Graves - Chapple Farm

2010 Annual Report

Northwest Missouri Demonstration Site

http://extension.missouri.edu/atchison/Graves/Main%20page.htm

Graves-Chapple Farm
College of Agriculture, Food and Natural Resources

UNIVERSITY OF MISSOURI
Extension
The Graves - Chapple Farm is a research and demonstration site located in southwest Atchison County. Graves - Chapple East is located on the east side of I-29 at the foot of the bluffs. Graves - Chapple Heitman Farm is on the west side of I-29 adjacent to State Hwy 111.

The site was established in 1988 as a collaborative effort between Atchison County Extension, Holt County Extension, University of Missouri Extension Commercial Agriculture Program, the University of Missouri’s Agricultural Experiment Station, local agribusinesses and local producers. Primary funding is provided by University of Missouri Extension and the Agricultural Experiment Station.

Projects at this site are devoted to various agronomic practices, with a major emphasis on the production of corn and soybeans. Work with forages, other row crops and alternative crops is also conducted. This site is somewhat unique in the state due to the soil types and the predominance of no-till planting techniques. Soil conservation and water quality issues are also addressed. The farm strives to perfect practices that will maintain or increase the profitability for area crop producers.

Acknowledgements

The staff appreciates the time and effort of the advisory committee that guides the work at this site.

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We want to thank the following people who have helped in so many ways throughout the year. A special thanks go to CAFNR Deans Tom Payne and Marc Linit, Director of Field Operations John Poeblmann and Karma Metzgar, University of Missouri Extension Northwest Regional Director, for their continuing support of Graves - Chapple Farm.

Bob Chapple  
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Graves-Chapple Farm
College of Agriculture, Food and Natural Resources

Agriculture is a great example of a constantly shifting target. The changes that have occurred in agriculture over the past 30 years have been staggering. This was made very apparent last year when I had calls from producers looking for on-farm batch dryers. These staples of our farms just 15 years ago were almost impossible to find.

In 1988, one of the major changes occurring was the promotion of the no-till farming system. No-till was seen as a way to reduce input costs and reduce erosion on our agricultural ground. Agriculture was being singled out as the major source of pollution in our nation’s lakes and rivers. The concept of not tilling the soil was so foreign to most farmers that the concept was thought to be impractical in Northwest Missouri. “It will not work up here” was a common refrain. Under that premise, the Graves-Chapple Farm was founded and has proven over the years that no-till is a viable, profitable and environmentally friendly farming process for northwest Missouri.

Why do we give you this background? Because the Graves-Chapple Farm is here for you. Visitors are always welcome whether you are attending a field day, special tour, meeting, or just passing through the area. We are pleased that you have picked up this copy of the 2010 annual report. The information in this annual report is a brief overview of some of the current research and demonstrations here at the farm and we hope that you find the information beneficial to your operation.

We have continued our work and efforts to demonstrate no-till technology with a major emphasis on the production of corn and soybeans. Efficient and profitable use of inputs such as fertilizer and herbicides has been a recent focus. Nitrogen application rates, timing and various nitrogen products as well as various herbicides have been examined. Corn and soybean variety demonstrations are also conducted each year in cooperation with local seed dealers. And of course, our long term tillage plots are still providing data.

If you are not on our mailing list or email list for flyers or meetings and would like to be, please let us know. We encourage you to ask questions. You are the reason this farm exists and sometimes your questions or suggestions become an entire experiment or demonstration that benefits many people.

We would also like to thank the members of our Advisory Board for their support and guidance. Their time and efforts are greatly appreciated.

Jim Crawford
Farm Coordinator

Wayne Flanary
Agronomist
We would like to thank the following companies and individuals for their contributions to this year’s work. Their assistance is greatly appreciated.

Ag Choice, Rock Port
AgriGold Hybrids
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Atchison County Extension Council
Atchison County Farm Bureau
Atchison-Holt Electric Coop
Burrus Power Hybrids
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Citizens Bank of Oregon
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Danny Burke
Douglas Garrison
Exchange Bank of Fairfax
Fairfax Agency
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Farmers Supply Ag Service, Burlington Junction
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Grebe Farm & Home
Helena Chemical Company
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Morris Heitman
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River Valley AG
Robert Gibson
Rock Port Rotary
Scheib Drainage
Scott Milne Pioneer Seed, Oregon
St. Joseph News-Press
Sur-Gro, Savannah
Sur-Gro Forest City
Syngenta
Tarkio Co-op
Taylor Seed Farms
Teresa Kurtz
Willcross Seed
Wyffels Seed
Yocum Fertilizer
**Objective**

The objective of this demonstration is to evaluate the effect of different tillage systems on corn yields and profitability of the enterprise. This is the 20th year for this demonstration.

**Methods & Materials**

The four most common tillage systems practiced in this region were used for this demonstration. The tillage systems used were:

- Fall & Spring Disk
- Spring Disk
- No-till
- Fall Chisel & Spring Disk

Each plot consisted of eight rows spaced 30 inches apart and 250 feet long. Yield results were taken from the center six rows of each plot. The plots were planted on April 29, 2010 with a population of 32,401 seeds/acre into a field that raised soybeans in 2009. Harvest was conducted on September 29, 2010.

