainfall

Temperatures during the 2013 season were similar to the long-term average at the Monsanto Learning Center at Scott, MS. May and early June were slightly cooler than usual, but the months of July, August, and September followed normal temperatures (Figure 1). Temperatures during 2013 were more moderate than temperatures in 2012 (Figure 2). For Scott, MS, there were no daytime high temperatures over 100° F, and no recorded low temperatures above 80° F. The lack of extended periods of extreme heat during the season contributed to high yields for the crops.

Periods of low humidity combined with cool nights also helped contribute to the above-average yields for crops in 2013 (Figure 3). Recorded humidity for 2013 was similar to humidity for 2012 (Figure 4). Lower humidity for both years helped to reduce the potential for extreme heat stress during the early to mid cropping season.

Rainfall was periodic and timely during the season (Figure 5). Monthly total rainfall was as follows: May 3.84 inches, June 3.46 inches, July 2.94 inches, August 2.38 inches, and September 5.08 inches for a total of nearly 18 inches of rainfall. Rainfall throughout the year was below the 10-year average. The longest period of no rain was 20 days from mid-August through the first

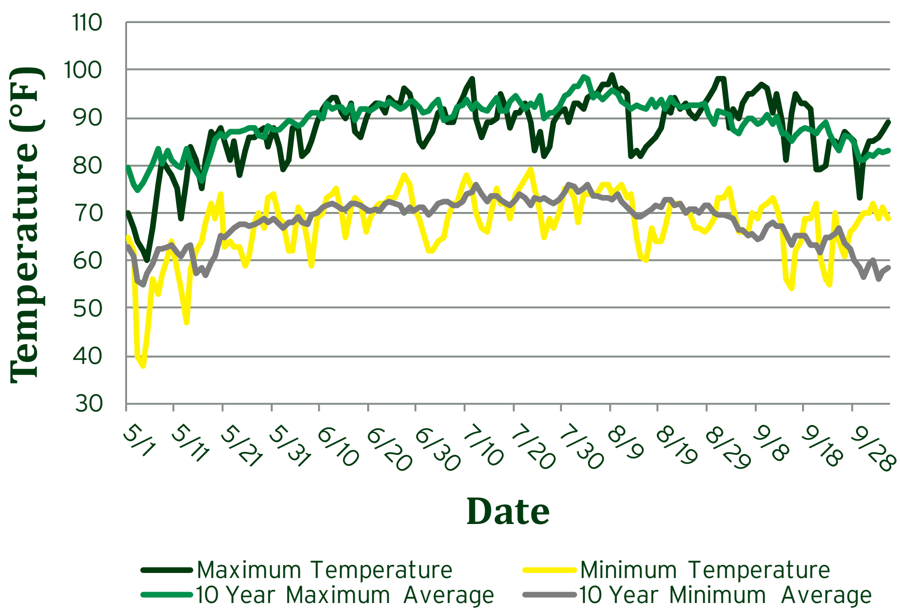


Figure 1. The 2013 maximum and minimum daytime temperatures compared to the 10-year averages from May 1 to October 1 at the Monsanto Learning Center at Scott, MS.

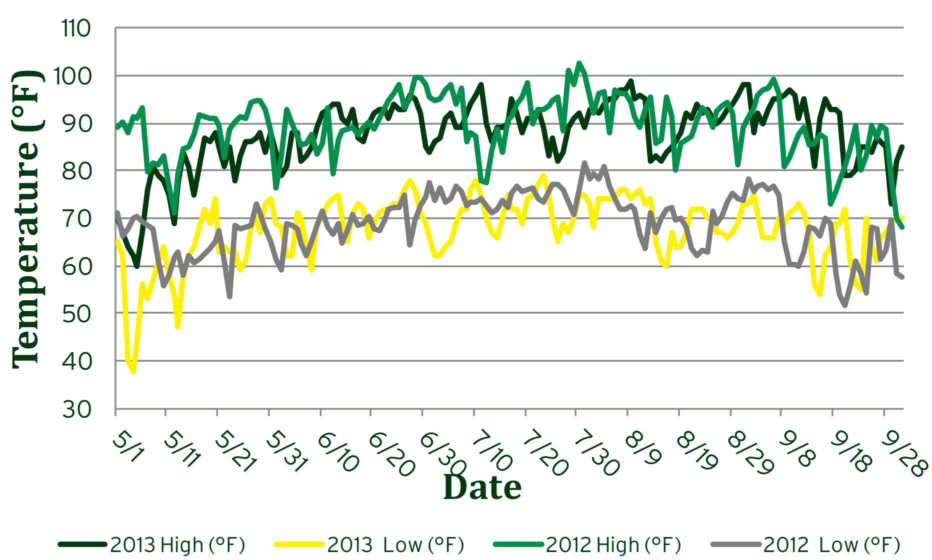
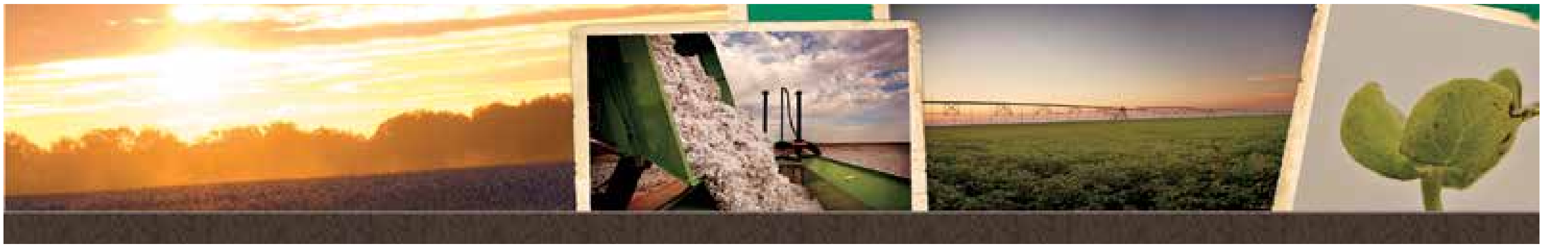


Figure 2. Temperature comparison for 2012 and 2013 at Scott, MS from May 1 to October 1.



2013 Weather Summary

week in September. Rainfall events of more than one inch occurred once in May, twice in June, once in July, once in August, and four times in September. The well-timed rainfall helped to produce above-average yields in dryland crop production systems. When compared to 2012 rainfall accumulation, the 2013 season began with more rainfall in May but received less rainfall for the rest of the growing season (Figure 6).

Adequate rainfall combined with periods of low humidity, cool nights, and no periods of high to extreme heat helped contribute to above-average yields observed for each crops in 2013.

Heat Units

Plant growth and development is related to heat unit accumulation. Heat units (DD60s) are equal to the average temperatures for a day minus a minimum growing temperature (50° F for corn and 60° F for cotton). Heat units are used as an aid in managing cotton, providing information about when to plant, when to expect first bloom, and when bolls might be maturing.

Heat unit accumulation varied throughout the 2013 growing season, but DD60s were accumulated at a rate similar to previous seasons (Figures 7 and 8). The accumulated heat units per day ranged from around 10.6 to 21 DD60s during May and June, peaking around 26.5 DD60s in July and again in August. The average heat unit accumulation was 17.0 DD60s per day from May 1 to October 5, 2013. Heat unit accumulation in 2013 was slightly less than accumulation in 2012 (Figure 9).

Sources and Legals

weatherplot.com. copyright 2001-2013. Iteris, Inc

Individual results may vary, and performance may vary from location to location and from year to year. This result may not be an indicator of results you may obtain as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible.

Deltapine® and Leaf Design® are registered trademarks of Monsanto Company. All other trademarks are the property of their respective owners. ©2013 Monsanto Company. CRB10132013.

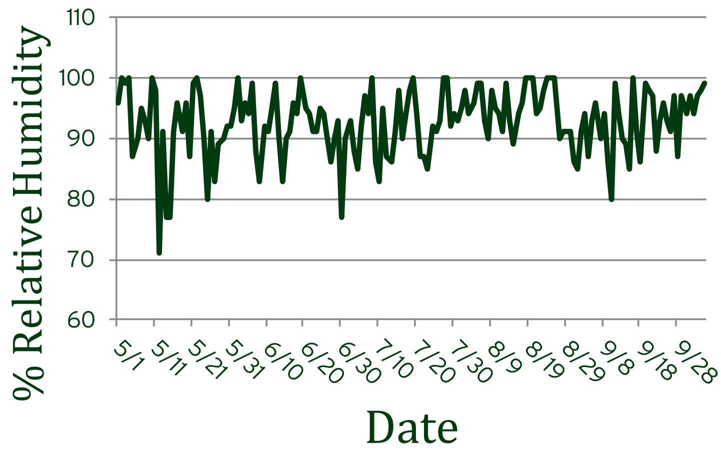


Figure 3. Humidity recorded for Scott, MS from May 1 to October 1, 2013.

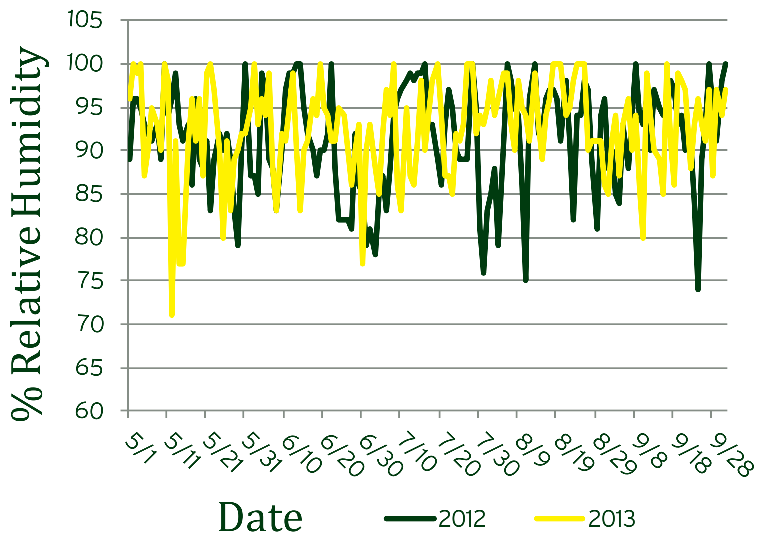


Figure 4. Humidity comparison for 2012 and 2013 at Scott, MS from May 1 to October 1.

2013 Weather Summary

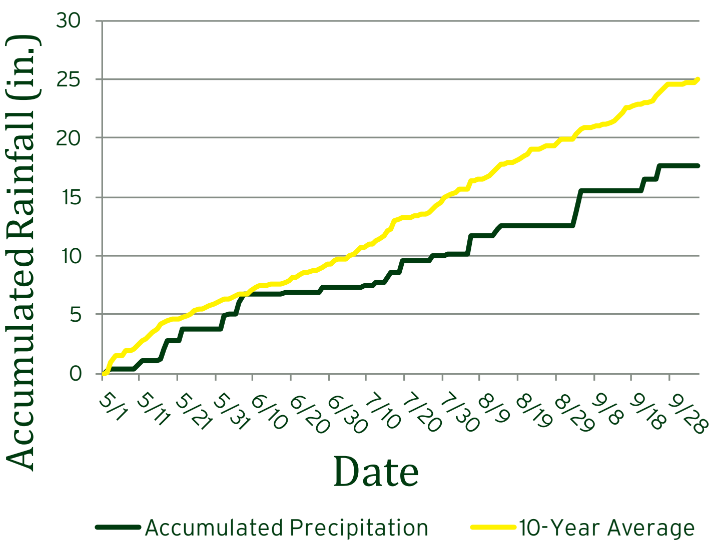


Figure 5. Accumulated precipitation for 2013 season compared to the 10-year average for Scott, MS from May 1 to October 1.

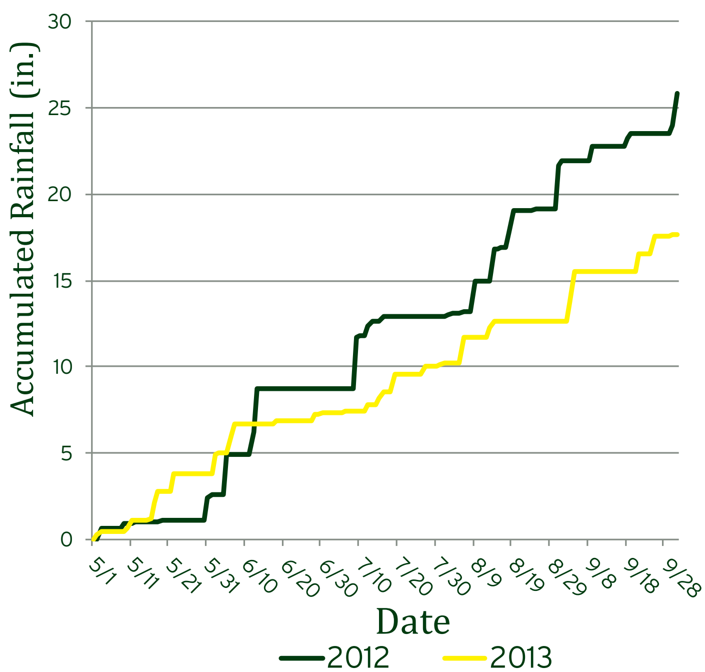


Figure 6. Accumulated precipitation comparison for 2012 and 2013 at Scott, MS from May 1 to October 1.

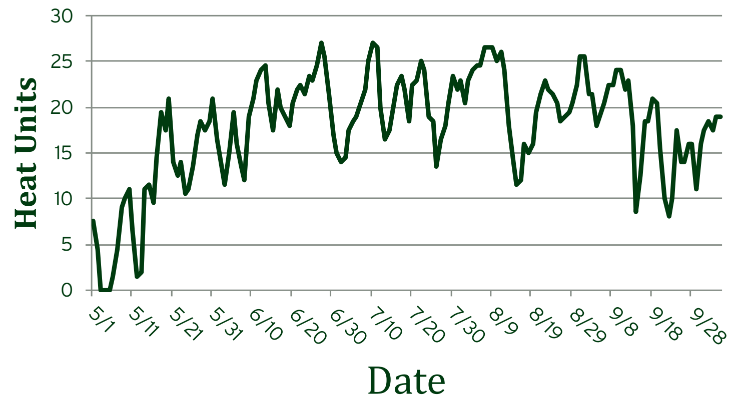


Figure 7. Heat units for 2013 for Scott, MS from May 1 to October 1.

