Precision Planting®

PRECISION TECHNOLOGY INSTITUTE

2018 RESEARCH SUMMARY
PONTIAC, IL

2018 PTI Results

Precision Planting

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2018 in Review

In 2018 the Precision Technology Institute (PTI) in Pontiac, IL was created. We realize that doing large scale research on your own farm is hard, so we dedicated over 200 acres to agronomy trials. These plots range from fertility to planting date to speed and more. And all of them are contained within the 99 pages of this book.

The PTI farm experience offers a unique opportunity to get in the field with our team and examine the difference between correct and incorrect planter settings and see trials up close with agronomist, Jason Webster. It's also the only place you can truly test drive the newest planter technology. Operate products that can't even be purchased yet as you take over the steering wheel in our 20-acre Ride N Drive area.

The spring weather was warmer and drier than normal and allowed for some early plantings. The first planting date of soybeans occurred on March 22 in some really nice planting conditions. Those conditions quickly deteriorated, as 13" of snow fell the next day. You will definitely want to check out our 2018 Soybean Planting Date Study to see the how these early-planted trials turned out! The majority of planting occurred beginning the last week of April and quickly finished with some dry weather that allowed many consecutive planting days.

Once the crop was planted, June turned out to be one of the first challenges in 2018. Two large rainfall events in June, 10 days apart from each other, wreaked havoc on the PTI farm with saturated soils, anaerobic field conditions, and nitrogen/sulfur losses. Ironically, once things dried out, the PTI then suffered 8 weeks of drought in July and August with no significant rainfall. On a positive note, somewhat cool temperatures prevailed throughout the dry weather to help alleviate crop stress.

In the end, corn yields varied from 133 – 285 Bu/A., averaging near 210 Bu/A.. Soybeans ranged from to 45 - 84 Bu/A. with averages near 60 Bu/A. Irrigation was so important at the PTI farm, with corn yield advantages from watering at 60-100 Bu/A.

2018 in Review Continued:

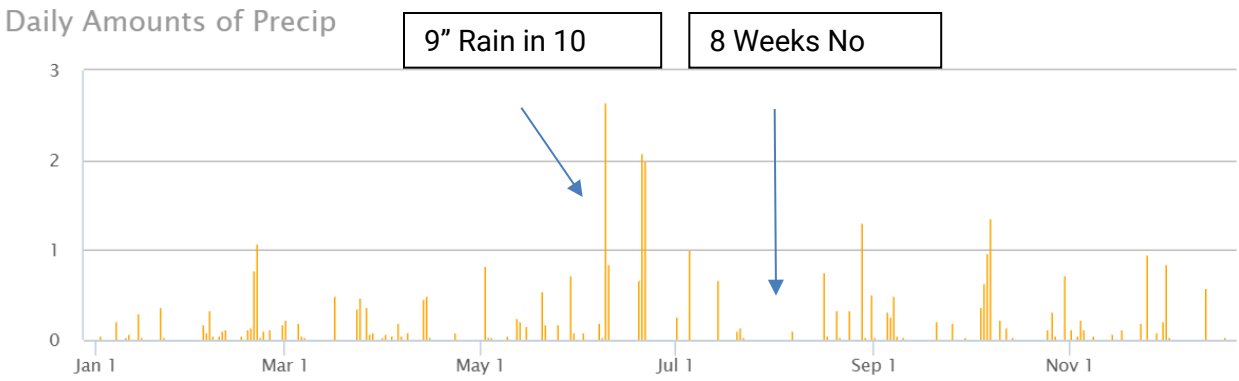
Precision Planting is excited to share our inaugural PTI Pontiac research farm results and findings. We know that these results will provide useful insights that help drive thoughtful consideration around future crop management decisions. This publication is intended to summarize and explain the many agronomic trials that were implemented in 2018.

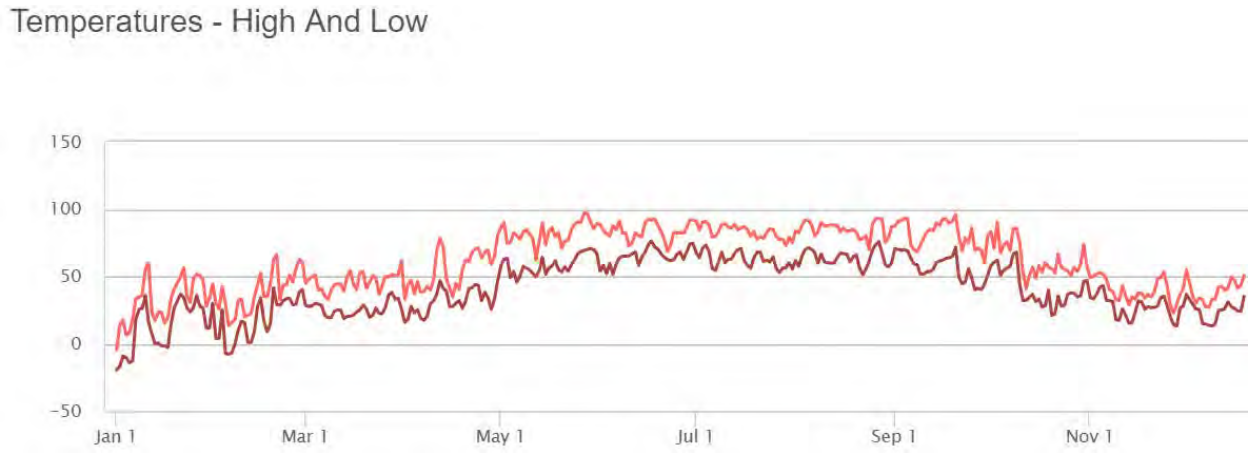
In most all trials, both agronomic yield and economics are detailed to help understand return on investment. At the bottom of each trial summary page, a brief explanation is listed to show Planting Date, Hybrid or Variety, Population, Row Width, Crop Rotation, and Commodity Price/Bu. and Pricing information that pertains to the products being evaluated (Figure 1). For starter fertilizer trials, most have a $30 re-allocation credit applied to each product in testing. This approach allows us to use the total intended fertility needed for soil test build-up and yield maintenance, but allows the planned use of both dry and liquid products without spending or over-applying more nutrients than needed. To accomplish this, we reduce our dry fertilizer rates of DAP (18-46-0) by $30/A. to account for the re-allocation.