**Results and Discussion**

In 2010, the Spring Disk and No-till plots tied for the highest yield with 250.4 bu/acre. The lowest yielding system was the Fall and Spring disk plot which yielded 237.7 bu/ac. The average for the four systems was 245.3 bu/ac with a standard deviation of 6.2 bu/ac. Yield results for all four tillage systems are shown in Table 1 and Figure 1.

Perhaps the best comparison can be made by looking at the 20-year results of the study as shown in Figure 2. This long term collection of data allows the weather variable to be minimized since we have had greatly varying weather patterns during this time period. During this 20 year period, the Spring Disk system averaged 165.9 bu/acre. The Fall and Spring Disk treatment had the lowest average of 161.5 bu/acre. With a standard deviation of 1.9 bu/acre over this period, there is no significant difference between the yields.

<table>
<thead>
<tr>
<th>Corn Tillage System</th>
<th>Harvest Moisture (%)</th>
<th>Yield at 15.5% Moisture</th>
<th>bu/acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall &amp; Spring disk</td>
<td>17.5</td>
<td>237.7</td>
<td></td>
</tr>
<tr>
<td>Spring Disk</td>
<td>15.9</td>
<td>250.4</td>
<td></td>
</tr>
<tr>
<td>No-Till</td>
<td>16.5</td>
<td>250.4</td>
<td></td>
</tr>
<tr>
<td>Fall Chisel/Spring Disk</td>
<td>16.7</td>
<td>242.8</td>
<td></td>
</tr>
<tr>
<td><strong>Trial averages</strong></td>
<td><strong>16.7</strong></td>
<td><strong>245.3</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Standard Deviation</strong></td>
<td><strong>6.2</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 1 - 2010 Corn tillage systems yield results.

![Figure 1 - 2010 Corn tillage systems yield results.](image)

The most important aspect of the tillage trials is the net bottom line. The application of fertilizer, herbicides, seed, planting and harvesting were identical for each of the tillage systems used. Thus, the economic differences shown are a result of the tillage procedures conducted on each plot and the associated costs.
Table 2. Gross income per acre minus tillage costs over a 20-year period.

<table>
<thead>
<tr>
<th>Corn Tillage System</th>
<th>20 Year Yield Ave bu/acre</th>
<th>Gross Income @ $5.00/bu</th>
<th>Tillage Costs per Acre</th>
<th>Gross Income less Tillage Costs per Acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall &amp; Spring Disk</td>
<td>161.5</td>
<td>$807.47</td>
<td>$23.32</td>
<td>$784.15</td>
</tr>
<tr>
<td>Spring Disk</td>
<td>165.9</td>
<td>$829.31</td>
<td>$11.44</td>
<td>$817.87</td>
</tr>
<tr>
<td>No-till</td>
<td>164.5</td>
<td>$822.44</td>
<td>$0.00</td>
<td>$822.44</td>
</tr>
<tr>
<td>Fall Chisel/Spring Disk</td>
<td>163.1</td>
<td>$815.46</td>
<td>$29.04</td>
<td>$786.42</td>
</tr>
</tbody>
</table>

Table 2 provides a summary of the gross income per acre minus the costs for the tillage work that was conducted. If we use a value of $5.00 per bushel, over this 20 year period the no-till plots grossed between $4.57 and $38.28 per acre more than the other tillage systems.

Another important factor that is sometimes not considered is the benefit to the environment of different tillage practices. No-till programs greatly reduce the amount of soil erosion caused by wind and water runoff. Soil particles are the number-one contaminant found in the rivers and streams of Northwest Missouri. These particles not only cloud the water but they also may have other pollutants (herbicides, insecticides, fertilizer) adhered to them which may contaminate the water.

Fig 2 - Corn tillage systems 20 year yield averages.

It is very difficult to estimate tillage costs as each grower's operating costs will be different. Age and size of the equipment, field shape and size as well as soil type will all effect the tillage costs. A large variable most seasons is fuel cost. To come up with a standard comparison value, we used the rates from the MU Custom Rates guidesheet for the various tillage operations performed. These values are based on data collected from producers across Missouri. The most recent guide was updated in 2009. There is no assurance that these rates would cover a particular producers costs. However, this is the best estimate we can find for a comparison.

One factor not considered in the economic analysis is labor. It is almost impossible to place a value on a producer's labor per hour. Therefore, no labor costs are included in the analysis.
Objective

The objective of this demonstration is to evaluate the effect of different tillage systems on soybean yields and profitability. This is the tenth year for this demonstration.