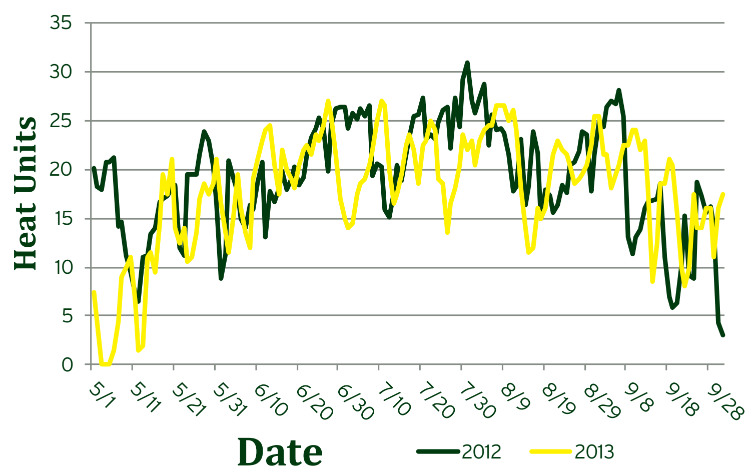


Figure 8. Comparison of heat units for 2012 and 2013 at Scott, MS from May 1 to October 1.

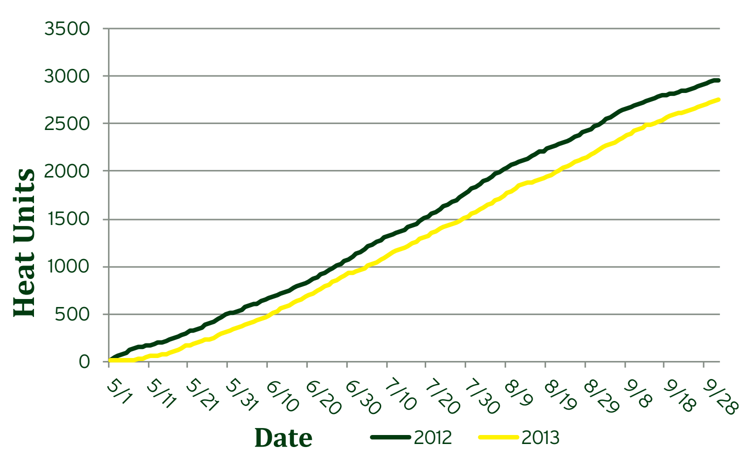
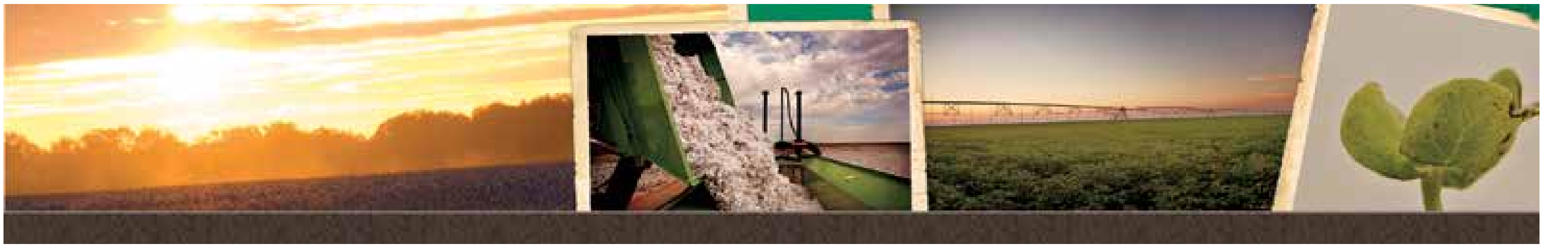


Figure 9. Comparison of heat unit accumulation for 2012 and 2013 at Scott, MS from May 1 to October 1.



The Response of Cotton Varieties to Population and Plant Growth Regulators

Study Guidelines

- A cotton demonstration trial was conducted at the Monsanto Learning Center at Scott, MS to demonstrate the effect of plant population and plant growth regulator (PGR) applications on plant growth and development.
- Questions asked included: What imapct does increasing plant population have on cotton growth and development? Do PGR applications and planting population interact differently for different varieties?
- Four Deltapine® cotton varieties (DP 1137 B2RF, DP 1311 B2RF, DP 1321 B2RF, and DP 13R347 B2RF) were planted on May 30, 2013.
- All varieties were Genuity® Bollgard II® with Roundup Ready® Flex (B2RF) cotton.
- Each variety was planted at five different seeding rates (13,800; 27,600; 41,400; 55,200; and 69,000 seeds/acre).
- Two PGR regimes were implemented: passive and aggressive. Each variety, at each seeding rate, received both passive and aggressive PGR treatments.

PGR Applications (oz/acre)		
Date	Aggressive	Passive
2-July	12	NA
20-July	16	10
1-August	20	12

Results and Conclusions

- The exceptional 2013 growing season provided cotton plants with a somewhat abnormally long period of balanced vegetative and reproductive growth from bloom until cutout.
- The 2013 growing season was very similar to growing conditions typically experienced in Australia, California, and Arizona.
- This allowed for the accumulation of extremely high fruit retention and associated yield.

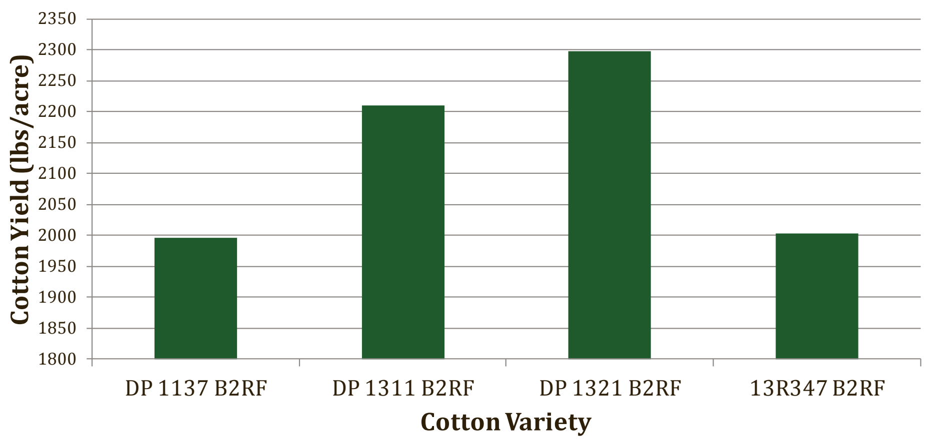


Figure 1. Cotton yield (lbs/acre) by variety across populations and PGR regimes. The 2013 cotton season was exceptional, with extremely high yield potential. Both DP 1311 B2RF and DP 1321 B2RF produced exceptional yields in 2013.

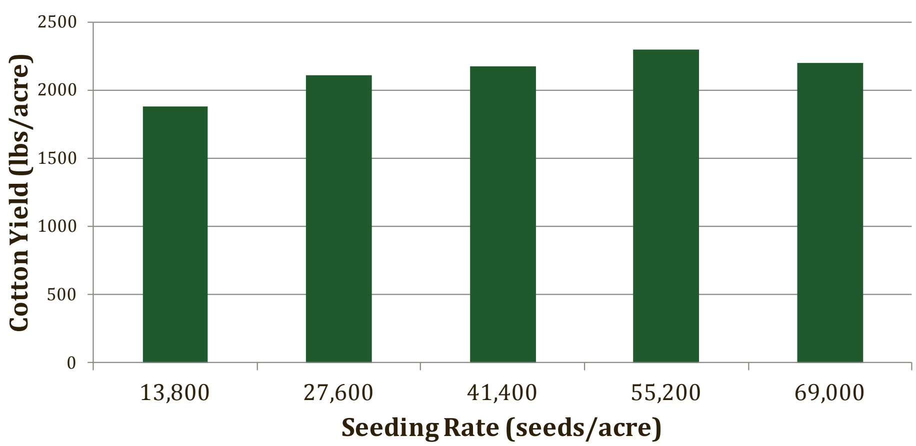


Figure 2. Cotton yield (lbs/acre) by seeding rate across varieties and PGR rates. The population responses in the growing conditions of 2013 were similar to previous years. There was a positive response to populations up to 55,200 seeds/acre and a drop in yield at higher populations.

The Response of Cotton Varieties to Population and Plant Growth Regulators

- The application of aggressive rates of PGRs in 2013 helped continue this balanced growth for a longer period, while the less aggressive management allowed plants to develop more vegetative growth in the mid-to-late season, resulting in cutout with a reduced fruit load.
- When managing "growthy" varieties, population can be a tool to moderate very aggressive vegetative development without great sacrifices in yield potential.
- Lower populations did not pay a huge price in yield.
- Aggressive PGR applications enhanced yields during the 2013 season.
- Results from the aggressive PGR applications in 2013 are a bit atypical in that during most growing seasons, many PGR applications will not lead to yield increases.
- During the extremely strong growing conditions of 2013, PGRs were a yield-increasing treatment across the board.
- This points out that that no two cotton fields or crops are the same, and each should be managed independently, based on knowledge and monitoring from that season, field, and/or variety.
- Growers should consult the data to determine which varieties are aggressive growers and how each product responds to both population and PGRs.

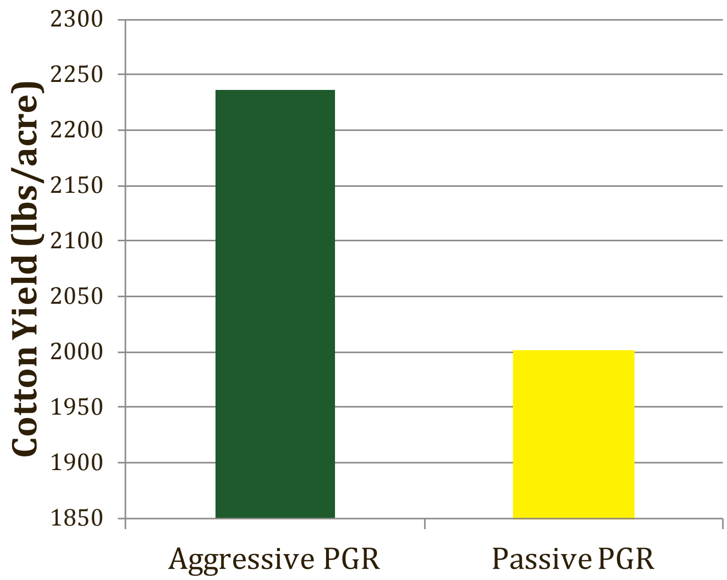


Figure 3. Cotton yield (lbs/acre) by PGR regime across varieties and populations. Contrary to more typical seasons, the aggressive PGR treatment improved yield in most cases. This is primarily due to the reallocation of resources in a season where fruit retention was extremely high.

Legal

Monsanto Company is a member of Excellence Through Stewardship® (ETS). Monsanto products are commercialized in accordance with ETS Product Launch Stewardship Guidance, and in compliance with Monsanto's Policy for Commercialization of Biotechnology-Derived Plant Products in Commodity Crops. This product has been approved for import into key export markets with functioning regulatory systems. Any crop or material produced from this product can only be exported to, or used, processed or sold in countries where all necessary regulatory approvals have been granted. It is a violation of national and international law to move material containing biotech traits across boundaries into nations where import is not permitted. Growers should talk to their grain handler or product purchaser to confirm their buying position for this product. Excellence Through Stewardship® is a registered trademark of Biotechnology Industry Organization.

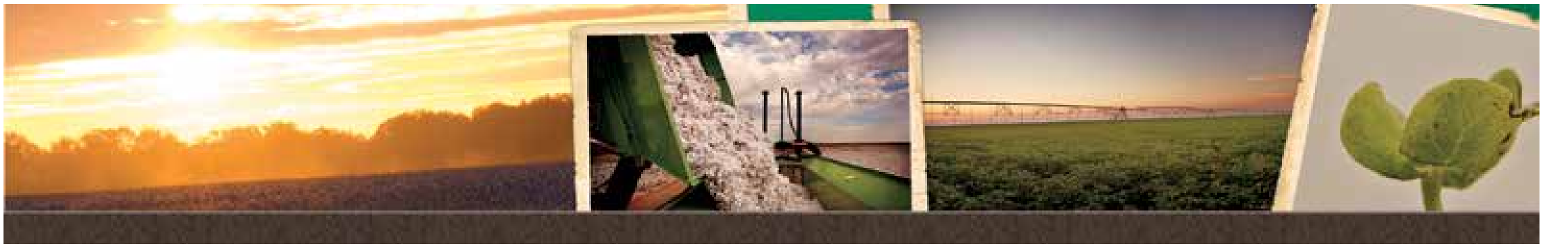
B.t. products may not yet be registered in all states. Check with your Monsanto representative for the registration status in your state.

Individual results may vary, and performance may vary from location to location and from year to year. This result may not be an indicator of results you may obtain as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible.

ALWAYS READ AND FOLLOW PESTICIDE LABEL DIRECTIONS. Roundup Ready® crops contain genes that confer tolerance to glyphosate, the active ingredient in Roundup® brand agricultural herbicides. Roundup® brand agricultural herbicides will kill crops that are not tolerant to glyphosate. Bollgard II®, Genuity Design®, Genuity Icons, Genuity®, Respect the Refuge and Cotton Design®, Roundup Ready® and Roundup® are trademarks of Monsanto Technology LLC. Deltapine® and Leaf Design® are registered trademarks of Monsanto Company. All other trademarks are the property of their respective owners. ©2013 Monsanto Company. 11122013JEH.

The information discussed in this report is from a single site, non-replicated demonstration. This information piece is designed to report the results of this demonstration and is not intended to infer any confirmed trends. Please use this information accordingly.

Before opening a bag of seed, be sure to read, understand and accept the stewardship requirements, **including applicable refuge requirements for insect resistance management**, for the biotechnology traits expressed in the seed as set forth in the Monsanto Technology/Stewardship Agreement that you sign. By opening and using a bag of seed, you are reaffirming your obligation to comply with the most recent stewardship requirements.