Figure 1.

Planting Date: 5/10 *Hybrid: DKC 63-21SS* *Population: 36K* *Row Width: 30”* *Rotation: CAB* *Corn Price: $3.50*

Fertilizer Pricing: $30/A DAP Re-allocation Pro-Germinator $5.80/Gal, Kalibrate $5.70/Gal, Micro500 $8.25/Gal, C-Tech $24/Gal, accesS $17.25/Gal





2018 PTI Results

Corn Planting Date Study

Objective: To evaluate various corn planting dates throughout the spring planting season to determine the optimum planting date that offered highest yield and return on investment. Once optimum planting date is discovered, economics can then be analyzed to determine yield loss and cost/acre when planting dates were not implemented within the optimum planting window.

Figure 2.

Results: The optimum planting window for corn at the Precision Technology Institue occurred during the week of April 25th. Corn planted during this week achieved the highest yields of our planting date study at 217.3 Bu/A. (Table 1). Planting earlier during the week of April 13th resulted in yield losses near 22 Bu/A. due to colder and wetter seedbed conditions. After the optimum plant date of April 25th, yields suffered an average yield loss of 21.2 Bu/A. per week over the next three weeks of plantings. These weekly yield decreases equated to average losses of **-$74.30/A.** as a result of missing the optimum planting window (Table 2). The May 17th planting date resulted in the lowest overall yield with over 30 Bu/A. losses and consequently diminished returns of **-$111.76/A.**

Table 1.

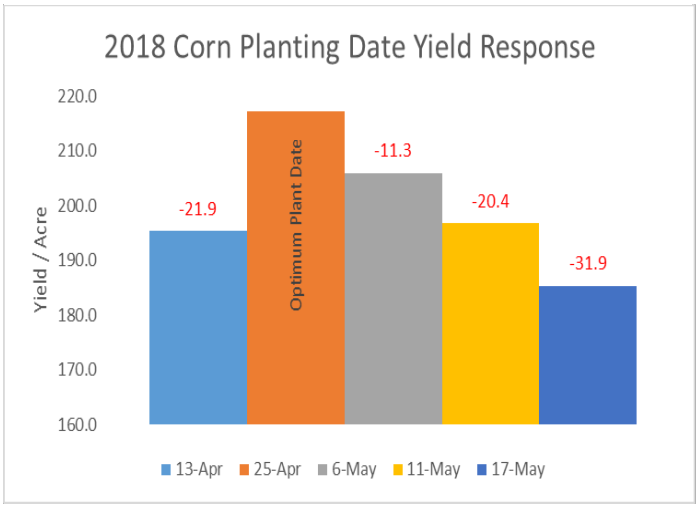
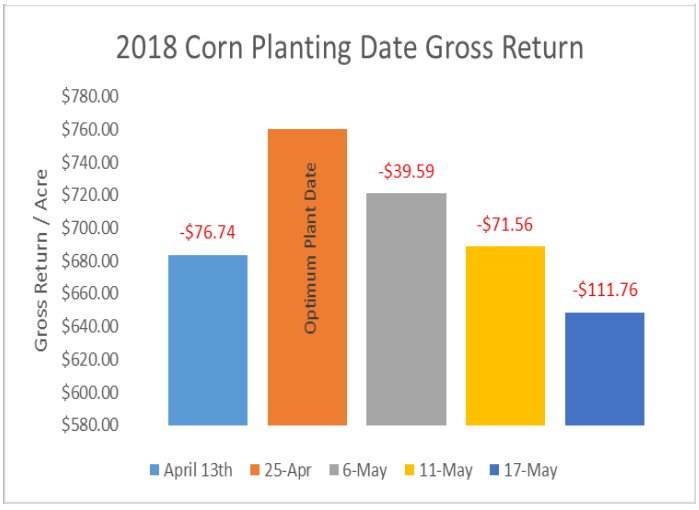


Table 2.

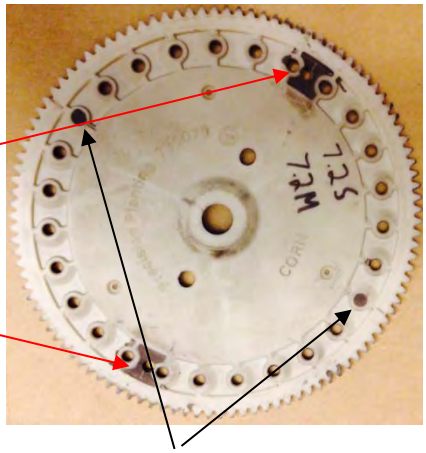


Planting Date: 4/25 *Hybrid: Pioneer 1197AMXT* *Population: 34K* *Row Width: 20"* *Rotation: CAC* *Corn Price: $3.50*