Methods & Materials

The four most common tillage systems practiced in this region were used for this demonstration. The tillage systems used were:

- Fall Chisel & Spring Disk
- No-till
- Spring Disk
- Fall & Spring Disk

Each plot consisted of eight rows spaced 30 inches apart and 250 feet long. Yield results were taken from the center six rows of each plot. The plots were planted on May 25, 2010 with a population of 170,000 seeds/acre into a field that was planted in corn in 2009. Harvest was conducted on October 21, 2010.

Results and Discussion

In 2010, the highest yielding system was the No-till plot with a yield of 55.8 bu/ac. The lowest yielding system was the Fall and Spring Disk plot which yielded 50.9 bu/ac. The average yield for the four systems was 54.2 bu/ac with a standard deviation of 2.2 bu/ac. Yield results for all four tillage systems are shown in Table 1 and Figure 1.

If you compare the data obtained over the ten years of the study, the Spring Disk treatment has had the highest average yield for any of the tillage methods with an average of 56.7 bu/acre per year. The Fall Chisel/Spring Disk treatment had the lowest average yield.

<table>
<thead>
<tr>
<th>Soybean Tillage System</th>
<th>Harvest Moisture (%)</th>
<th>Yield at 13.0% Moisture bu/acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall Chisel/Spring Disk</td>
<td>10.1</td>
<td>55.3</td>
</tr>
<tr>
<td>No-till</td>
<td>10.1</td>
<td>55.8</td>
</tr>
<tr>
<td>Spring Disk</td>
<td>10.3</td>
<td>54.7</td>
</tr>
<tr>
<td>Fall &amp; Spring Disk</td>
<td>10.5</td>
<td>50.9</td>
</tr>
<tr>
<td><strong>Trial averages</strong></td>
<td><strong>10.3</strong></td>
<td><strong>54.2</strong></td>
</tr>
<tr>
<td><strong>Standard Deviation</strong></td>
<td><strong>2.2</strong></td>
<td></td>
</tr>
</tbody>
</table>

Table 1 - Soybean tillage systems yield results for 2010.

For any of the treatments with an average of 55.3 bu/ac per year. These yields are shown in Figure 2.

With ten years of data, you can see a trend developing in the yields for each tillage method. This longer term collection of data allows the weather variable to be minimized since we had varying weather patterns during this time period. The ten year average for all the plots is 56.1 bu/acre with only a 0.6 bu/acre standard deviation. This is not a significant variation between the various tillage systems.

Fig 1 - 2010 Soybean tillage systems yield results.
<table>
<thead>
<tr>
<th>Soybean Tillage System</th>
<th>10 Year Yield Ave bu/acre</th>
<th>Gross Income @ $12.00/bu</th>
<th>Tillage Costs per Acre</th>
<th>Gross Income Less Tillage Costs per Acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall Chisel/Spring Disk</td>
<td>55.3</td>
<td>$663.81</td>
<td>$29.04</td>
<td>$634.77</td>
</tr>
<tr>
<td>No-till</td>
<td>56.2</td>
<td>$674.05</td>
<td>$0.00</td>
<td>$674.05</td>
</tr>
<tr>
<td>Spring Disk</td>
<td>56.7</td>
<td>$680.77</td>
<td>$11.44</td>
<td>$669.33</td>
</tr>
<tr>
<td>Fall &amp; Spring Disk</td>
<td>56.0</td>
<td>$671.76</td>
<td>$23.32</td>
<td>$648.44</td>
</tr>
</tbody>
</table>

Table 2 - Gross income per acre minus tillage costs over a ten year period.

![Soybean tillage ten year yield averages.](image)

The economic analysis follows the trend we have seen in the corn tillage demonstrations. The application of the fertilizer, herbicides, seed, planting and harvesting were identical for each of the tillage methods used. With only a 0.6 bu/acre variation between the treatments, the economic difference is a result of the tillage procedures conducted on each plot and the associated costs. It is very difficult to estimate tillage costs as producer's operating costs will be different. Age and size of the equipment, field shape and size, and soil type will all effect the tillage costs. As with the corn tillage demonstration, we used the 2009 MU Custom Rates guidesheet to estimate the tillage costs for each system used.

One factor not considered in the economic analysis is labor. It is almost impossible to place a value on a producer's labor per hour. Therefore, no labor costs are included in the analysis.

Table 2 provides a summary of the gross income per acre minus the costs for the tillage work that was conducted. The No-till plots grossed between $4.73 and $39.28 per acre more than the other tillage systems assuming a price of $12.00 per bushel for soybeans.

Another important factor that is sometimes not considered is the benefit to the environment of different tillage practices. No-till programs greatly reduce the amount of soil erosion caused by wind and water runoff. Soil particles are the number-one contaminant found in the rivers and streams of Northwest Missouri. These particles not only cloud the water but they also may have other pollutants (herbicides, insecticides, fertilizer) adhered to them which may contaminate the water.
The Influence of Different Corn Planting Populations at Three Different Locations on Corn Yield

Introduction

Growers using precision agriculture technologies have the option to adjust seeding rates as they plant. However, determining the correct seeding rate and where to change seeding rates is difficult to predict. The optimum population may vary with each growing season in many soil types.