The Response of Cotton Varieties to Population and Plant Growth Regulators

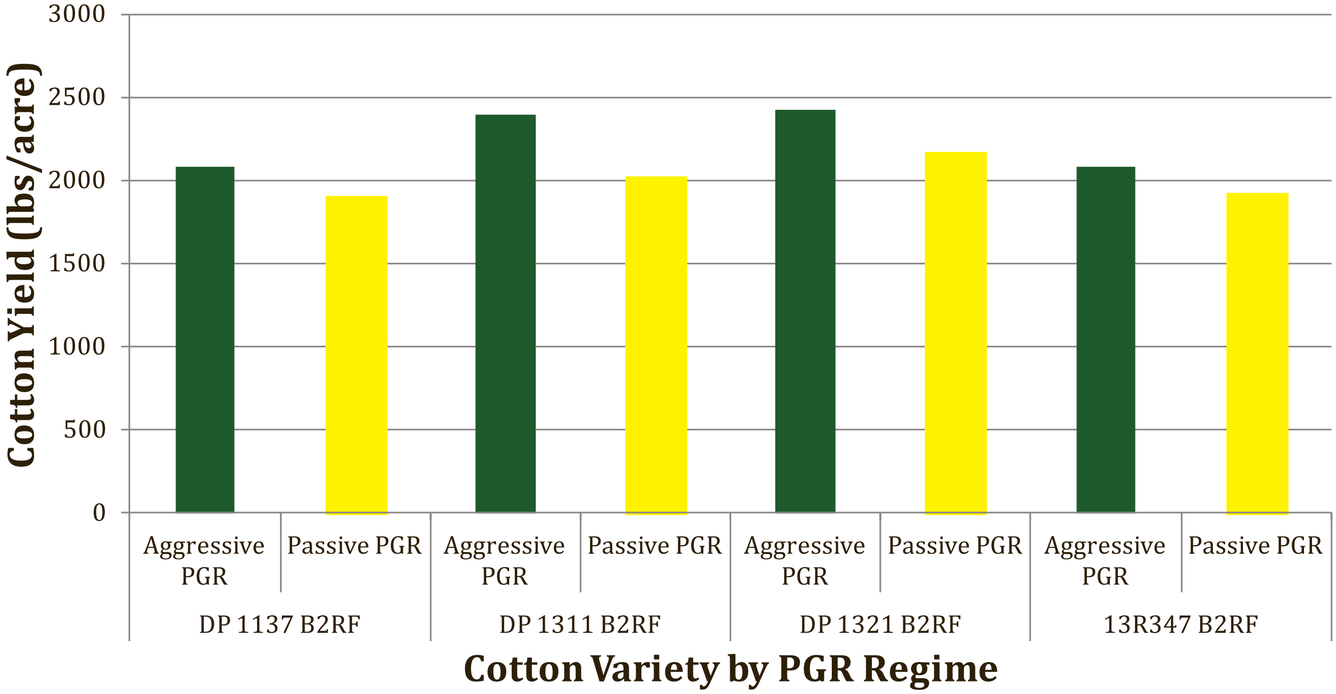


Figure 4. Cotton yield (lbs/acre) by variety and PGR regime across populations. For each variety tested, the aggressive PGR regime produced the highest yields in 2013.

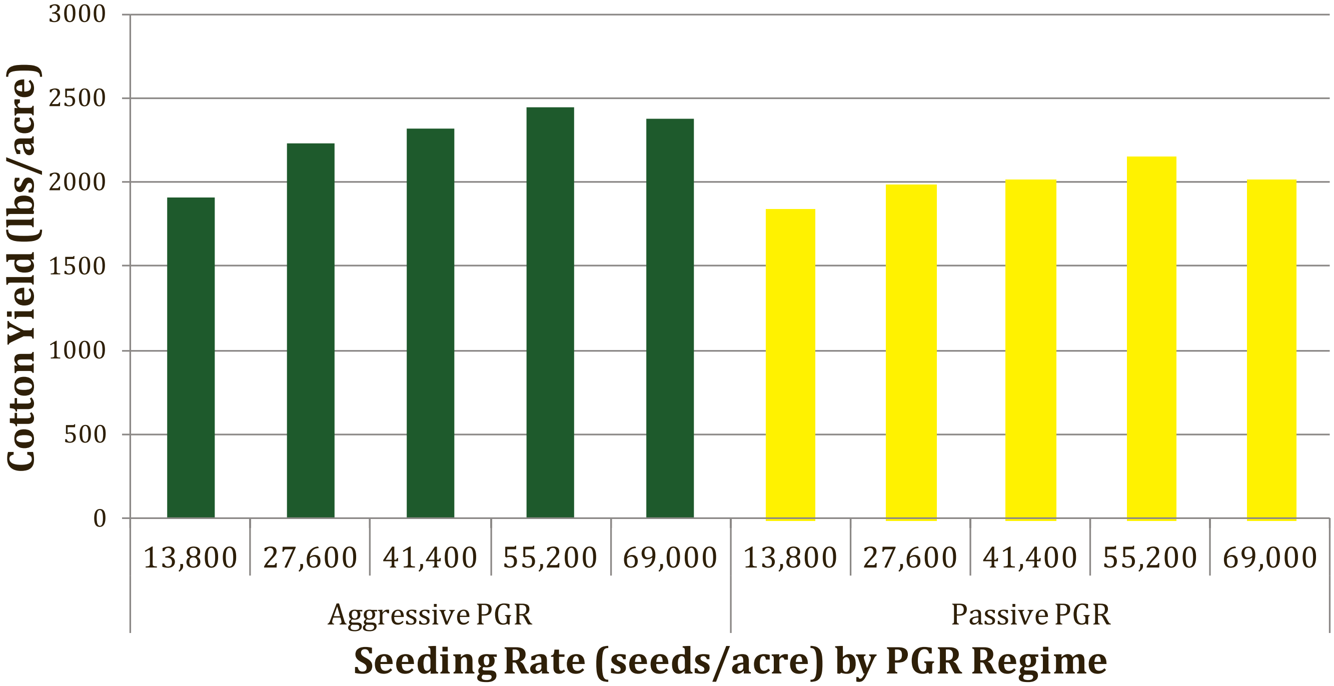


Figure 5. Cotton yield (lbs /acre) by variety and seeding rates across populations. Yields increased with the aggressive PGR treatment and, up to 55,200 plants/acre.

The Response of Old and New Cotton Varieties to Plant Growth Regulators

Study Guidelines

- A cotton demonstration trial was conducted at the Monsanto Learning Center at Scott, MS to investigate the effects of passive and aggressive plant growth regulator (PGR) management strategies on old and new cotton varieties.
- Fifteen Deltapine® cotton varieties were planted at 45,000 seeds per acre on May 30, 2013.
- All varieties except the two conventional varieties (Deltapine 20 and Deltapine 50) were Genuity® Bollgard II® with Roundup Ready® Flex cotton.
- Each variety received both the passive and the aggressive PGR treatments, which were compared to an untreated check.
- A primary goal of this trial was to learn about the growth habit and response to two levels of PGR applications on currently available cotton varieties as well as new cotton varieties that may be available to growers soon.
- Data were collected on plant growth reduction and yield.

PGR Applications (oz/acre)

Date	Aggressive	Passive
2-July	12	NA
20-July	16	10
1-August	20	12

Plant Monitoring and PGR Decision Making

Depending on the current growth rate of the field being managed, different decisions may be made about PGR management. The primary decision to be made by a manager is related to both rate and timing. By increasing the rate applied, or decreasing the interval between applications, a more aggressive management system can be instituted in the field. The most aggressive system would be increasing rate and decreasing the interval simultaneously. It is difficult to know when these modifications are necessary without a sound monitoring program.

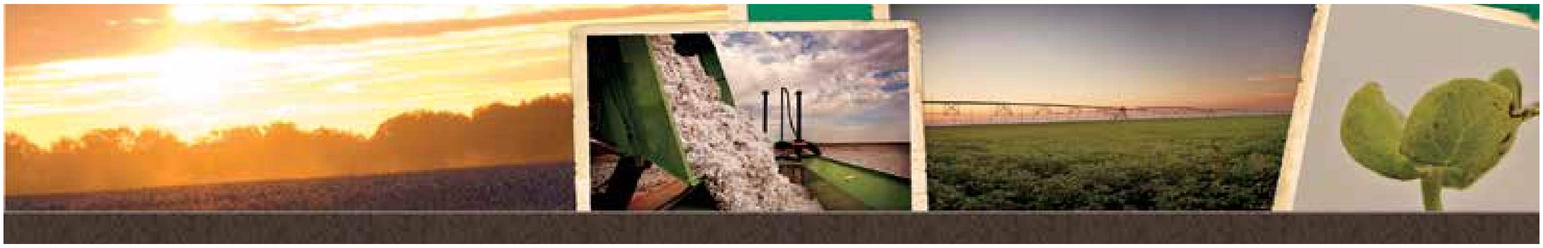
The following are a few considerations for monitoring fields and making good decisions:

- Care should be taken to observe the growth patterns of all varieties.
- Monitoring is best accomplished via measurements of plant height and internode distance between the 4th and 5th nodes below the terminal node. This internode is easy to identify, either by counting down the plant or simply by bending the terminal. It will almost always be the internode that bends (Figure 1).
- The 4-5 internode length best indicates the actual plant growth rate. When considered in combination with the 2-3 internodes below it, this gives a good indication of plant growth rates and changes in growth rate over the last 2 weeks or so. If it's shorter, growth is decelerating.
- Use the plant size, internode length, and amount of PGR already applied to determine timing and rate for future PGR applications.

Figure 1. Monitoring the plant height and the internode distance between the 4th and 5th node below the terminal node to determine PGR application rate and timing.

Factors in Making a PGR Decision

- PGRs are active at a dry weight concentration of approximately 10 ppm dry weight.
- Larger plants require more PGR to get over the threshold.
- PGR does not degrade. Once it is in the plant it stays there.
- PGR effect is diluted by growth.
- A PGR applied early is still useful later in the growing season.
- Low rates applied early can have benefits later in the season.



The Response of Old and New Cotton Varieties to Plant Growth Regulators

Results and Conclusions

- Proper use of plant growth regulators (PGRs) can be critical to help maximize yield potential.
- Mismanagement of PGRs can result in reduced yield potential.
- Understanding an individual variety's growth habit and response to growth management is one of the most important factors in developing a sound PGR management strategy.
- Plant response to PGRs varies by variety, plant genetics, and environmental conditions during and after application.
- Plant monitoring and PGR application are variety- and season-specific.
- The 2013 cotton season was exceptional, with extremely high yield potential.
- 5 of the 15 varieties reported higher yields with the passive PGR strategy.
- 5 of the 15 varieties reported higher yields with the aggressive PGR strategy.
- 5 of the 15 varieties reported higher yields in the untreated check.
- All varieties reported the tallest heights in the UTC plots.
- Certain varieties that were likely more determinate, with the fruit load helping to control vegetative growth, were not as responsive to PGR applications because height control was not needed.
- Less determinate varieties and varieties which typically have relatively aggressive early-season growth responded favorably to aggressive PGR applications (DP 1137 B2RF and DP 1252 B2RF).
- Aggressive PGR management of determinant varieties may reduce yield potential (Deltapine 20 and DP 1133 B2RF).
- Old Deltapine® cotton varieties (Deltapine 20 and Deltapine 50) yielded less than most of the newer cotton varieties, demonstrating the determinate nature of many older products vs. most of the newer varieties.
- This study provides a snapshot of responses in only one growth environment, location, and year, but may provide insight into the growth and development nature of the old and new Deltapine® cotton varieties.

Note: These results are not intended to provide you with a blueprint on how to grow any specific variety,

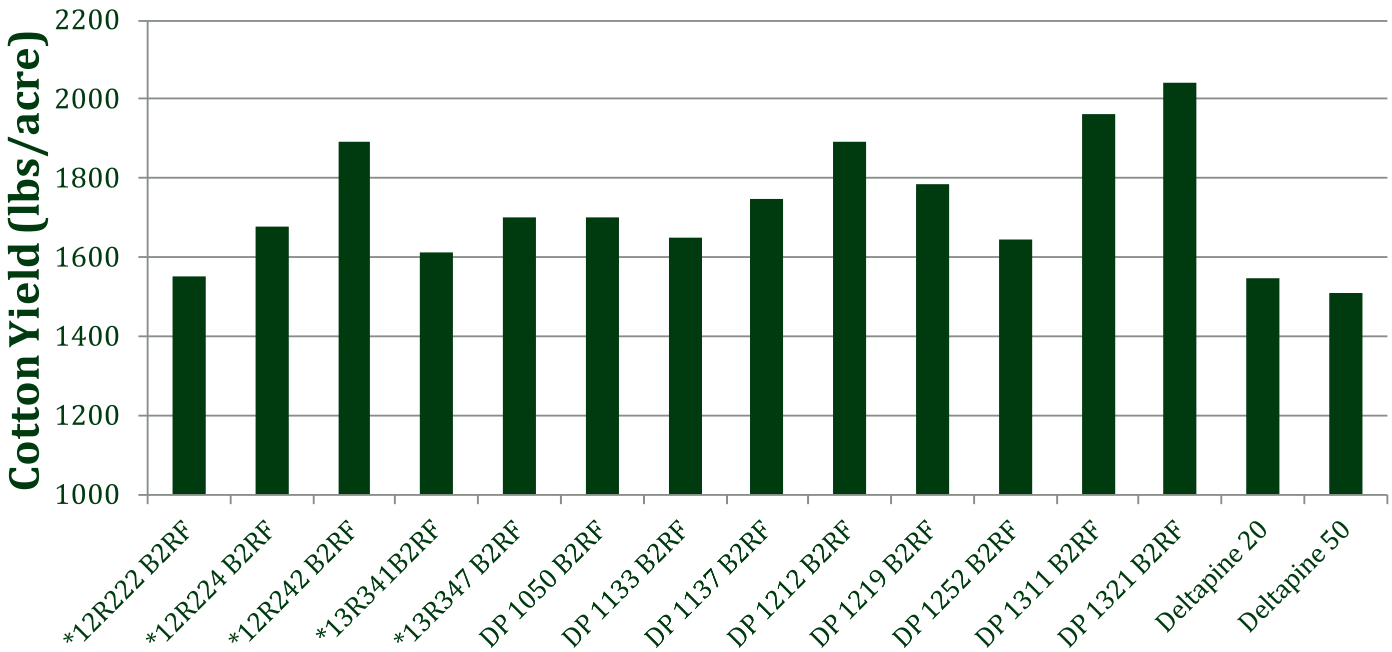


Figure 2. Cotton yield (lbs/acre) by variety across PGR regimes. *Experimental variety - not commercially available.