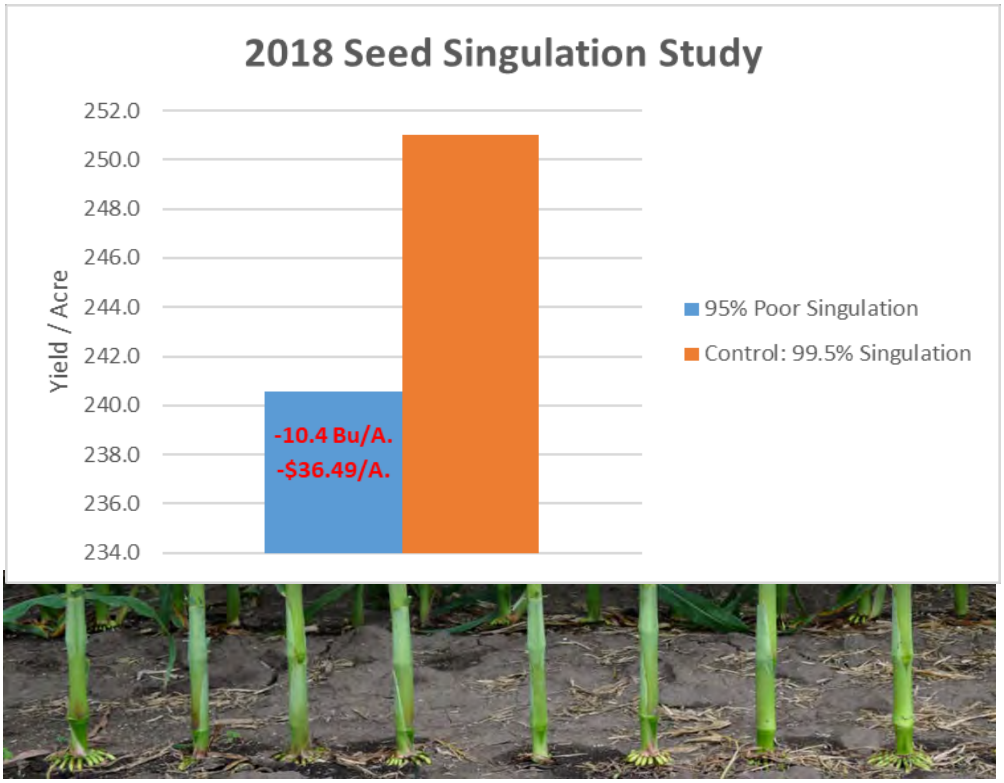
2018 PTI Results

vSet® Seed Singulation Study

Objective: To evaluate how improper seed singulation affects corn yield. Modified vSet™ seed plates with plugged and extra holes were used in order to create doubles and skips. These goof plates created an average of 95% singulation accuracy vs. the control at 99.5%.



Results: 95% seed singulation resulted in yield losses of **-10.4 Bu/A.** with economic losses of **-$36.49/A.** based on a corn commodity price of $3.50/Bu. In general, this equates to **-2.1 Bu/A.** for each percentage of singulation lost.



Planting Date: 5/16 *Hybrid: Pioneer 1366AMXT* *Population: 34K* *Row Width: 30"* *Rotation: CAB* *Corn Price: $3.50*

2018 PTI Results

Planting Depth/SmartFirmer Furrow Moisture Study:

Figure 1. SmartFirmer®

Objective: To evaluate the correlation of corn yield by planting depth and furrow moisture levels, sensed and recorded by SmartFirmer® (Figure1).

Soil moisture is a critical component for seed germination and uniform plant emergence, and ultimately crop yield. SmartFirmer gives row-by-row visibility to soil moisture in the seed furrow, allowing farmers to choose the right planting depth as soil conditions change.

Results: Table 1. illustrates that the average optimum planting depth occurred at the 2" depth setting. As planting depth was decreased, yields fell by **-3.7 to -7.8 Bu/A.** Similiarly, as planting depth was increased above 2", yields fell by **-6.9 to -15.3 Bu/A.**

Table 2 depicts the economic losses associated from incorrect planting depths, averaging **-$12.95 to -$53.55/A.** losses. This data helps to stress the importance of correct planting depth and how quickly yield and economic loss can occur if not implemented properly.

Table 1.

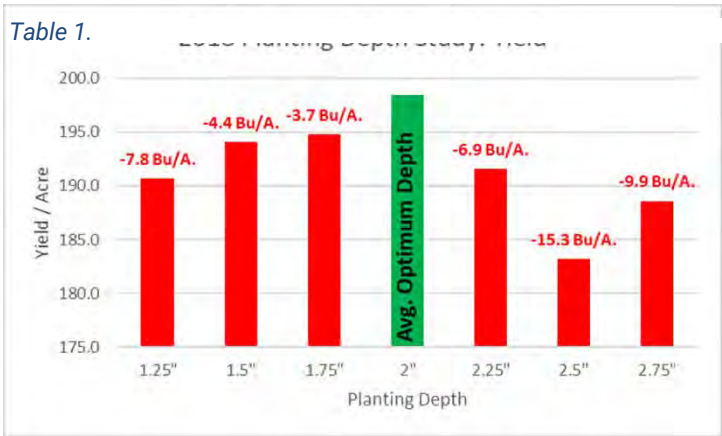


Table 2.

Planting Depth/SmartFirmer Furrow Moisture Study Continued:

Table 3. depicts the relationship of furrow moisture to planting depth. As soils become dry and furrow moisture decreases, planting depths need to be increased to ensure planting into moisture. Conversley, planting too deep into furrows with sufficient mositure could present resistance to emergence in some soil types and textures.

Table 3.

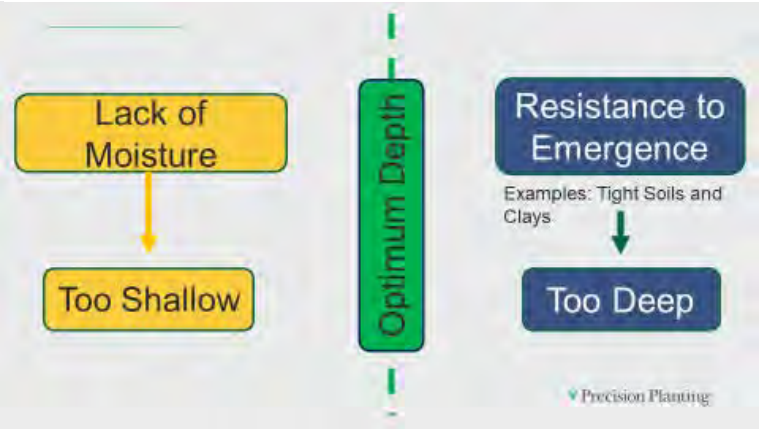
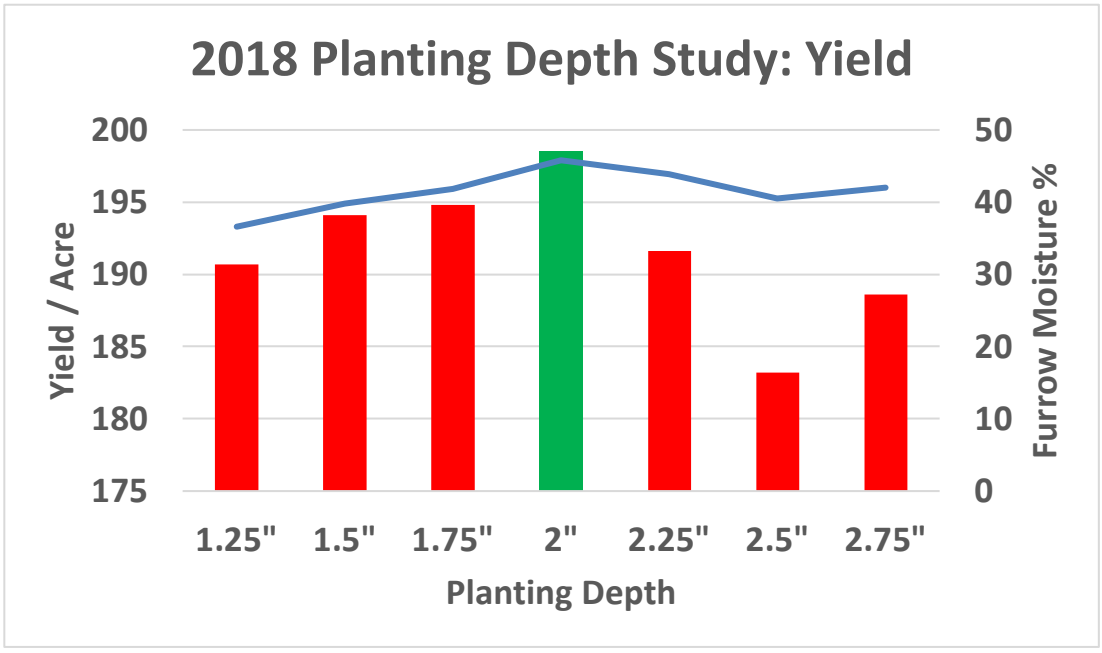