Methods & Materials

Three sites were chosen for the different yield environments. The high yielding productive site was Graves - Chapple Farm East location. The second site was a compacted site also at Graves - Chapple was located over top of the haul road when the Interstate was built. The compacted layer starts at 18 inches then is approximately two feet of compacted soil. The third site is wet soil subject to nitrogen loss.
Previous Crop: Corn
Variety: Pioneer 33D49

No. of treatments: 3
No. of replications: 5
Planting Date: 4/28 West and 5/19 East
Plot Size: 10 X 35
Row Spacing: 30-inch
Design: RCBD
Herbicide Program: Lumax, Atrazine, 2,4-D, Glystar
Harvest Date: Oct 28, 2010

Results and Discussion

The highest productivity site had an optimum planting population over 32,000 plants per acre. Other yield environments were limiting and yields were level or dropped slightly with increasing populations. The site with wet soil was targeted to be at a moderate yield level but because of wetness, the site yielded poorly across all populations.

![Effect of Different Productivity Environments on Corn Yield](image)

- Compact layer 18-Inches
- Nitrogen deficient wet area
- High yielding productive soil

![Yield (Bu)](Yield_Bu)

![Populations](Populations)
Introduction

Measure the effect of different nitrogen fertilizer products on corn yield.

A urease inhibitor is used to prevent volatilization. Thiophosphoric triamide, commonly referred to as NBPT, has the trade name Agrotain. This product inhibits the urease enzyme that converts urea to ammonia. The addition of this product reduces the potential volatilization of surface applied urea containing products.

Nitrification inhibitors retard the conversion of ammonium to nitrate. The nitrate form of nitrogen is susceptible to losses by denitrification or leaching. The benefit from using an inhibitor varies. Soil conditions, time of year, type of soil, geographic location, rate of nitrogen application, and weather conditions that occur after the nitrogen is applied and before it is absorbed by the crop affect the value of nitrification inhibitors.

Super U contains the urease inhibitor Agrotain and a nitrification inhibitor DCD (dicyandiamide).

ESN stands for Environmentally Smart Nitrogen and is manufactured by Agrium. Polymer coated urea has a special polymer coating. Water moves through coating to dissolve urea. The nitrogen diffuses through the porous polymer membrane.

Methods & Materials

Nitrogen products were applied at the rate of 180 pounds of nitrogen per acre. ESN was applied with ammonium nitrate per the recommendation by manufacturer. This is to insure that enough nitrate nitrogen would be available soon enough for early season crop growth. The mix was 75% ESN plus 25% ammonium nitrate.

The products Super U, urea, urea plus Agrotain, ESN and ammonium nitrate were tested. The check did not have any nitrogen applied.

Previous Crop: Corn
Variety: Pioneer 33D49
No of treatments: 6
No. of replications: 5
Planting Population: 34,500
Planting Date: 4/28/2010 Heitman Farm
5/3/2010 Graves-Chapple east
Plot Size: 10 X 35
Row Spacing: 30-inch
Design: RCBD
Herbicide Program: Lumax, Atrazine, 2,4-D, Glystar
Treatments: Applied at planting
Urca
Urea + Agrotain
135 ESN + 45 Nitrate
Ammonium nitrate
Super U
Harvest Date: Oct 18, 2010

Results and Discussion

There were no significant differences between any of the nitrogen sources at the Graves-Chapple east site. However, at the Heitman site, ammonium nitrate out performed all of the other sources of nitrogen. Also, at this site, there were other significant differences between the additives and nitrogen sources. Be sure to use the LSD to determine if the differences are due to the treatments rather than variability of plots.
Effect of Nitrogen Products and Additives on Corn Yield - G/C

![Graph showing yield comparison between different nitrogen products and additives.](image)

Effect of Nitrogen Products on Corn Yield - Heitman

![Graph showing yield comparison between different nitrogen products.](image)

Filmary 2010; LSD .05 = 21

Filmary 2010; LSD .05 = 13
Objective

Strip intercropping is the technique of planting different crops together to maximize production. The precise growing of crops can be attained by using equipment aided by GPS technology which allows one to accurately to plant strips and apply treatments.

Methods & Materials

Plots were 100 feet long by 20 feet wide. Row spacing for both crops were 30-inch and were composed of 8 rows for each plot. Plots were planted in alternating corn and soybeans and individual rows in each plot were harvested. The center rows were harvested and averaged as first pass through the plot was limited by the width of the grain head.

Plot Size: 100 x 20
Variety: Soybean - Pioneer 93M61
Corn - Pioneer 33D49
Planting Population:
Corn - 34,500 seeds/acre
Soybean - 180,000 seeds/acre

Row Spacing: 30-inch
Planting Date: Corn - April 28, 2010
Soybeans - May 3, 2010
Herbicide Program: Glyphosate + Dual
FB Glyphosate Post

Results and Discussion

The response of two crops to strip cropping is mostly determined by the width of the strip. Tall corn intercepts more sunlight at the border with soybeans and thus has greater yields. However, soybean yields at corn borders can be decreased due to shading and water competition.