The Response of Old and New Cotton Varieties to Plant Growth Regulators

but merely provide observations from research in 2013. Your experience and knowledge will remain an invaluable component to the successful management of any variety. This information is being provided to aid decision making and advice regarding the management of these varieties. This information is not intended to replace your experience and knowledge regarding the proper management of your individual crops.

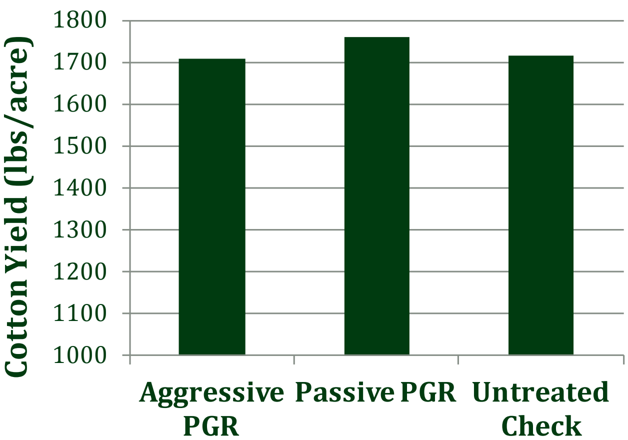


Figure 3. Cotton Yield (lbs/acre) across varieties by PGR regimes

Legal

Monsanto Company is a member of Excellence Through Stewardship® (ETS). Monsanto products are commercialized in accordance with ETS Product Launch Stewardship Guidance, and in compliance with Monsanto's Policy for Commercialization of Biotechnology-Derived Plant Products in Commodity Crops. This product has been approved for import into key export markets with functioning regulatory systems. Any crop or material produced from this product can only be exported to, or used, processed or sold in countries where all necessary regulatory approvals have been granted. It is a violation of national and international law to move material containing biotech traits across boundaries into nations where import is not permitted. Growers should talk to their grain handler or product purchaser to confirm their buying position for this product. Excellence Through Stewardship® is a registered trademark of Biotechnology Industry Organization.

B.t. products may not yet be registered in all states. Check with your Monsanto representative for the registration status in your state.

Individual results may vary, and performance may vary from location to location and from year to year. This result may not be an indicator of results you may obtain as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible.

ALWAYS READ AND FOLLOW PESTICIDE LABEL DIRECTIONS. Roundup Ready® crops contain genes that confer tolerance to glyphosate, the active ingredient in Roundup® brand agricultural herbicides. Roundup® brand agricultural herbicides will kill crops that are not tolerant to glyphosate. Bollgard II®, Genuity Design®, Genuity Icons, Genuity®, Respect the Refuge and Cotton Design®, Roundup Ready® and Roundup® are trademarks of Monsanto Technology LLC. Deltapine® and Leaf Design® are registered trademarks of Monsanto Company. All other trademarks are the property of their respective owners. ©2013 Monsanto Company. 11142013JEH.

The information discussed in this report is from a single site, non-replicated demonstration. This information piece is designed to report the results of this demonstration and is not intended to infer any confirmed trends. Please use this information accordingly.

Insect Resistance Management
Planting Refuges. Preserving Technology

Before opening a bag of seed, be sure to read, understand and accept the stewardship requirements, **including applicable refuge requirements for insect resistance management**, for the biotechnology traits expressed in the seed as set forth in the Monsanto Technology/Stewardship Agreement that you sign. By opening and using a bag of seed, you are reaffirming your obligation to comply with the most recent stewardship requirements.

RESPECT THE REFUGE

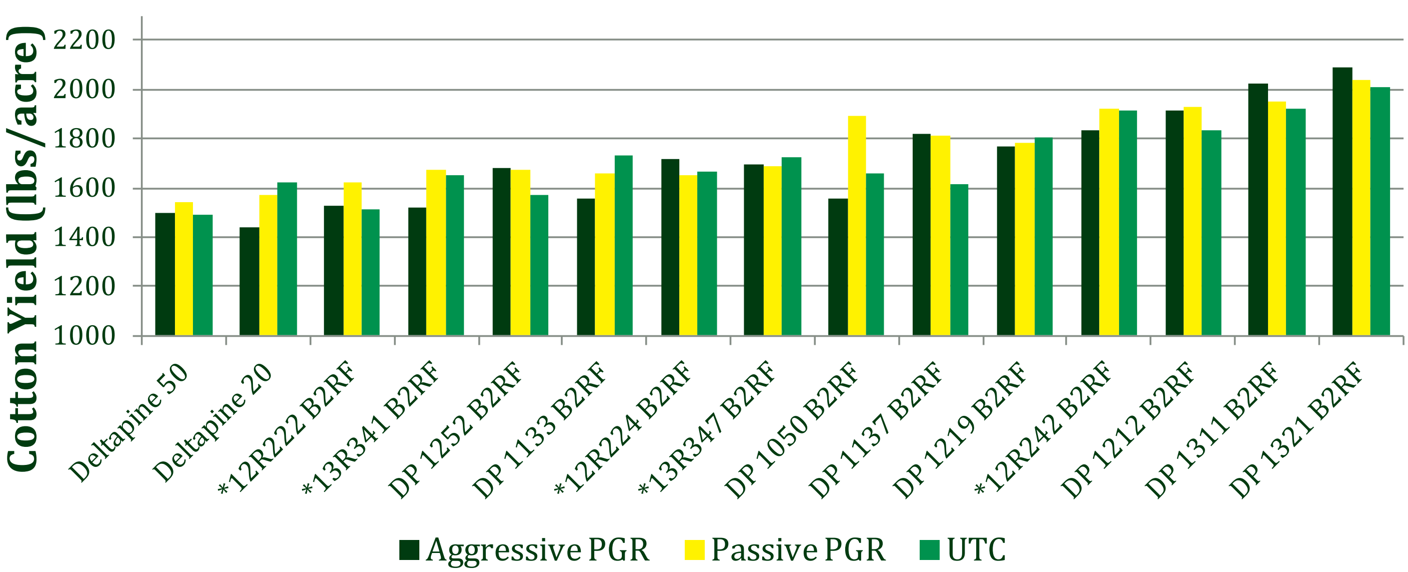
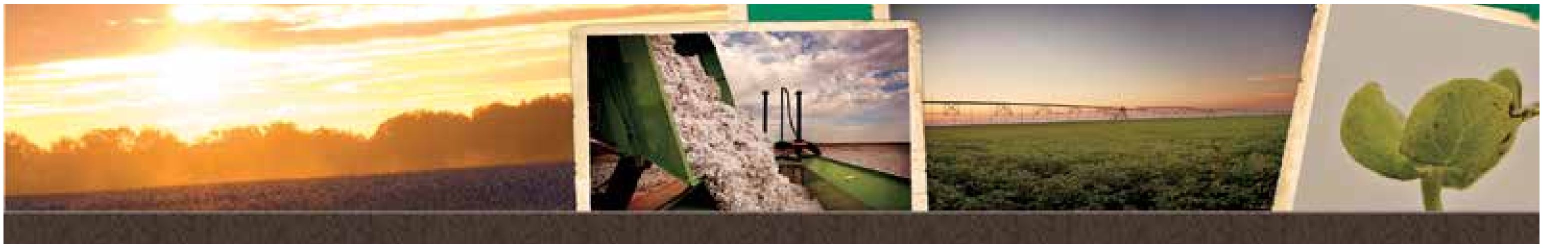


Figure 4. Cotton yield (lbs/acre) by PGR regimes by variety. *Experimental variety - not commercially available.



The Response of Old and New Cotton Varieties to Plant Growth Regulators

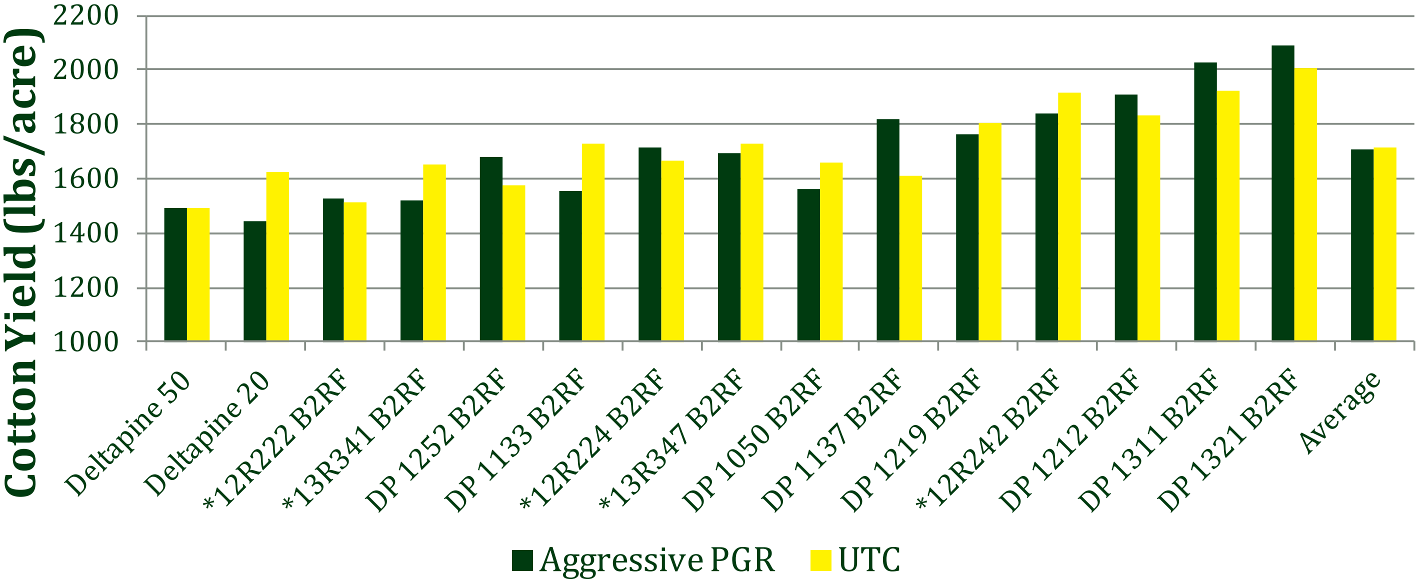


Figure 5. Cotton yield (lbs/acre) by variety with aggressive PGR regime. *Experimental variety - not commercially available.

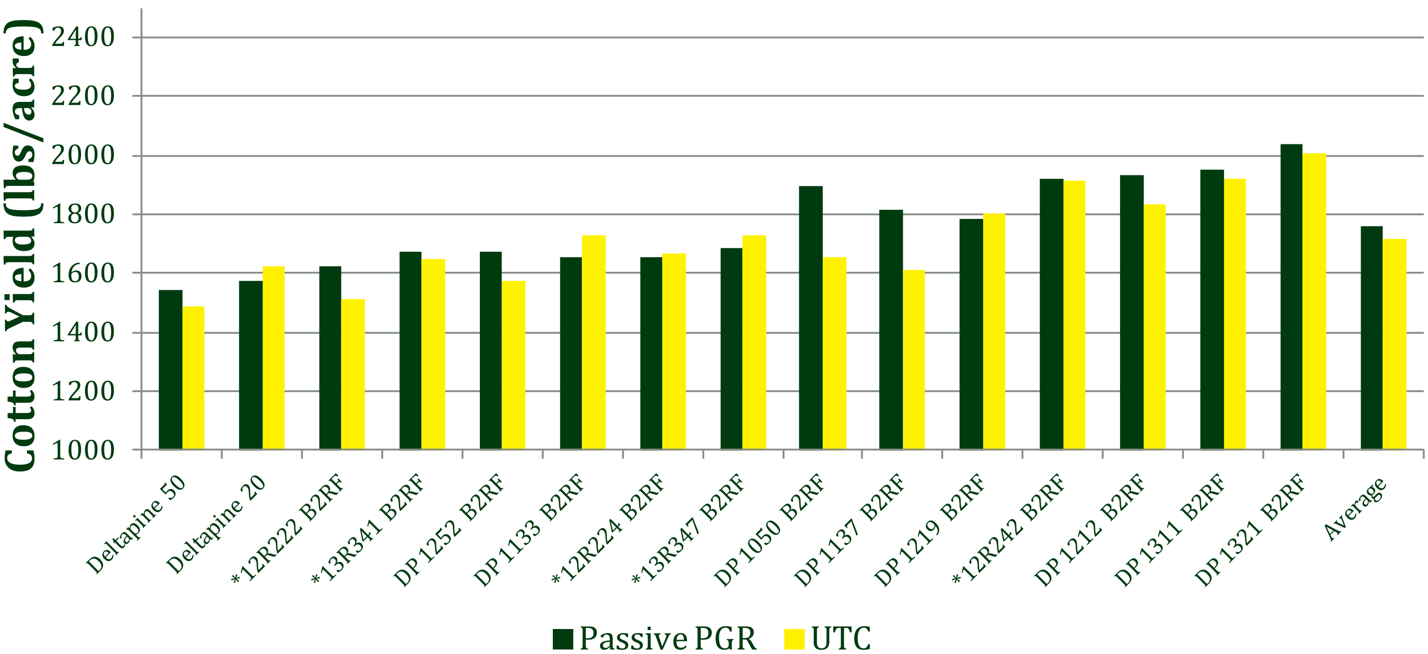


Figure 6. Cotton yield (lbs/acre) by variety with passive PGR regime. *Experimental variety - not commercially available.