Table 4. shows the same yield and optimum planting depth data from Table 1. above, however adds the furrow moisture values from SmartFirmer at planting. In this particular study, soil moistures levels never fell below 36% furrow moisture.

Precision Planting's early research currently indicates that soil moisture levels near 30% should provide adequate moisture for seed imbibition and emergence. Values below 30% may determine the need to implement deeper planting depths to ensure higher moisture values. Furrow moisture values over 30% should not need deeper planting depths and could in fact cause emergence resistance. That's exactly what happened in this particular study, as planting deeper than the optimum yield depth of 2" actually caused yield losses. More research needs to be completed to fully understand the relationship of furrow moisture and planting depth, however we are beginning to shine a flashlight of how we might sense, understand, and react to varying soil moisture conditions across a field to optimize stand establishment.

Table 4.



Blue line is representative of furrow moisture.

2018 PTI Results

Day of Emergence Study

Objective: This study evaluates the impact of yield loss when corn plants emerge from the soil surface at an inconsistent basis. Flag testing implementation (Figure 1) was used to monitor the emergence timing of young plants. As corn first started to emerge from the soil surface, flags were placed at four different timings to identify the emergence timing of all plants within the study.

Figure 1.

Protocol:

Red Flags = 1st Initial Plants to Emerge

Yellow Flags = Plants that emerged 18-28 hours later

White Flags = Plants that emerged 29-42 hours later

No Flag = Plants that emerged >42 hours later

Figure 2.

Results: Manual ear checks were completed to calculate potential yield loss from late emerging plants. Figure 2. illustrates the ear size of the first emerging plants (with-in 18 hrs), while Figure 3. represents ear sizes of plants that emerged 42 hours or later of the first initial emergers. Upon ear weight calculations at harvest, Table 1. summarizes the effects of yield loss at emergence is delayed by each timing category. Due to droughty conditions this year, late emergers suffered up to 50% yield loss. Plants that emerged just 18-28 hrs late suffered 20% yield loss and 29-42 hr late emergers 25%.

Table 1.

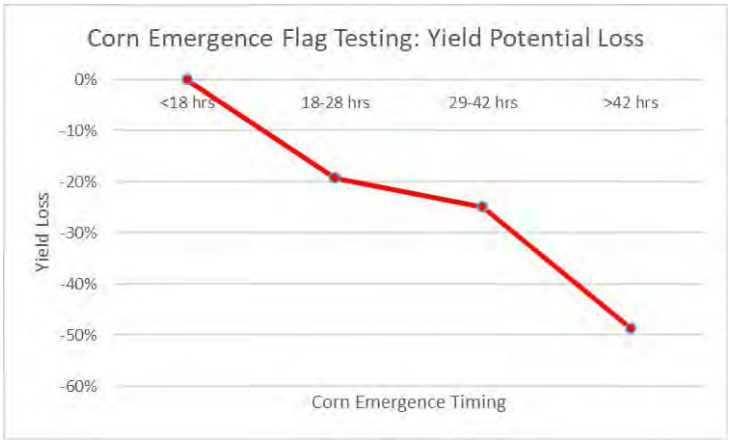


Figure 3.

Planting Date: 5/5 Hybrid: Wyffels 7696VTPro Population: 34K Row Width: 30" Rotation: CAC Corn Price: $3.50

2018 PTI Results

Keeton® Seed Firmer Study

Objective: This study evaluates the benefits of Keeton Seed Firmers. Seed doesn't always land right in the bottom of the trench where they belong. With its unique, in-the-trench design, the Keeton Seed Firmer gently firms those seeds to the bottom of the V-trench (Figure 1). The end result is even depth, correct seed-to-soil contact, and most importantly uniform germination.

Figure 1

Results: The absence of seed firmers resulted in yield losses of **-2.2 Bu/A.** (Table 1.), with gross returns of **-$7.70/A.** At a cost of $35/row for Keeton seed firmers and quick attach brackets for a 16-row planter, corn prices at $3.50, break-even occurs at only 73 acres.