The yield increase of corn is at the border as shown in the following graph. The tall, blocks of bars represent corn rows and smaller blocks represent soybean. The positive yield increase may extend to the second row. However, width greater than four rows would yield as a single crop. The negative yield loss with soybeans occurs in the two outside rows. Yields increase further from the borders with corn.
Objective

The objective was to measure the corn yield of point rows compared to single planted rows. Automatic planter shut-off is technology allows growers to prevent overlap of rows. This technology reduces the amount of wasted seed and the reduction of overlap plants results in less lodging.

Methods & Materials

Overlapped corn rows were compared to single rows. Corn was planted at 45 degrees to create overlapped rows.

Previous Crop: Soybeans
Plot Size: 10 x 35
Variety: Pioneer 33D49
Planting Population: 34,500 seeds/acre
Row Spacing: 30-inch
No. of treatments: 2
No. of replications: 5

Design: RCBD
Planting Date: April 28, 2010
Herbicide Program: Lumax, Atrazine, 2,4-D, Glystar
Nitrogen Source: 180 lbs N as Ammonium nitrate
Harvest Date: Oct 18, 2010

Results and Discussion

Statistically, there were not any significant differences in corn yield between the overlap and single rowed corn. Corn stalks of plants that were doubled were smaller and lodged. Ear size was also smaller.

![Effect of Doubled Rows on Corn Yield](image-url)

*Flanagan 2010, LSD .05 = NS*
The Effect of Different Nitrogen Application Timings on Corn Yield

Objective

To demonstrate nitrogen applications at different corn plant growth stages. Supplemental nitrogen fertilizer can be applied up to corn tassel growth stage and obtain a yield response where nitrogen has not been applied or corn is nitrogen deficient.

Peter Scharf, MU Soil Fertility Professor, indicates that if you apply nitrogen to corn by stage V-11, you have a good chance of making full yield, especially if some fertilizer N was previously applied. This is recommendation is based on 37 N timing experiments. Furthermore, in six experiments where nitrogen applications were delayed until V-12 to V-16 and corn yield averaged only a 3% yield reduction.

Methods & Materials

The nitrogen source was Urea treated with Agrotain. Pre-plant nitrogen was applied April 27th, V-6 application was made June 7, and V-14 was applied at June 22. The nitrogen rate was 180 pounds nitrogen per acre.

Previous Crop: Soybean
Variety: Pioneer 33D49
No of treatments: 5
No. of replications: 5
Planting Population: 34,500 seeds/acre
Planting Date: May 3, 2010
Plot Size: 10 X 35
Row Spacing: 30-inch
Design: RCBD
Nitrogen Source: 180 pounds ammonia
Herbicide Program: Lumax, Atrazine, 2,4-D, Glystar
Harvest Date: Oct 19, 2010

Results and Discussion

All nitrogen applications significantly increased yield compared to the check. There were not any significant differences of corn yield between the preplant and V-6 application timing. However, both preplant and V-6 nitrogen application timing yielded significantly more than V-14 application.
Objective

The objective was to demonstrate the value of 15-inch row spacing compared to 30-inch with late soybean seeding dates. The Extension Service recommends using narrow row spacing during delayed planting. When planting late, the time for vegetative growth is shorter and this reduces the canopy development. By narrowing the row spacing, the crop can compensate by producing more pods per area.

Methods & Materials

Four row plots were planted and the center two rows were harvested. Each variety was an individual test comparing the 30-inch row spacing with 15-inch.

Previous Crop: Corn

Variety: Various
No. of replications: 5
Planting Population: 180,000 seeds/acre
Planting Date: May 25, 2010
Plot Size: 10 X 35
Row Spacing: 30-inch
Design: RCBD
Herbicide Program: Dual, Sharpen, 2,4-D, Glystar fb Fusilade, Cobra
Treatments: Only single varieties were tested against each other.
Harvest Date: Oct 21, 2010

Results and Discussion

Each variety was a single experiment that compared 30-inch row spacing to 15-inch. The chart compares each variety with a 30-inch row spacing to the 15-inch. The means are provided at the top of the bar.
**Effect of Different Nitrogen Rates on Corn Yield**

**Objective**

The objective was to measure the effect of different nitrogen fertilizer rates on corn yield.

Nitrogen fertilizer rates are based on yield goals and contributions of nitrogen from various sources.

Nitrogen efficiency is affected by uncontrollable factors such as precipitation and temperature. Controllable factors are crop type, past crop, yield goals, organic matter, application timing and sources of nitrogen. These factors should be carefully considered when considering nitrogen use efficiency.