The Response of Old and New Cotton Varieties to Plant Growth Regulators

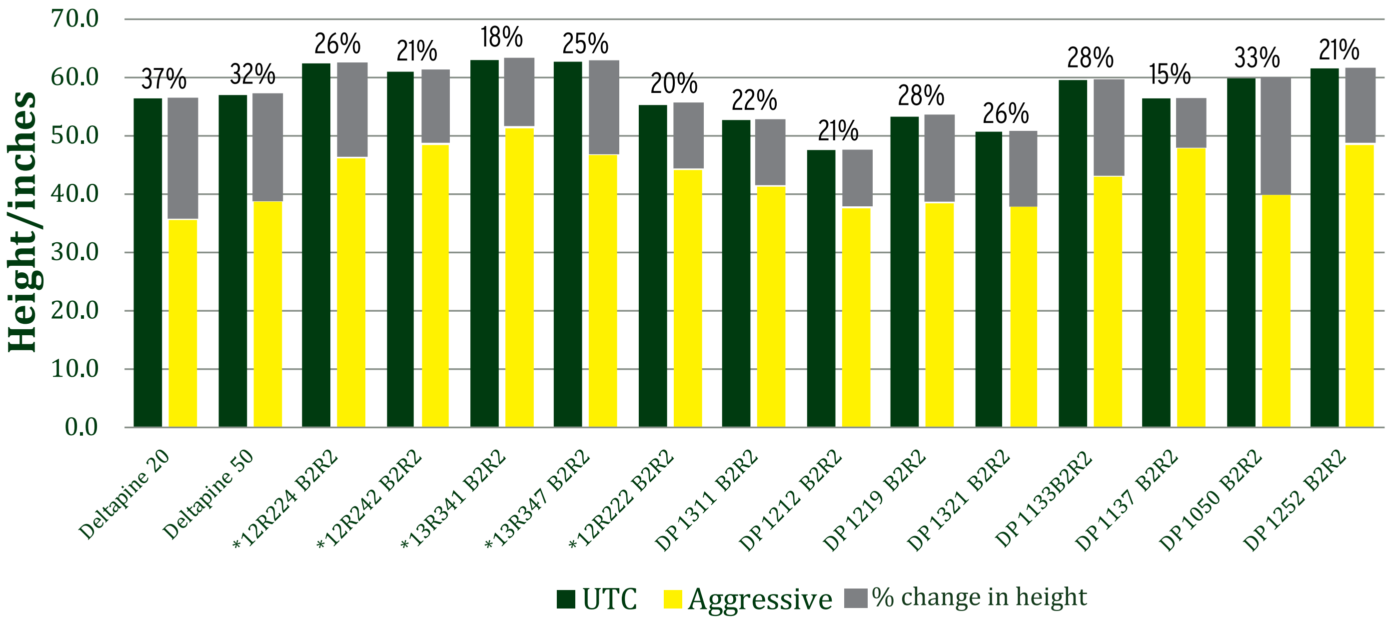


Figure 7. Percent height reduction from aggressive PGR regime on Deltapine® cotton varieties. *Experimental variety - not commercially available.

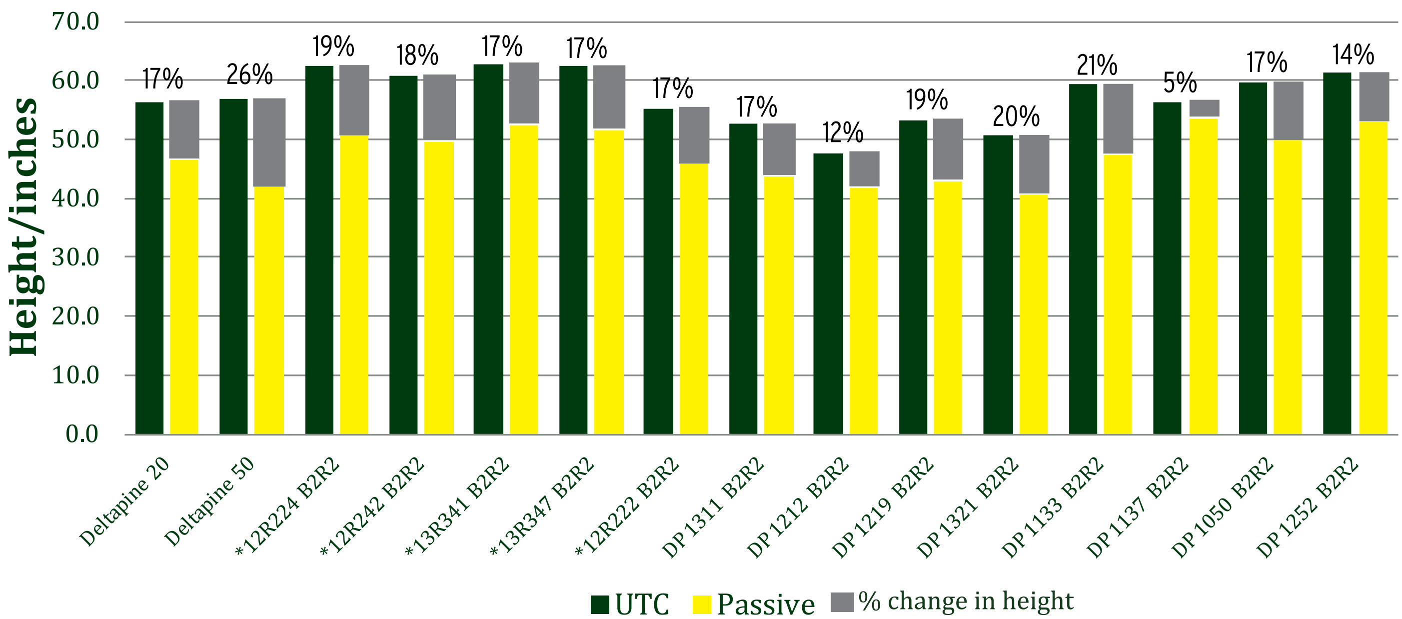
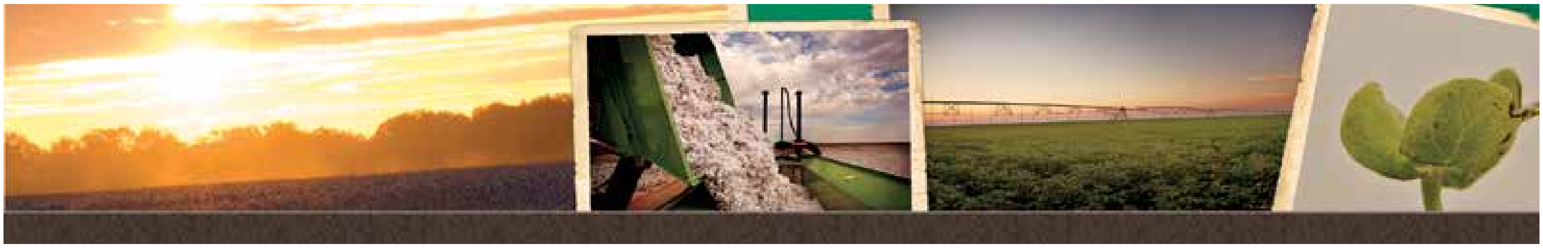


Figure 8. Percent height reduction from passive PGR regime on Deltapine® cotton varieties. *Experimental variety - not commercially available.



Response of Deltapine® Cotton Varieties to Population and Row Configuration

Some cotton growers are interested in switching from planting in 38-inch solid rows to 30-inch, 2:1 skip rows. This planting system would allow the use of the same 30-inch planter for cotton, corn, soybeans, and other row crops. This trial was developed to answer grower questions about proper plant populations and variety selection for skip-row cotton planting, and whether or not skip-row cotton will produce yields similar to solid row plantings.

Materials and Methods

A demonstration trial was conducted in 2013 at the Monsanto Learning Center at Scott, MS, to show the impacts and interaction of population by variety in 2:1 skip-row and 38-inch solid cotton plantings. Four cotton varieties were planted at four different populations. The products were DP 1133 B2RF, DP 1219 B2RF, DP 1311 B2RF, and DP 1321 B2RF. Seeding rates were 13,600; 27,200; 40,800; and 54,400 seeds/acre.

Cotton was planted on May 13, 2013 and harvested on October 29, 2013. Agronomic management was similar to local standards, including conventional tillage, weed management, insect management, and irrigation as needed. Plant growth regulator (PGR) applications (4.2% mepiquat chloride; 0.35 lb active ingredient per gallon) were lower in the skip-row cotton than would normally be applied in solid-row cotton. The first PGR application of 12 fl oz/acre was made on July 2, 2013 to only the 38-inch solid rows. The second PGR application of 16 fl oz/acre was made on July 20, 2013 to 38-inch solid rows, and the first application of 10 fl oz/acre to 2:1 skip rows was also made on July 20, 2013. The final PGR applications were made on August 1, 2013 with 20 fl oz/acre applied to 38-inch solid rows and 12 fl oz/acre applied to 2:1 skip rows.

Results

Some growers believe they may save money on seed and technology fees by planting skip-row cotton. This trial, across all cotton products, showed that plant populations per field acre (not acre of row feet) needs to be in the same range as solid planted cotton. The seed that would have been planted in the skipped rows should be planted in the remaining rows to achieve an acceptable plant population for optimum yield potential. This results in the same seed cost per acre, with plants closer together down each row.

Overall the highest yields were reported in 38-inch solid row configuration (Figures 1 and 2). DP 1321 B2RF produced the highest yield in the trial (2,512 lbs/acre) at 54,400 seeds/acre, and the second highest yield of 2,258 lbs/acre at 40,800 seeds/acre (Figure 3). DP 1219 B2RF also produced high yields with 2,103 lbs/acre at 54,400 seeds/acre in 38-inch solid rows. When evaluating only 2:1 skip rows DP 1321 B2RF and DP 1133 B2RF at the highest planting population (54,400 seeds/acre) had the highest yields with 1,932 lbs/acre and 1,920 lbs/acre, respectively.

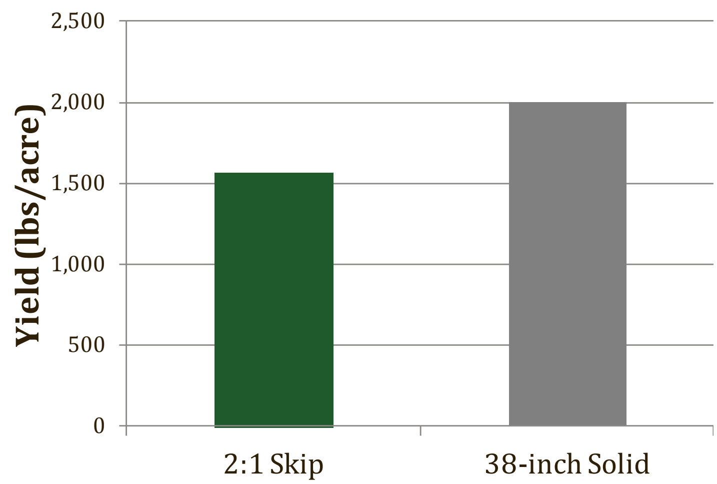


Figure 1. The yield response of cotton when averaged across varieties and planting populations.

Summary Comments

In 2013, the 38-inch solid rows outperformed the 30-inch 2:1 skip rows for all four cotton varieties (Figures 1 and 2). The 2013 growing season provided crops with bright clear sunshine and cool nighttime temperatures, which all helped to produce record cotton yields. Fruit retention was exceptionally high with no major fruit shed events. These ideal weather conditions were optimal for the 38-inch solid-row spacing as cotton plants are positioned for maximum sunlight, water, and nutrient interception.

Yields reported for the 30-inch 2:1 skip-row spacing were reduced in comparison to the 38-inch solid rows. However, the yields were still high and appeared to respond similarly to the different planting populations

Response of Deltapine® Cotton Varieties to Population and Row Configuration

in the trial for both the 38-inch solid row and 30-inch 2:1 skip row configurations, with the higher planting populations producing higher final yield (Figure 3).

Similar yields can be expected from either 38-inch solid rows or 30-inch 2:1 skip rows, as long as management decisions are made to optimize conditions for that row configuration: uniform seed spacing/ placement, adequate bed preparation, and clear middles to allow irrigation and drainage.[1,2] When selecting cotton varieties for skip row configurations consider using more indeterminate cotton products that produce more vegetative growth and spread and fill in the "skip" area.

Tips for 2:1 Skip Row Configurations

- Skip-row planting may allow for better light penetration before canopy closure.
- Skip-row planting may provide some level of moisture conservation advantage over solid row cotton.
- By adopting 2:1 skip-row spacing, seed and technology costs will not be saved as most or all of the seed that would have been planted in the skipped row should be evenly distributed in the planted rows.
- Carefully read planter manuals to determine settings to achieve the desired population per acre of land, not per planted acre.
- Since cotton plants will eventually fill the skipped row, all over-the-top applications from mid-to-late-season, should be calculated as if the cotton were planted in solid rows.
- Particular care should be taken to keep the skipped row weed free until canopy closure.

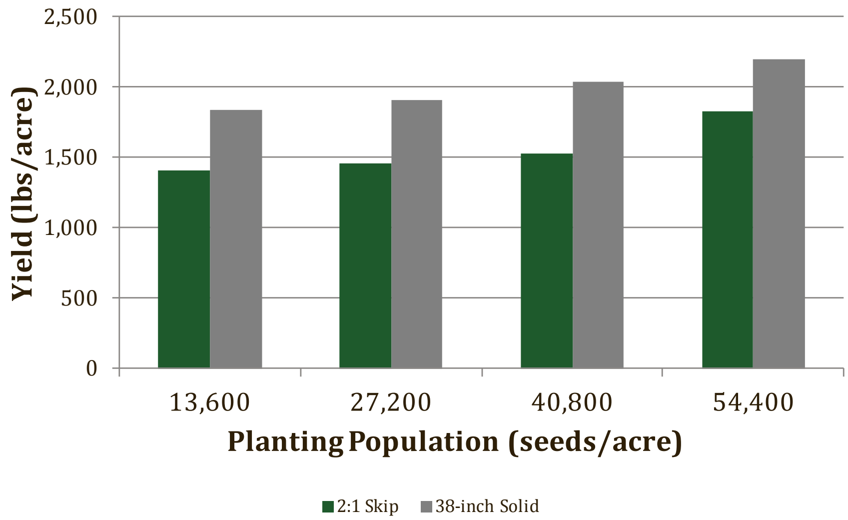


Figure 2. The yield response of cotton varieties by row planting population when averaged across cotton varieties.

All of the decisions going into planning any cotton production system are highly variable and production practice specific including the variety planted, population, and in-season management of inputs. Introduction of 2:1 skip row systems can be successfully used for cotton production in the Southern United States. The use of 30-inch skip-row configurations in cotton would allow growers to mainstream the use of their planter for grains and cotton, and keep cotton viable in a production plan.