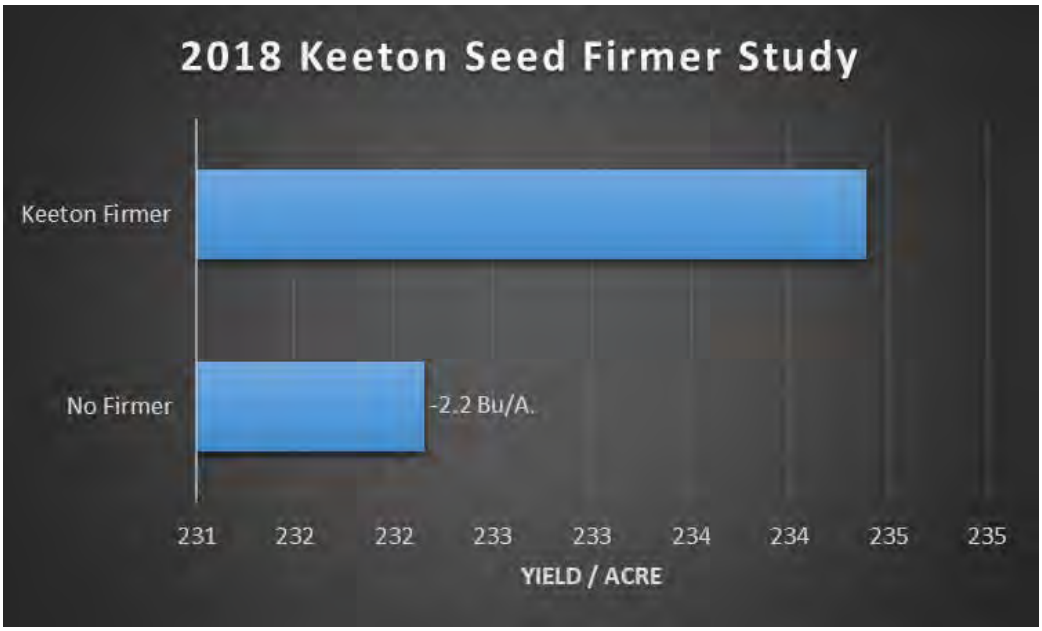


Table 1.

Planting Date: 5/16 *Hybrid: Pioneer 1366AMXT* *Population: 36K* *Row Width: 30"* *Rotation: CAC* *Corn Price: $3.50*

2018 PTI Results

At-Plant Film Study

Objective: This study evaluates the use of an at-plant 90-day biodegradable film designed to create a greenhouse effect to warm soils and preserve moisture. Film was laid directly over top of a planted row and has slits at 3-inch intervals directly above the seed placement. This film traps heat from the sun, raises soil temperatures, thus increasing heat units. At the same time, the film locks moisture underneath it, preserving that water for plant uptake throughout the growing season.

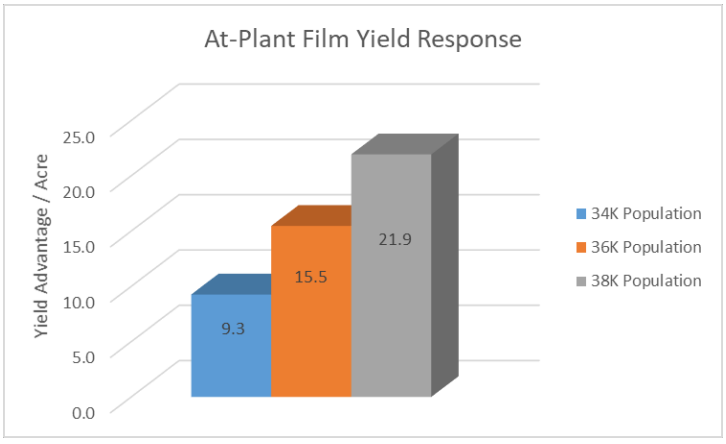
Figure 1. Norseman Techni-Plant FL Film Planter

Results: The at-plant biodegradable film worked excellent on our early April 13th planting dates. Still having cold soil temperatures below 50 degrees, the film was utilized to help insulate and warm the soil surface. In fact, after only two hours after planting it was common to see soil temperatures near 7 degrees warmer due to the film's warming effect.

Figure 2. Close-Up View of Film After Planting

As for yield, the at-plant film increased yield by an average of 15.6 Bu/A., however there was a stark contrast in response to seeding rate. Three seeding rates were replicated and evaluated at 34K, 36K, and 38K populations. The results proved that the higher the seeding rate, the higher the yield response from the at-plant film due to 7 weeks of drought conditions in July and August. The highest seeding rate of 38K offered the highest yield gains of +21.9 Bu/A. with additional gross revenue of +$76.76/A. As seeding rates decreased to 36K and 34K, yield response decreased by roughly 30% at each seeding rate. Therefore, at-plant film yield response decreased to +15.5 and +9.3 Bu/A. respectively, with additional gross returns of +$54.14 and +$32.42/A.

Table 1



Concerning return on investment, Norseman Techni-Plant FL states that the cost for the 90 day biodegradable film is estimated at $100/A. With this cost, break-even yield would occur at 28.6 Bu/A., indicating that all treatments fell short of profitability.

We look forward to testing this interesting technology and finding ways to protect and improve corn yields in the future. Special thanks to Michael Freeman for supplying the use of the film planter for Precision Planting agronomic research.

Planting Date: 4/13 *Hybrid: Pioneer 1197AMXT* *Population: 34-38K* *Row Width: 30"* *Rotation: CAC* *Corn Price: $3.50*

2018 PTI Results

CleanSweep® Residue Management Study

Objective: This study evaluates the benefits of planter row cleaners equipped with CleanSweep. Residue management has become a necessary part of today's operation to maximize profitability. Tougher stalks and more corn-on-corn acres mean a heavier load of residue that needs to be managed. Residue in the seed trench competes with seedlings for moisture and harbors disease. CleanSweep will put row cleaners right where they need to be, moving residue but not the soil. Continuous adjustments can be made as field conditions change with the cab-mounted controller to easily lift or make more aggressive adjustments.

Results: The absence of row cleaners resulted in yield losses of **-3.3 Bu/A.** and proved economic losses of **-$11.50/A.** compared to row cleaners with CleanSweep set at 25 PSI of lift. Floating row cleaners also resulted in **-3.8 Bu/A**. yield losses and similar net losses of **-$13.32/A**.