**Methods & Materials**

**Previous Crop:** Corn  
**Variety:** Pioneer 33D49  
**No of treatments:** 6  
**No. of replications:** 3  
**Planting Population:** 34,500 seeds/acre  
**Planting Date:** April 28, 2010 Heitman Farm  
**May 19, 2010 G-C East**  
**Plot Size:** 10 X 35  
**Row Spacing:** 30-inch  
**Design:** RCBG  
**Nitrogen Source:** Ammonia Nitrate  
**Herbicide Program:** Lumax, Atrazine,  
2,4-D, Glystar  
**Harvest Date:** Oct 18, 2010
Results and Discussion

The 2010 early corn growing season was wet resulting in nitrogen losses. The nitrogen response was typical with additional nitrogen rates providing a response at the Graves Chapple site. However, there was not a significant yield response beyond the 180 pound nitrogen rate but the data shows a trend. This is shown in the following bar chart. Yields are shown at the top of the bars.

The nitrogen rates at the Heitman site also leveled out at the 180 pound nitrogen rate. There was little loss of nitrogen at this location from denitrification as the plot area is well drained.
Objective

Measure the impact of nitrogen fertilizer application rates and planting populations on corn yield. Population and adequate amounts of nitrogen are critical for high corn yields.

Methods & Materials

Corn was planted at 24,000 and 32,000 plants per acre and nitrogen was applied at 0, 180 and 240 pounds of nitrogen per acre. The combination of these factors was tested against each other at the Heitman site.

Previous Crop: Corn
Variety: Pioneer 33D49

No of treatments: 6
No. of replications: 5
Planting Population: See Treatments
Planting Date: May 3, 2010
Plot Size: 10 X 35
Row Spacing: 30-inch
Design: Factorial
Herbicide Program: Lumax, Atrazine, 2,4-D, Glystar
Harvest Date: Oct 18, 2010

Results and Discussion

There was significant increase in yield compared to a check with the zero rate of nitrogen. There were not any significant differences between 180 and 240 pounds of nitrogen and the two populations of 24,000 and 32,000 plant populations.
Objective

The objective is to measure impact of split, pre and side-dress application timings on corn yield. Nitrogen application timing, given the wet springs, has created attention with many growers adding supplemental nitrogen to nitrogen deficient corn and obtaining excellent responses. Growers question whether they should split nitrogen, or if they split nitrogen, what rates of splits should be used.

Methods & Materials

Urea treated with Agrotain was used as source of nitrogen. Pre-plant was applied April 27th along with initial first split of nitrogen applications. The side-dress application and second application of the split was applied June 11th. The corn planting date was May 3rd.

Previous Crop: Soybean  
Variety: Pioneer 33D49

No of treatments: 5  
No. of replications: 5  
Planting Population: 34,500 seeds/acre  
Planting Date: May 3, 2010  
Plot Size: 10 X 35  
Row Spacing: 30-inch  
Design: RCBD  
Herbicide Program: Lumax, Atrazine, 2,4-D, Glystar  
Harvest Date: Oct 19, 2010

Results and Discussion

The pre-plant nitrogen yielded significantly better than the side-dress application and split applications. There was not a significant difference among split applications. The split applications yielded significantly higher than side-dress application. The results of 2010 indicate that pre-plant nitrogen near planting time is an efficient way to apply nitrogen fertilizer in well drained soils.

Effect of Split Applications on Corn Yield (Heitman)
Objective

There has been considerable information in the media describing the advantage of twin row spacing. Twin rows corn production is two rows placed 8-inches apart on 30-inch centers. Twin rows create narrow rows without changing the row configuration of other equipment. Growers can use the same corn head as used in 30-inch row spacing. Research of twin rows in Missouri has provided inconsistent results.

Methods & Materials

A Kinze split-row planter was used to space rows 8-inches apart. Two planting populations of 34,000 and 40,000 plants per acre and 30-inch rows compared to 8-inch rows on 30-inch centers
Previous Crop: Soybeans
Variety: Pioneer 33D49

No of treatments: 4
No. of replications: 4
Planting Population: 34,000 and 40,000 seeds/acre
Planting Date: May 5, 2010
Plot Size: 10 X 100
Row Spacing: 8 and 30-inch
Design: RCBD
Herbicide Program: Lumax, Atrazine, 2,4-D, Glystar
Harvest Date: Oct 18, 2010

Results and Discussion

There was no significant difference of yields among treatments. There was a trend of increased yields with increasing populations. Stand counts indicated typical stand losses and final plant stands were similar in 30-inch rows and twin rows.
Objective

As production costs continue to increase, producers are looking at ways to maximize the efficiency for their inputs. Fertilizer, herbicides and seed costs are all being closely examined. This demonstration was initiated to look at increases in yield with increased planting populations.

Methods & Materials

Determining the correct seeding rate and where to change seeding rates is difficult to predict. The optimum population may vary with each growing season and by soil types. Six representative planting rates were used for this demonstration.