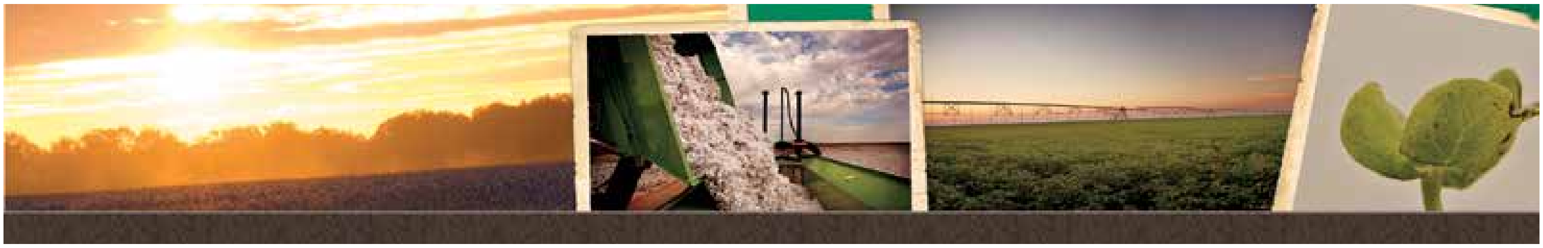
Sources and Legal

[1] Cotton Variety by Populations: Response in 2:1 Skip-Row Planting. Monsanto Learning Center Summary at Scott, MS. 2012. [2] Two-in-One Skip Row Cotton Evaluations. Monsanto Learning Center Summary at Scott, MS. 2011.

The information discussed in this report is from a single site, non-replicated, multiple-year demonstration. This informational piece is designed to report the results of this demonstration and is not intended to infer any confirmed trends. Please use this information accordingly.

Individual results may vary, and performance may vary from location to location and from year to year. This result may not be an indicator of results you may obtain as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible.

Deltapine® and Leaf Design® are registered trademarks of Monsanto Company. All other trademarks are the property of their respective owners. Always read and follow IRM, where applicable, grain marketing and all other stewardship practices and pesticide label directions. ©2013 Monsanto Company. CRB11202013



Response of Deltapine® Cotton Varieties to Population and Row Configuration

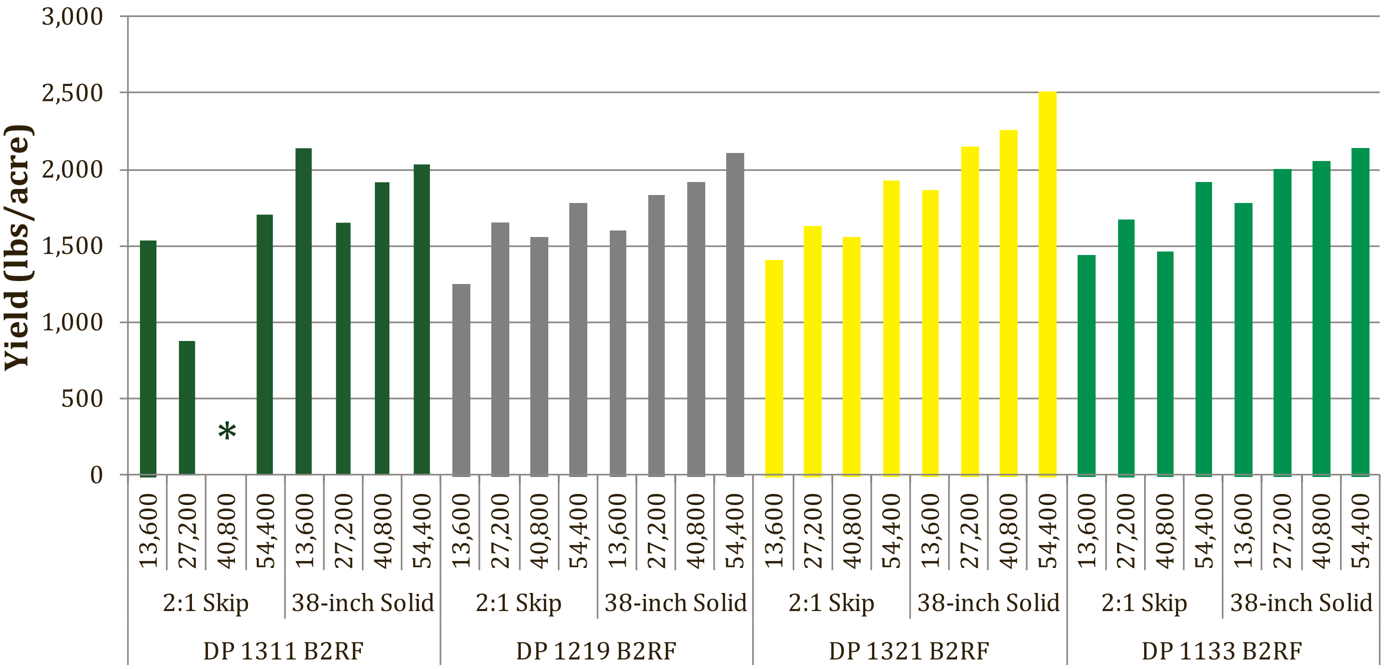


Figure 3. The yield response of cotton varieties by row configuration and planting populations. *Data was not collected for DP 1311 B2RF at 40.800 seeds/acre in 2:1 skip rows.

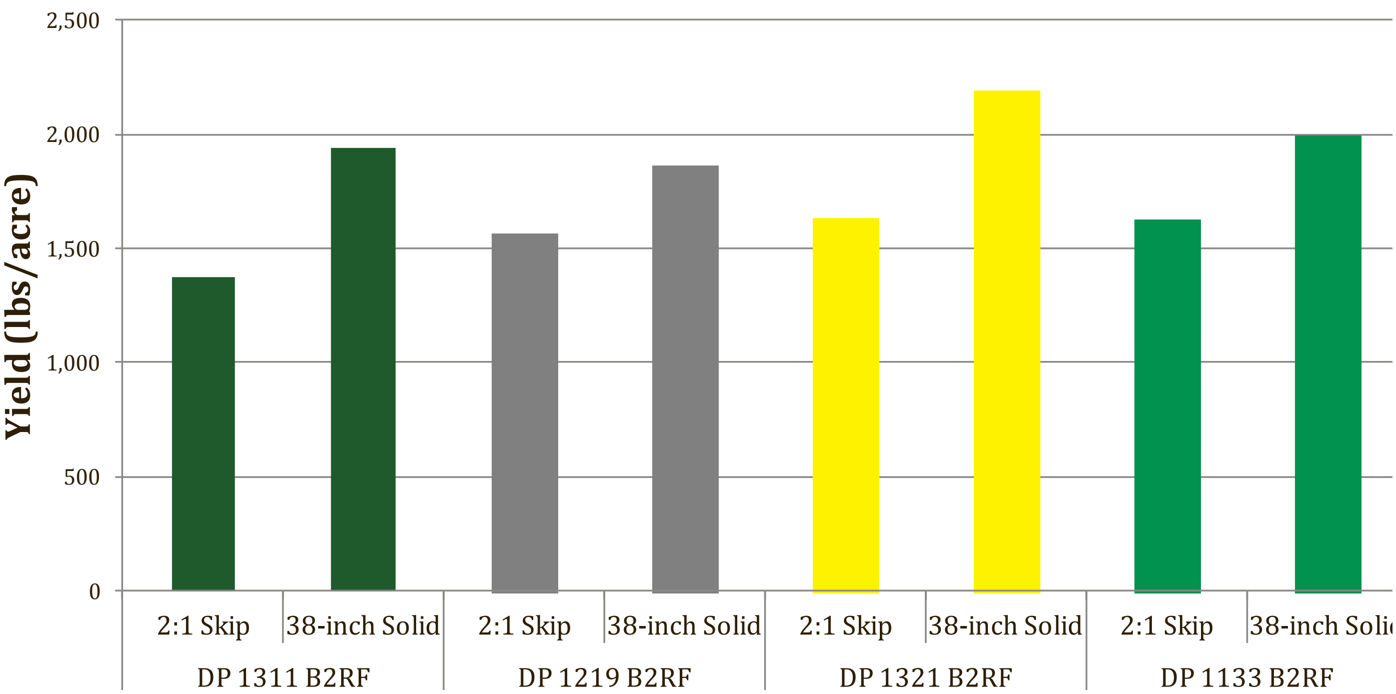


Figure 4. The yield response of cotton varieties by row configuration when averaged across planting populations.

THE RESPONSE OF SOYBEANS TO SIMULATED HAIL DAMAGE

Study Guidelines

A demonstration trial was planted on April 4, 2013 at the Monsanto Learning Center at Scott, MS. The trial was designed to assess the response of soybeans to simulated hail damage. Five Asgrow® soybean brands (AG4531, AG4533, AG4632, AG5332, and AG5633) were planted in 38-inch rows at populations of 80,000, 120,000, and 160,000 seeds per acre. A flail mower was used to simulate hail damage (Figure 1). Soybean plants were 24 inches tall and in the R2 (full flowering) growth stage when mowed. Approximately 10 inches of the soybean top growth was mowed out (Figure 2). This removed terminal dominance and allowed soybean plants to branch. Plots were harvested on September 18, 2013 to assess the yield of undamaged and damaged soybeans.

Figure 1 (above). Tractor flail mower used to simulate hail damage in the demonstration trial.

Figure 2 (left). Approximately 40% of the soybean top growth was cut off with the flail mower when plants were in the R2 stage of growth.

Results and Observations

Soybeans in this demonstration trial yielded in the 70 bushel per acre range. At harvest, the mowed soybeans were about 10 inches shorter than the undamaged plants. When yields were averaged across the five Asgrow® soybean brands at the low (80,000 seeds per acre) and high (160,000 seeds per acre) planting populations, there was no difference in yield between damaged and undamaged plants (Figure 3). The data suggests that when soybean plants are moderately damaged by hail (not completely defoliated), they have the potential to recover without affecting yield.

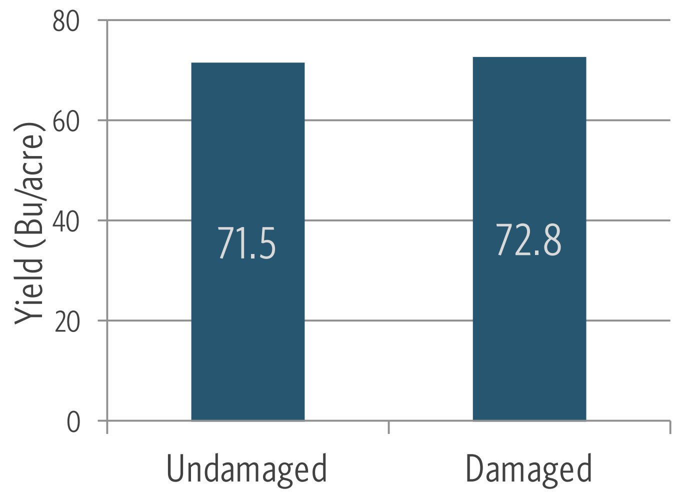


Figure 3. Yield of undamaged and damaged soybeans when averaged across five Asgrow® soybean brands and two planting populations.

When averaged across the Asgrow® soybean brands and planting populations, yield differences were greater at the lower planting population (Figure 4). This indicates that soybeans may recover better from hail damage at lower populations, possibly because of plants being able to branch out more.

All five Asgrow® soybean brands in this testing responded similarly at the low planting population of 80,000 seeds per acre (Figure 5). However, at the high planting population of 160,000 seeds per acre, AG4533 brand yielded less when they were damaged (Figure 6). AG4531 and AG4632 brands had the highest yield increases when damaged.

THE RESPONSE OF SOYBEANS TO SIMULATED HAIL DAMAGE

Summary Comments

- Hail damage to soybeans can result in reduced stands, leaf defoliation, stem damage, and pod damage. After soybean plants advance in their vegetative growth, they have the capacity to recover from severe defoliation. Hailstorms that occur during the reproductive stages of development, especially pod fill (R3 to R6), can do the most damage. Hail that damages soybeans later in the season can also leave the crop susceptible to disease and insect damage.
- Soybean plants have the ability to recover by branching out after a hail event. Results of this demonstration suggest that, although soybean plants damaged by hail may look bad, plants can recover and yield may not be greatly affected. Yield loss predictions should be based on the stage of growth at the time of damage, and the degree of plant damage.
- Hail can drive down into the soybean crop canopy causing foliar damage and extensive bruising and stem damage which may not be accounted for in this testing. Therefore, a hail storm causing similar visual injury could be more damaging to yield and overall plant health than that caused by the flail mower injury in this demonstration.

Sources and Legals

Klein, R.N. and C.A. Shapiro. 2011. Evaluating hail damage to soybeans. University of Nebraska-Lincoln extension publication EC128. http://extension.unl.edu; Roozeboom, K. 2008. Hail damage on soybeans. Kansas State University Extension Agronomy e-Updates number 145. http://www.agronomy.edu.

The information discussed in this report is from a single site, 2 rep demonstration. This informational piece is designed to report the results of this demonstration and is not intended to infer any confirmed trends. Please use this information accordingly.

Individual results may vary, and performance may vary from location to location and from year to year. This result may not be an indicator of results you may obtain as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible.

ALWAYS READ AND FOLLOW PESTICIDE LABEL DIRECTIONS. Asgrow and the A Design® and Asgrow® are registered trademarks of Monsanto Technology LLC. Leaf Design® is a registered trademark of Monsanto Company. All other trademarks are the property of their respective owners. ©2013 Monsanto Company. 10072013TED

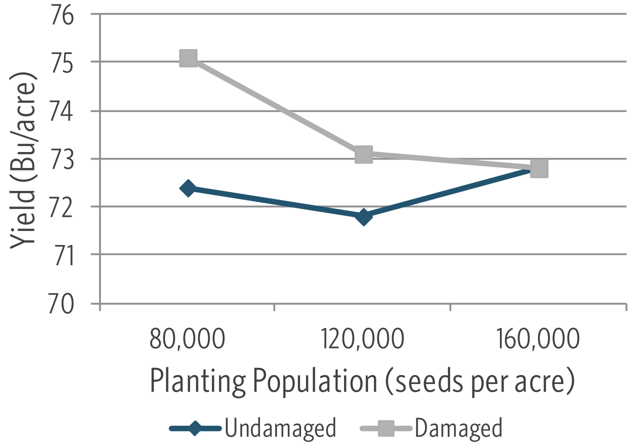


Figure 4. Yield of undamaged and damaged soybeans at three planting populations when averaged across four Asgrow® soybean brands.