Table 1: Yield Response

Table 2: Economic Return

Planting Date: 5/16 *Hybrid: Pioneer 1366AMXT* *Population: 34K* *Row Width: 30"* *Rotation: CAB* *Corn Price: $3.50*

Seed Trench Residue Management Study

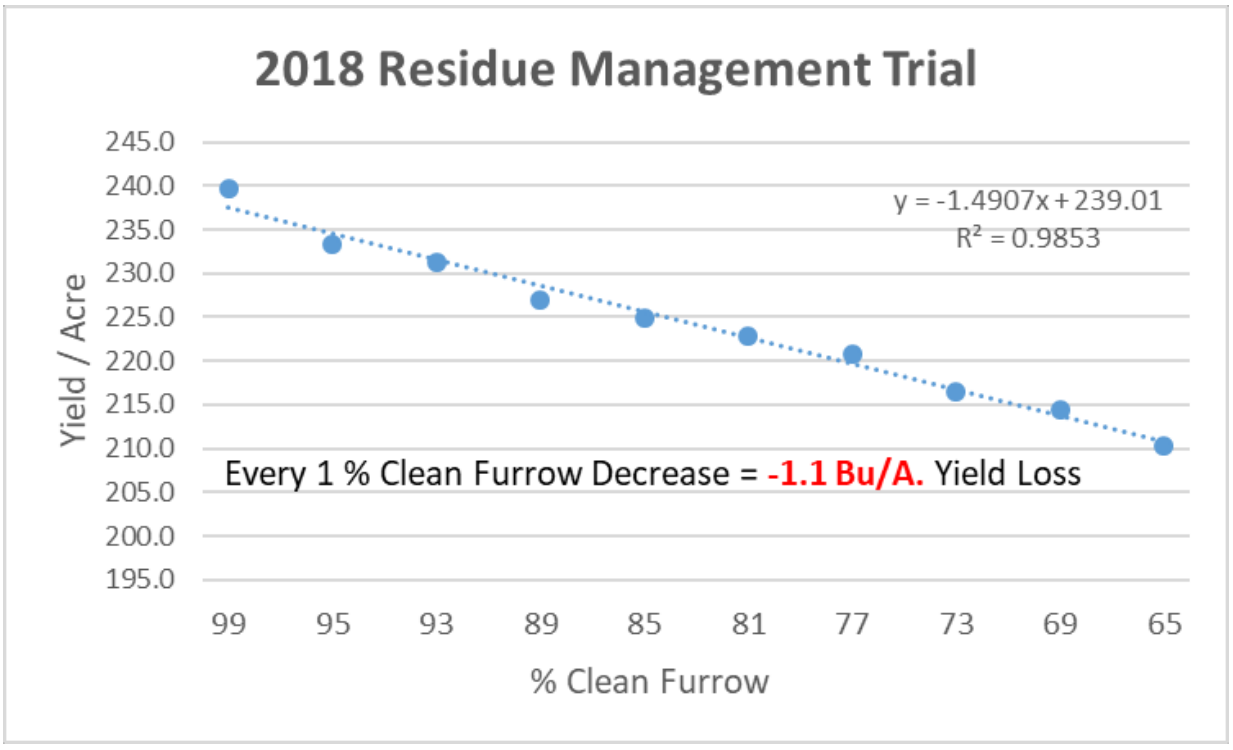
Objective: This study evaluates the impact of plant residue in the seed trench at planting (Figure 1). Old plant residue in the seed furrow can rob moisture away from the seed, cause air pockets, and create a lower percentage of seed-to-soil-contact. All these factors can delay germination and impact corn yield. This study attempts to quantify corn yield loss from varying percentages of residue on the seed at planting.

To create a controlled environment, manual infestations of corn residue were placed directly on corn seed in the furrow at percentages from 100% to 64% clean furrows.

Figure 1

Results: Table 1 illustrates the strong relationship of yield response to residue in the furrow. For every 1% loss in clean furrow, corn yield decreased by **-1.1 Bu/A.** Corn yields ranged from 210 to 240 Bu/A., indicating losses up to 30 Bu/A. as a result of high amounts of residue in the furrow. It should be noted that this controlled study only applies residue directly on the seed. No other residue is distributed between the seed or elsewhere in the furrow. In typical field settings, residue would be more than likely be distributed throughout the seed furrow, thus increasing the total amount of residue and consequently causing a higher degree of corn yield loss.

Table 1.

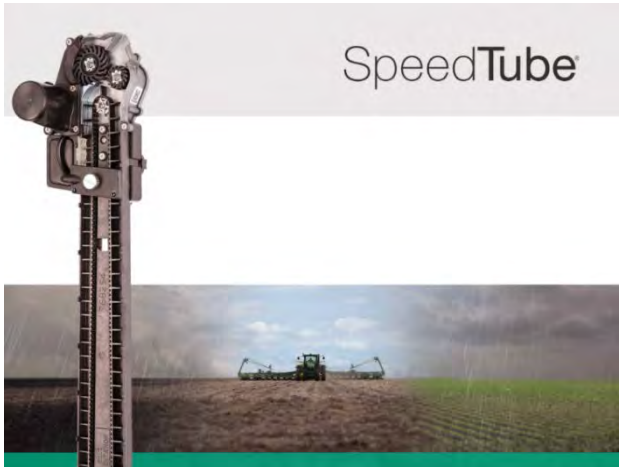


Planting Date: 5/16 *Hybrid: Pioneer 1366AMXT* *Population: 36K* *Row Width: 30”* *Rotation: CAC* *Corn Price: $3.50*