Previous Crop: Soybeans
Variety: Pioneer 33M16
No of treatments: 6
No. of replications: 2

Planting Population: See treatments
Planting Date: April 29, 2010
Plot Size: 30 x 250
Row Spacing: 30-inch
Design: Strip
Fertility: 100 lb/acre P₂O₅, 300 lb/acre N
Herbicide Program: Lumax, Atrazine, Credit Extra
Harvest Date: September 29, 2010

Results and Discussion

Yield results are shown in Table 1. The average of all the plots was 194.7 bu/acre with a standard deviation of 5.9 bu/acre. In this case, there was not a significant yield increase above 27,700 seeds/acre to justify the increase in seed cost for higher populations. However, every location can have it’s own, unique limiting factors such as drainage, compaction, organic material etc. and should be evaluated independently.

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<thead>
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<th>Planting Population</th>
<th>Yield Bu/acre</th>
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<tr>
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<td>41,200</td>
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Table 1 - Yield results for corn planting population demonstration.
Objective

The objective of this demonstration was to demonstrate Non-GMO soybean variety releases from the University of Missouri. Varieties are available through the Missouri Crop Improvement Association. Following is a list of tested varieties and characteristics.

Magellan (Protected Variety) is an early group IV indeterminate variety (relative maturity 4.3) with gray pubescence, purple flowers, tan pods and buff hila seed. Magellan has shown to be susceptible to phytophthora root rot and soybean cyst nematode.

Mustang (Protected Variety) is an early group IV indeterminate variety (relative maturity 4.3) that averages 38” in height. It has grey pubescence, white flowers, tan pods and buff hila seed. Mustang is resistant to races 3 and 14 of soybean cyst nematode and has demonstrated good resistance to lodging and shattering.

Patriot is a late group III indeterminate variety (relative maturity 3.9) that averages 37” in height. It has white flowers, tawny pubescence, tan pods and buff hila seed. Patriot has resistance to Race 3 of soybean cyst nematode and Race 1 of phytophthora root rot and has tolerance to sudden death syndrome.

MPV 4238N is an early to mid group IV indeterminate variety (relative maturity 4.3) that averages 39” in height with white flowers, tawny pubescence and black hila seed. MPV 4238SCN is rated as resistant to races 3 and 14 of soybean cyst nematode and moderately susceptible to sudden death syndrome. MPV 4238N has demonstrated significant yield advantages over the variety Maverick in both infested and non-infested SCN environments in replicated performance testing.

MPG 415CN is an early-mid group IV indeterminate variety (relative maturity 4.3) that averages 39” in height. It has white flowers, tawny pubescence and black hila seed. MPG 415CN is resistant to races 3 and 14 of soybean cyst nematode and is moderately susceptible to sudden death syndrome. MPG 415CN has demonstrated significant yield advantages over the variety Maverick in both SCN infested and non-infested environments.

EXP 4010 is an experimental line being tested by MU.

Pioneer 93M61 was also planted as a GMO comparison variety.

Methods & Materials

Plots were 4-row wide with the center two rows harvested using a plot combine. Since these are non-GMO varieties, a conventional, post emergence herbicide program was utilized.

Previous Crop: Corn
Variety: See treatments
No. of replications: 5
Planting Population: 180,000 seeds/acre
Planting Date: May 25, 2010
Plot Size: 10 x 35 feet
Row Spacing: 30-inch
Design: RCBD
Herbicide Program: Dual, Sharpem, 2,4-D,
Glystar
fl Fusilade and Cobra
Harvest Date: Oct 21, 2010
Results and Discussion

The analyzed data indicates there were no significant differences between varieties. Across one of the replications was quite wet limiting yields and causing variability in the test.

The line bars indicate the standard deviation for each treatment.
The 22nd annual Graves-Chapple Farm Field Day was held on August 24, 2010. Over 150 participants registered at the event.

New in 2010 was a pre-field day breakfast to thank the many individuals, organizations and agribusinesses that make the farm possible. One hundred and ten attendees enjoyed breakfast and fellowship before the 2010 Supporters of Graves-Chapple Farm were recognized. Dick Grebe and Phil Graves were recognized as outstanding individual supporters. Wally Riebesell and Mo Valley Ag were recognized as the outstanding agribusiness supporter.

The field day tours and lunch were made possible through the assistance of many local organizations. Atchison-Holt REA provided doughnuts and coffee to the attendees in the morning. A pork loin lunch was sponsored by the farm with ice cream sandwiches provided by MO Valley Ag. KMA Radio from Shenandoah and KFEQ Radio from St. Joseph conducted live remote broadcasts from the farm during the event.
Attendees could participate in three tours that highlighted some of the work being conducted on the farm. These tours were:

**Red Tour – Pest Management**

**Stop 1** - *New Emerging Insect Pests to Watch for In Your Fields*
Dr. Wayne Bailey
MU Assoc. Professor of Entomology

**Stop 2** - *Considerations for the Management of Glyphosate-resistant Weeds in Missouri*
Kristin Payne
PhD grad student, Plant Sciences

**Stop 3** - *Key Diseases to Watch for When Considering Fungicide Application*
Dr. Laura Sweets
MU Extension Associate Professor