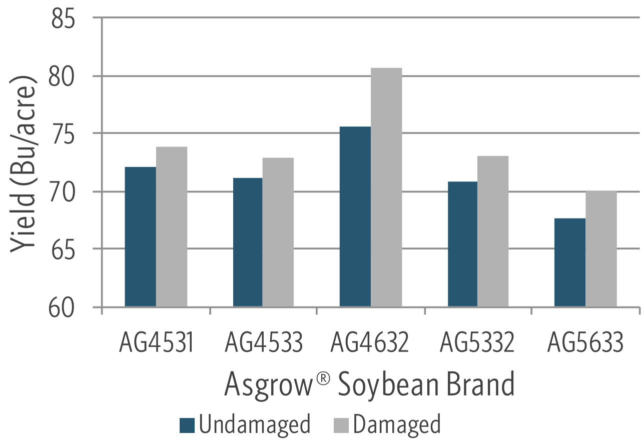


Figure 5. Yield of undamaged and damaged Asgrow® soybean brands when planted at the low population of 80,000 seeds per acre.

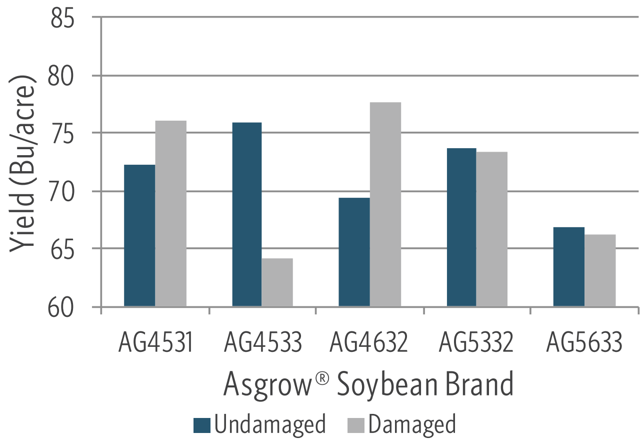


Figure 6. Yield of undamaged and damaged Asgrow® soybean brands when planted at the high population of 160,000 seeds per acre.

ASGROW | ASGROW 4P SYSTEM

PLAN PLANT PROTECT PERFORM

SOYBEAN RESPONSE OF THREE POPULATIONS TO SINGLE VS TWIN ROWS.

Study Goals

Midsouth soybean growers are interested in determining the best combination of row configuration, population, and soybean product for optimum soybean yield. Cotton growers want a soybean row configuration that is compatible with their cotton planting equipment.

Study Guidelines

A soybean demonstration trial was planted on April 25, 2013 at the Monsanto Learning Center near Scott, MS to:

- Demonstrate the effect of agronomic practices on soybean yield.
- Determine optimum soybean populations for the Midsouth.
- Evaluate how soybean products respond to various row configurations and populations.

Seven Asgrow® soybean brands (AG4531, AG4533, AG4534, AG4632, AG4633, AG4933, and AG5332) were planted in both twin rows (7.5 inches apart on 38-inch beds) and single (38-inch) rows, and at populations of 90,000, 120,000, and 140,000 seeds per acre in each of the row configurations. Standard agronomic practices for the area were implemented with irrigation provided as needed.

Results and Observations

Twin rows generally produced higher yields than single rows; however, some soybean product response was observed. Planting soybeans on 38-inch beds provided improved drainage and allowed planting of twin rows, spaced 7.5 inches apart, on top of the bed. Yields were similar across all soybean products, row configurations, and most populations. Some differences, likely based on plant architecture, were observed in the single vs. twin-row plantings. In this demonstration, it appears that soybeans respond better to higher populations when planted in twin rows. Lower populations may help in the management of both lodging and disease. Soybean products should be evaluated on a case-by-case basis to determine how they fit into any production system.

Summary Comments

Soybean products that will perform well in various row configurations and at various populations are available to Midsouth soybean growers. Growers should evaluate soybean products to determine which products have the highest probability of performing well in a specific combination of row spacing and plant population.

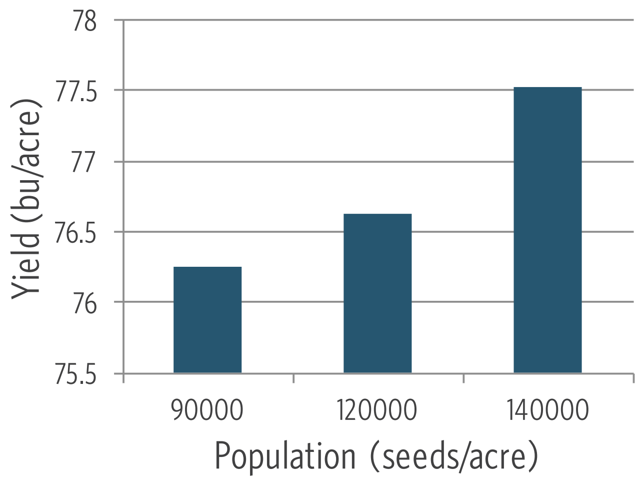


Figure 1. The trend toward decreasing soybean populations appeared to offer agronomic advantages and maintain the opportunity for optimal yield potential.

Legals

The information discussed in this report is from a single site, 2 rep demonstration. This informational piece is designed to report the results of this demonstration and is not intended to infer any confirmed trends. Please use this information accordingly.

Individual results may vary, and performance may vary from location to location and from year to year. This result may not be an indicator of results you may obtain as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible.

ALWAYS READ AND FOLLOW PESTICIDE LABEL DIRECTIONS. Asgrow and the A Design® and Asgrow® are registered trademarks of Monsanto Technology LLC. For more information regarding the intellectual property protection for the seed products identified in this publication, please see www.asgrowanddekalb.com. Leaf Design® is a registered trademark of Monsanto Company. All other trademarks are the property of their respective owners. Always read and follow grain marketing and all other stewardship practices and pesticide label directions. ©2013 Monsanto Company. 10142013JEH.

SOYBEAN RESPONSE OF THREE POPULATIONS TO SINGLE VS TWIN ROWS.

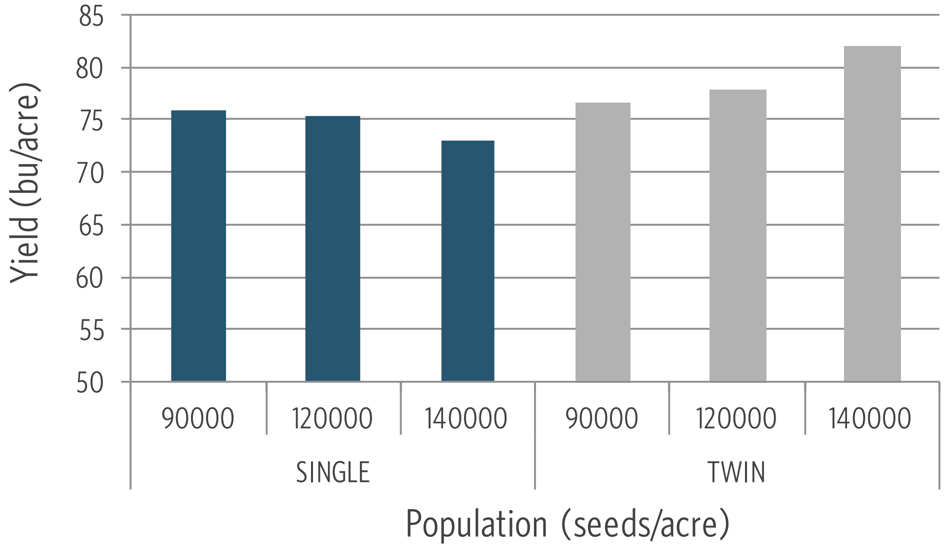


Figure 2. In this demonstration, twin rows generally produced higher yields than single rows. Soybean products planted in twin rows also responded better to higher plant populations.

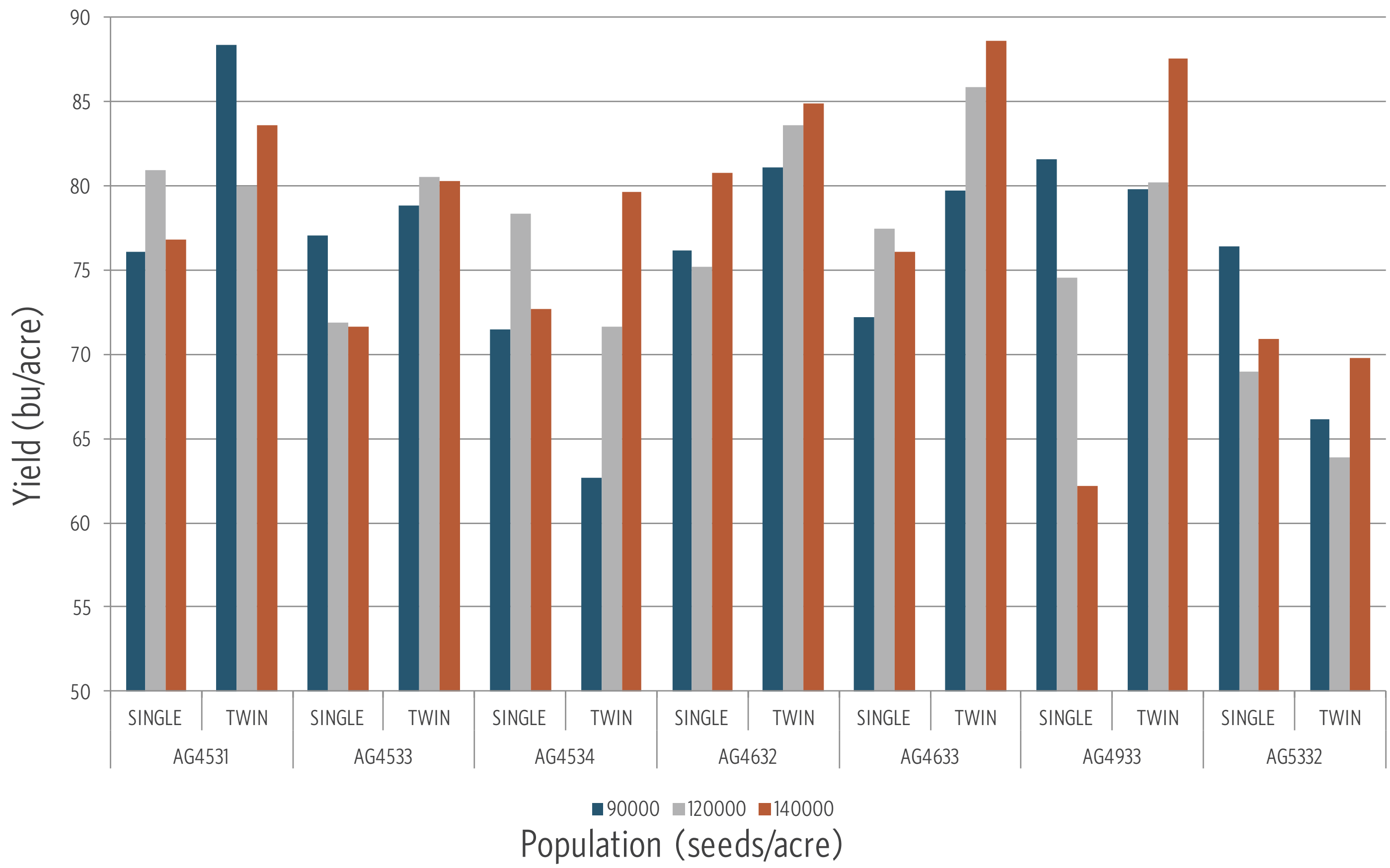


Figure 3. Soybean products should be evaluated on a case-by-case basis to determine how they fit into any production system.

RESPONSE OF THREE SOYBEAN POPULATIONS TO THREE ROW CONFIGURATIONS

Study Guidelines

A demonstration trial was conducted at the Monsanto Learning Center at Scott, MS to evaluate how soybean products respond to planting populations, row widths, and configurations. Mid-south growers are interested in determining the best combination of planting population and row configuration to obtain optimum yields with soybean products. Cotton growers would like a soybean row configuration that is compatible with their cotton planting equipment. This demonstration was designed primarily to evaluate the impact of row configuration and planting population on soybean production.

Five Asgrow® soybean brands (AG4531, AG4533, AG4633, AG5533, and AG5634) were each planted in three row configurations:

- 30-inch single
- 38-inch single
- 38-inch twin (7.5 inches apart on 38-inch beds).

Each product was also planted at three populations in each row configuration:

- 90,000 seeds/acre
- 120,000 seeds/acre
- 150,000 seeds/acre.

Standard agronomic practices for the area were implemented with irrigation provided as needed.

Results and Observations

Average soybean yield, under the conditions of this demonstration trial, was 65.5 bushels per acre (bu/acre). The 38-inch twin row configuration was the highest yielding system (Figure 1). The 30-inch rows were generally intermediate in yield, and the 38-inch single rows were the lowest yielding. The 38-inch seedbeds help to improve drainage and allows for the planting of twin rows, spaced 7.5 inches apart, on top of the bed.

Planting population did not have a big impact on soybean yield in this trial (Figure 2). Soybean yield was adequate, even at the lowest planting rate of 90,000 seeds/acre. However, optimum soybean yields generally occurred at the 120,000 seeds/acre planting rate (Figure 3).

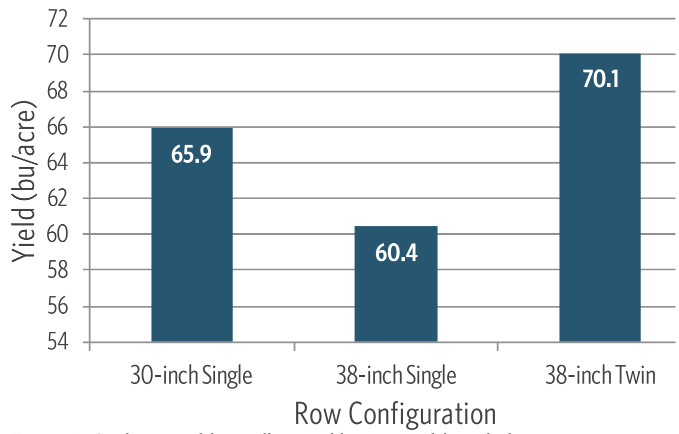


Figure 1. Soybean yield as influenced by row width and planting configuration (averaged across five Asgrow® soybean brand products and three planting populations).