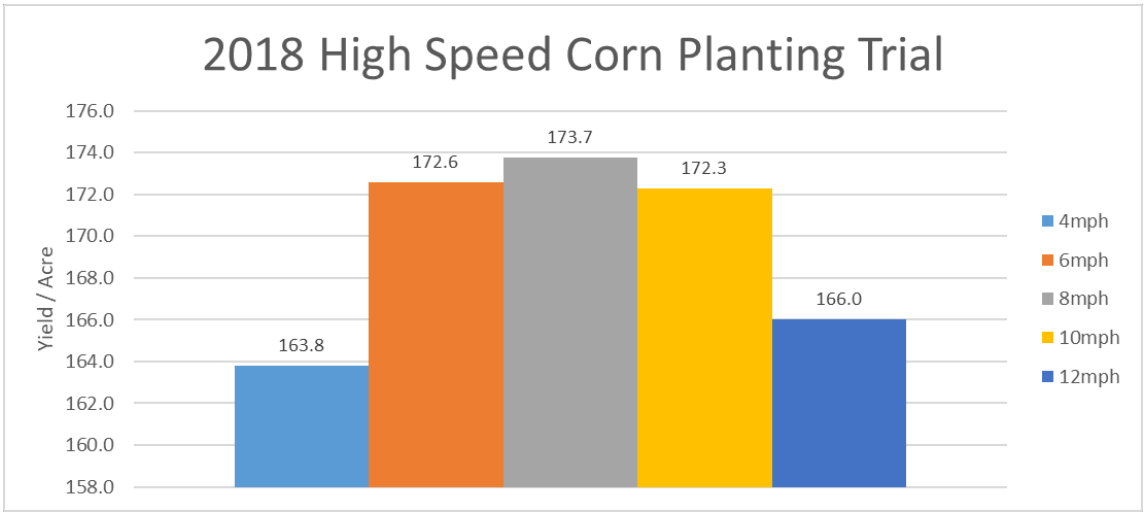
2018 PTI Results

Corn High Speed Planting Study

Objective: To evaluate yield response of planting speeds of 4, 6, 8, 10, and 12 MPH with SpeedTube®. This high-speed planting technology takes the place of conventional seed tubes and consists rather of a flighted belt that takes gravity out of the equation. By hand delivering each seed to the furrow, there is no opportunity for seeds to ricochet into the trench. Even at twice normal planting speeds, seed arrives safely at the bottom of the trench, spaced evenly, every time. All entries in this study utilize SpeedTube technology.



Results: Using SpeedTube technology, highest corn yields occurred at the 6, 8, and 10 mph planting speeds. In fact, there was only a 1.1 – 1.4 Bu/A. difference between all three of these planting speeds. With traditional planting speeds typically near 5 mph, this data would suggest that growers could plant twice as fast with SpeedTube technology without sacrificing planter performance.



Planting Date: 5/5 *Hybrid: Pioneer 0707AMXT* *Population: 34K* *Row Width: 30”* *Rotation: CAB* *Corn Price: $3.50*

High Speed Planting/Closing Wheel Study

Objective: To evaluate how high speed planting impacts the performance of closing wheels. Closing wheels are designed to close the seed trench, eliminate sidewall compaction/smearing, remove air pockets, all at the same time achieving good seed-to-soil contact. When planting at speeds of 8-10 mph, can growers still use "spike-type" closing wheels without causing seed placement issues from fingers grabbing seed or from excess soil movement? This study evaluates four distinct types of closing wheel systems at planting speeds of 4, 6, 8, 10, and 12 mph.

Dual Smooth Rubber Closing System:

Advantages: Pack and seal type system. Moisture saving.

Disadvantages: In wet soils, can't shatter side-wall smear

Hard to close trench in reduced till or wet soils

Dual Poly Twister™ Spike Closing System:

Advantages: Lifts and fractures sidewall compaction/smear

Center ring acts as depth maintainer

Disadvantages: Potential plugging

Single Rubber/Yetter Poly Twister Spike Closing System:

Combination of above two systems for variable soils

Dual Martin Dimple™ Spike Closing System:

Advantages: Lifts and fractures sidewall compaction/smear

Versatile heavy wheel, great for reduced tillage

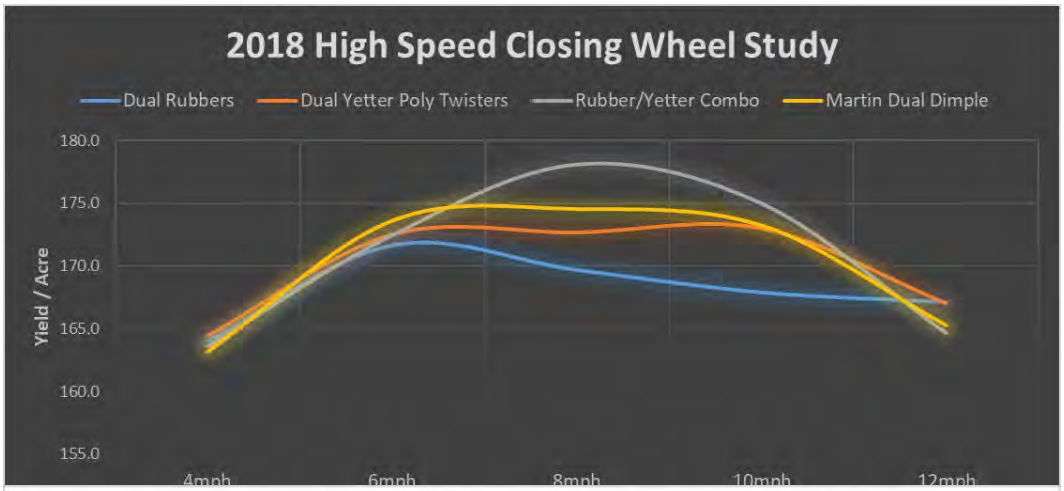
Depth Maintaining

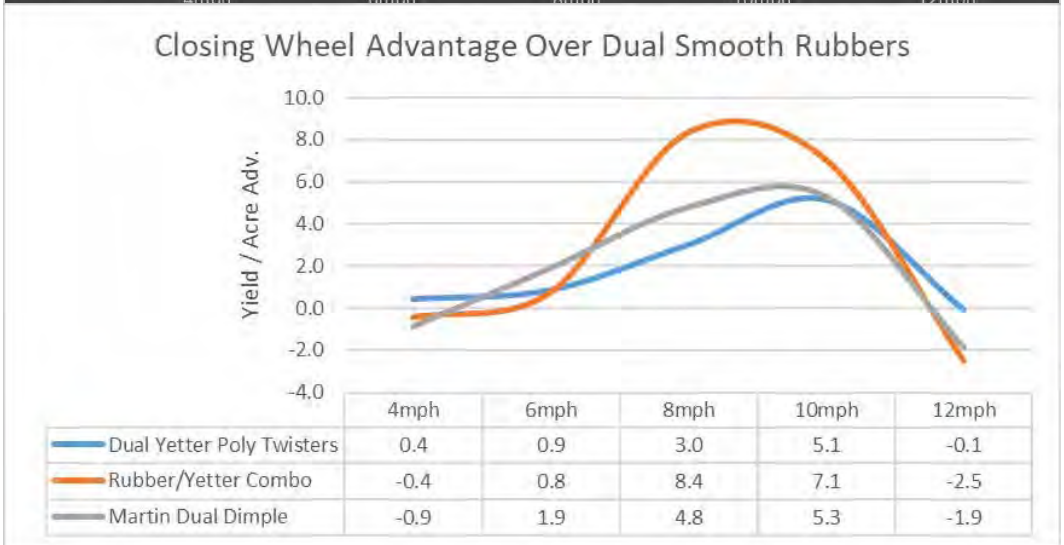
Disadvantages: Extra weight can be aggressive

2018 PTI Results

Results: As we think of closing wheel systems being too aggressive and potentially moving seed at high planting speeds, we used the dual smooth rubber closing system as our control in this study. Since the smooth rubber system has no spike action and should not have the ability to misplace seed, all spike type systems were compared at 4, 6, 8, 10, and 12 mph planting speeds.