**White Tour – Crop Management**

**Stop 1** - *Different Nitrogen Products and Application Timing*
Wayne Flanary
MU Extension Regional Agronomist

**Stop 2** - *New, Conventional Soybean Varieties Released by MU*
Kerry Clark
MU Plant Sciences Research Assoc.

**Stop 3** - *Optimum Corn and Soybean Planting Populations and Row Widths*
Dr. Bill Wiebold
MU Professor Agronomy

**Blue Tour – New Technology**

**Stop 1** - *Production of Woody Biomass Crops*
Dr. Hank Stelzer
MU Extension Assoc. Professor

**Stop 2** - *Nitrogen Management, Sensors and Side-dressing*
Larry Mueller
MU Plant Science Research Specialist

**Stop 3** - *Using New Technology to Estimate Crop Yield Potential and Variable Rate Seeding*
Chris Nelson
Midwest Independent Soil Samplers
Dan Lucas
Heartland Technical Solutions

Wayne Flanary, MU Extension regional agronomist talks to producers about different nitrogen sources and application timing during the 2010 field day.

Dr. Wayne Bailey, MU Assoc. Professor of Entomology, shows producers insect pests for which they should be on the lookout in 2010.
**Corn Variety Demonstrations**

Planted - May 5, 2010  
Harvested - October 5, 2010  
Planted rate - 30,800 seeds/acre  
Row Spacing - 30 inches  
Tillage - No-till  
Soil Type - Haynie Silt Loam  

Fertilizer - 250 lbs N, 100 lbs P per acre  
Pre-Herbicide - Lumax, Atrazine  
Post-Herbicide - Callisto, Atrazine  
Previous Crop - Soybeans  
Check variety - Hoegemeyer HPT8505HxLLRR  
Check Average - 211.4 bu/acre

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<td>Adjusted Yield bu/acre</td>
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Soybean Variety Demonstrations

Planted - May 28, 2010
Harvested - October 13, 2010
Planted rate - 178,000 seeds/acre
Row Spacing - 30 inches
Tillage - No-till
Soil Type - Haynie Silt Loam

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Average | 10.8 | 52.0 |
Std Deviation | 0.4 | 4.1 |
Median | 51.5 |
One hundred seventy five high school students from 5 area schools attended the annual Student Field Day at the Graves-Chapple Farm on September 17. The goal for the event is to show some of the various aspects of agriculture to demonstrate to our youth that there is more to agriculture than planting crops.

Each learning station was designed to provide hands on learning opportunities for the students on some of the cutting edge technology and practices used in today’s agriculture as well as provide safety information when working around equipment.

6) Portable Sawmill - A look at agro forestry as an alternative income supply for some of Missouri’s ground that is unsuitable for conventional agriculture.

7) Cannulated Cow - This cow has a door surgically implanted into its digestive tract so that students can access the rumen and observe food in the digestive system of the cow.

8) Genetic Zoo – How altering a gene or using selective breeding has transformed corn produced in the United States.

9) Field tour to show some of the projects and research being conducted at the farm.

Bob Kelly, MU Regional Agribusiness Specialist, uses a straw dummy to demonstrate the potential dangers of a tractor PTO shaft.

The learning stations were:

1) PTO Safety – The dangers associated with tractor power take-off shafts.

2) Agri-business Entrepreneurship and Agri-Tourism - A look at different approaches taken by entrepreneurs to start their businesses.

3) Production of Fresh Water Prawns - Aquaculture in Missouri producing a high dollar product with an increasing demand.

4) Representative from MU with opportunities in agriculture at MU.

5) Uses for Distillers Grains – The increasing production of ethanol from corn is also producing an increasing supply of this very valuable co-product; how do we utilize it?

Under the guidance of MU Regional Livestock Specialist Amie Schleicher, a student explores the cow’s rumen.

Jerry Baker, MU Regional Community Development Specialist, talks to the students about Agri-business Entrepreneurship and Agri-Tourism.
A lunch of hotdogs and hamburgers was provided by the farm and local area businesses and prepared by the Rock Port Rotary club.

Jim Humphrey, MU Extension Regional Livestock Specialist, explains some of the uses for the products left when corn is made into ethanol.

The students were asked to complete an evaluation at the conclusion of the event. Based on the responses, over 96% indicated an increase in knowledge of current agricultural practices from information presented at the event. The PTO safety station made the biggest impact on 48% of the respondents with the cannulated cow and the genetic zoo each receiving 26%.

Eric Lawman, MU Research Assistant, talks about a new form of aquaculture in Missouri - raising fresh water prawns.

Steve Klute, Graves-Chapple Farm advisory board chair, shows a group of students some of the various corn plants in the genetic zoo.

Dusty Walter, MU Natural Resource Research Assistant, explains the value that can be obtained when timber is properly managed.

With Bob Chapple as their guide, a group of students sets out on a tour of the research and demonstration plots at Graves-Chapple Farm.
# Daily Precipitation Data, April - September 2010

## Daily Precipitation in Inches

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**TOTAL** | 2.75  | 3.71 | 4.96 | 4.87 | 4.80   | 3.23
### Daily Temperature Data, April - September 2010

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