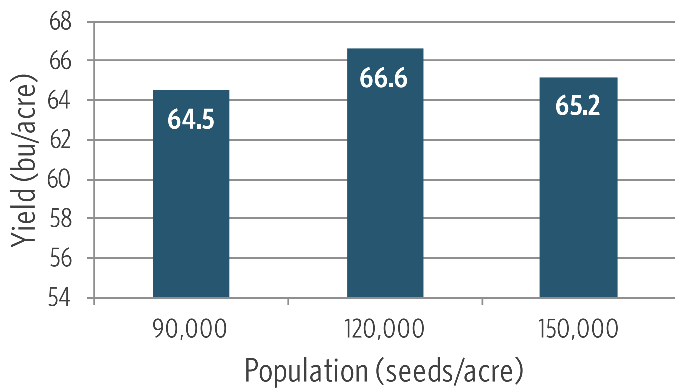


Figure 2. Soybean yield as influenced by planting population (averaged across five Asgrow® soybean brand products and three row configurations).

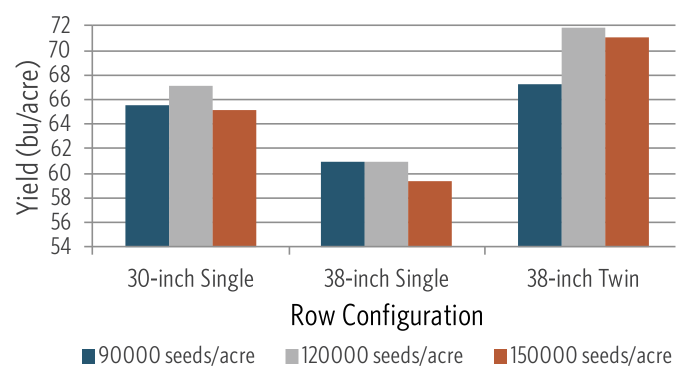


Figure 3. Soybean yield as influenced by planting population and row configuration (averaged across five Asgrow® soybean brand products).

RESPONSE OF THREE SOYBEAN POPULATIONS TO THREE ROW CONFIGURATIONS

The results also show that soybean seed planted in 38-inch twin rows can yield more at higher planting populations. Research has shown that soybean plants have the ability to adjust growth and development to compensate for different plant populations.

Twin rows generally produced higher yields than single rows, but some differences in soybean product response were observed (Figure 4). Asgrow® soybean brands AG4531, AG5533, and AG5634 responded better to lower planting populations, whereas Asgrow® soybean brands AG4533 and AG4633 responded better to higher planting populations (Figure 5). Soybean products should be evaluated on a case-by-case basis to determine how they fit into any production system.

Summary Comments

The results indicate that row configuration can be more important than planting population to optimize yield in Mid-south soybean production. The relationship of row configuration and drainage can have an impact on soybean plant health and final stand. The 38-inch beds can provide improved drainage, and twin rows can help soybean plants respond better to higher planting populations. However, soybean products that perform well in various row configurations and at various populations are available to Mid-south soybean growers. Growers should evaluate soybean products to determine which products have the highest probability of performing well in a specific combination of row spacing and plant population.

Legals

The information discussed in this report is from a single site, non-replicated demonstration. This information piece is designed to report the results of this demonstration and is not intended to infer any confirmed trends. Please use this information accordingly.

For more information regarding the intellectual property protection for the seed products identified in this publication, please see www.asgrowanddekalb.com. Individual results may vary, and performance may vary from location to location and from year to year. This result may not be an indicator of results you may obtain as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible.

Asgrow and the A Design® and Asgrow® are registered trademarks of Monsanto Technology LLC. Leaf Design® is a registered trademark of Monsanto Company. Always read and follow grain marketing and all other stewardship practices and pesticide label directions. ©2013 Monsanto Company. 11202013TED

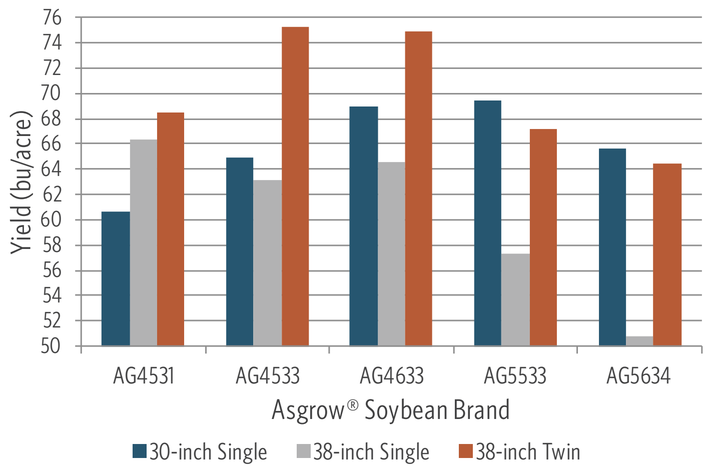


Figure 4. Yields of soybean products as influenced by row width and planting configuration (averaged across three planting populations).

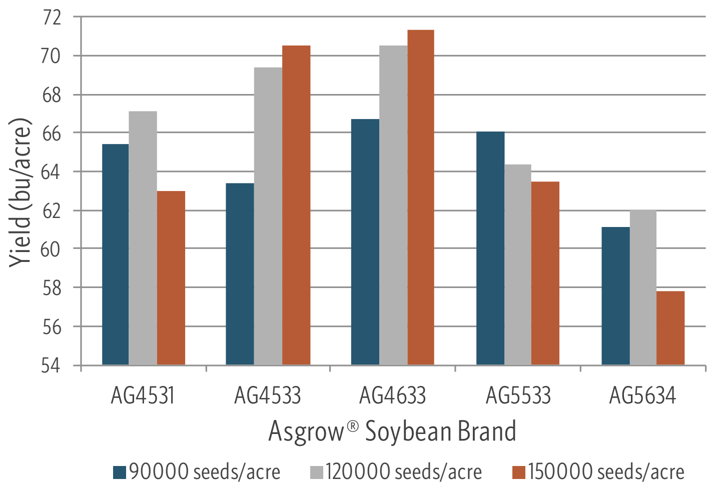


Figure 5. Yields of soybean products as influenced by planting population (averaged across three planting configurations).

EFFICIENT USE OF IRRIGATION RESOURCES

Water use has become a hot issue in the Delta region of the Mississippi River basin. The total annual rainfall in the Mississippi Delta region is typically more than required for optimum plant growth; however, water distribution in the summer months can be scarce. Periodic summer droughts make irrigation necessary to avoid crop failure. Two approaches to help increase the supply of water for crop use are: 1) increase the intake and storage of moisture in the soil; 2) increase supplemental irrigation. Irrigation application is costly and time consuming, making efficient use of irrigation a main objective for crop production in the region.

Materials and Methods

In 2013, the Monsanto Learning Center at Scott, MS began investigating ways to utilize irrigation more efficiently. Conversation with local university and agricultural engineers, pointed to the fact that silt loam soils commonly found throughout the region, are known to compact and seal over (Figure 1). When sealing occurs, the soils do not allow irrigation water to penetrate to the crop root zone. In some fields, much of the rainfall and supplemental irrigation being applied may merely run over the ground flowing directly into the ditches. Fall deep tillage has proven to help store rainfall for the following season.

Knowing that fall deep tillage can help soils store rainfall, the question becomes, are there benefits to in-season deep tillage? Discussions with a local agricultural engineer revealed an in-season tillage system he utilized in the early 1990's, which provided effective water utilization, and helped reduce the number of pivot irrigation applications needed. This engineer designed and constructed a deep-tillage parabolic subsoiler for use in-crop. The subsoiler was used to break the compaction layer of the silt loam soil to allow the irrigation water to penetrate the root zone and eliminate irrigation frequencies.

For the initial study, many possible tillage systems were explored. The following selection criteria were used. The tillage must:

- Run 10 to 12 inches deep
- Provide minimal soil movement
- Be adaptable to commonly used implements
- Be used in conjunction with other operations

For this trial, a subsoiler was constructed with M1 Winged Anhydrous Knives manufactured by Nichols Tillage Tools® and mounted on an Orthman® toolbar directly behind the buster. The subsoiler was adjusted to run 10 inches deep and could be used in conjunction with the buster to allow for furrow irrigation (Figure 2). An on-farm trial was initiated in 2013 in a field planted to soybeans, with a portion of the pivot irrigated field left untreated as a check. In-season deep tillage was run with the constructed subsoiler at crop layby.

The Monsanto Learning Center at Scott, MS was assisted by Jason Krutz, Associate Research/Extension Professor specializing in irrigation at the Mississippi State Delta Research and Extension Center. Moisture sensors were installed to measure infiltration rates in the treated and untreated areas of the field. Each sensor is approximately 4 inches in length and sensors were installed at depths of 6 and 12 inches (Figure 3). A sensor placed at 6 inches measured water movement from 4 to 8 inches and a sensor placed at 12 inches measured water movement from 10 to 14 inches.

Figure 4 provides results from the 2013 sensor data. Plots that received in-season tillage from the constructed subsoiler are signified by the symbol ▲ and plots that did not receive in-season tillage are signified by the symbol ●. The Y-axis provides the level of soil saturation or water potential, with 0 water potential representing the point of soil saturation. Decreasing numbers indicate soil drying, with -250 water potential representing a very dry soil. The -100 water potential level triggered irrigation initiation. When irrigation was applied, treated areas were recharged to soil saturation at the 6- and12-inch levels. When irrigation was initiated in the plots that did not receive in-season tillage, the recharge never reached the sensor. This means that irrigation water never recharged moisture to the 4-inch level.

Figure 1. Soil compaction that can cause the silt loam soil to seal and reduce water penetration. Photo source: Jason Krutz, Associate Research/Extension Professor Mississippi State University.

EFFICIENT USE OF IRRIGATION RESOURCES

Results from the demonstration indicated that the in-season subsoiler tillage treatments disrupted the shallow 8- to 10-inch compaction layer and allowed irrigation water to infiltrate the soil to the 6- and 12-inch levels. The sensor data from the study demonstrates that when the plots did not receive the in-season subsoiler tillage treatment that irrigation water never infiltrated the soil more than 4 inches, with the balance most likely becoming runoff water.

Figure 2. Row without in-season tillage (left) vs. row with in-season tillage (right). Photo source: Jason Krutz, Associate Research/Extension Professor Mississippi State University.

Summary Comments

From the 2013 sensor data collected from the in-season subsoiler treatments, the following observations and evaluations were made.

- The infiltration rate was much higher in the plots that received in-season subsoiler treatments.
- Infiltration rates for plots that did not receive in-season tillage were reduced.

The information discussed in this report is from a single site, non-replicated, one-year demonstration. This informational piece is designed to report the results of this demonstration and is not intended to infer any confirmed trends. Please use this information accordingly.

Legals

Individual results may vary, and performance may vary from location to location and from year to year. This result may not be an indicator of results you may obtain as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible.

Asgrow and the A Design® and Asgrow® are registered trademarks of Monsanto Technology LLC. Leaf Design® is a registered trademark of Monsanto Company. All other trademarks are the property of their respective owners. Always read and follow IRM, where applicable, grain marketing and all other stewardship practices and pesticide label directions. ©2013 Monsanto Company. CRB11252013.

Figure 3. Sensor used to measure infiltration rates.

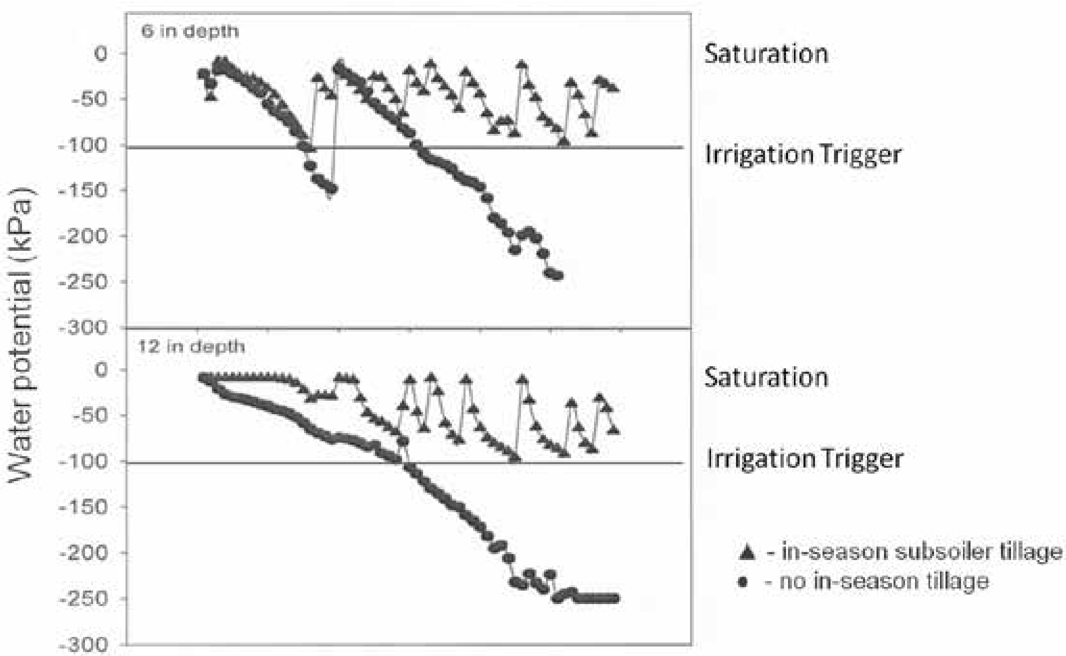


Figure 4. Effect of in-season subsoiler tillage on soil water potential at 6- and 12-inch depths.

NOTES

the LEARNING MONSANTO CENTER™

Technology Development & Agronomy by MONSANTO