At 6, 8, and 10 mph each spike type closing system actually out-yielded the dual smooth rubber closing system by 0.8 – 8.4 Bu/A. This yield increase would suggest that spike type systems did not misplace seed and cause issues from high speed planting. At the slow speed of 4 mph and the fastest speed at 12 mph, all systems appeared to perform very similarly. The data below would suggest that all the spike-type closing systems performed very well, but the Rubber/Spike combination did obtain the highest yield advantages. However, the clear focus in this study was not to compare the individual systems competitively, but to see if spike-type closing wheels have the potential to misplace seed in a high-speed planting system.





	4mph	6mph	8mph	10mph	12mph
Dual Yetter Poly Twisters	0.4	0.9	3.0	5.1	-0.1
Rubber/Yetter Combo	-0.4	0.8	8.4	7.1	-2.5
Martin Dual Dimple	-0.9	1.9	4.8	5.3	-1.9

Planting Date: 5/5 *Hybrid: Wyffels 7696VTPro* *Population: 36K* *Row Width: 30”* *Rotation: CAC* *Corn Price: $3.50*

Continuous Corn Closing Wheel Study

Objective: To evaluate the performance of closing wheels in four different tillage systems. Closing wheels are designed to close the seed trench, eliminate sidewall compaction/smearing, remove air pockets, all at the same time achieving good seed-to-soil contact. This study evaluates four distinct types of closing wheel systems in a conventional, strip, vertical, and no-till continuous corn rotation.

Dual Martin Dimple™ Spike Closing System:

Advantages: Pack and seal type system. Moisture saving.

Disadvantages: In wet soils, can't shatter side-wall smear

Hard to close trench in reduced till or wet soils

Dual Smooth Rubber Closing System:

Advantages: Lifts and fractures sidewall compaction/smear

Center ring acts as depth maintainer

Disadvantages: Potential plugging

Dual Poly Twister™ Spike Closing System:

Combination of above two systems for variable soils

Single Rubber/Yetter Poly Twister Spike Closing System:

Advantages: Lifts and fractures sidewall compaction/smear

Versatile heavy wheel, great for reduced tillage

Depth Maintaining

Disadvantages: Extra weight can be aggressive

2018 PTI Results

Conventional Tillage Results:

Conventional tillage consisted of a disc ripper in the fall, followed by a soil finisher in the spring before planting. Yields within this tillage system only ranged within 1.1 Bu/A. over all the four different closing systems (Table 1). In general, conventional tillage offers an easier environment for closing wheels to perform making selections of closing systems less critical.

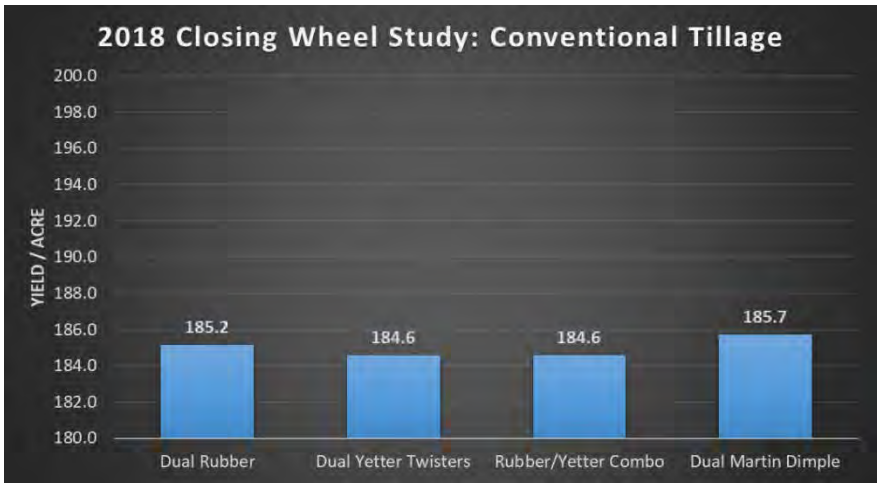


Table 1.

Strip-Till Results:

Strips were created after harvest with a shank/knife type system directly between the existing rows. Similar to conventional tillage, the difference between all four closing systems only varied by 3.0 Bu/A., with the dual rubber system offering the lowest yields of all closing systems.

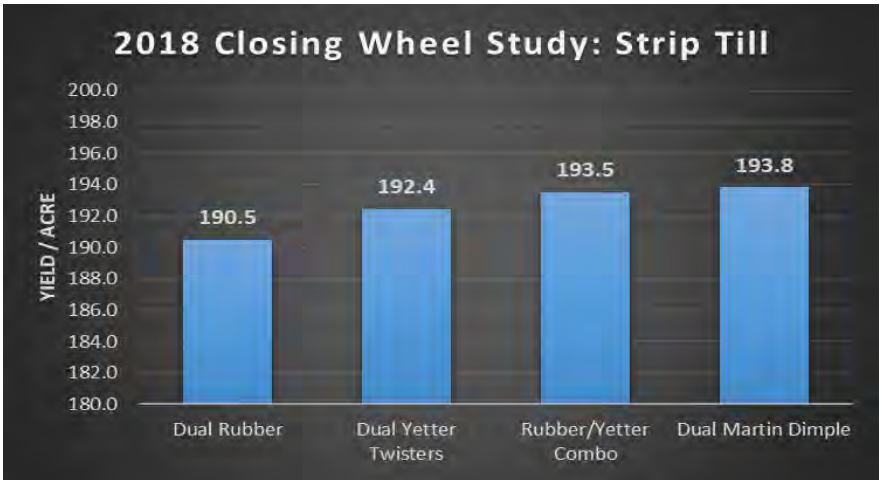


Table 2.

Vertical Tillage Results:

Vertical tillage in the fall after harvest was designed to lightly till, size residue, and anchor a portion of the residue into the upper few inches of soil. In this reduced tillage system, the performance of closing systems started to become more variable . Table 3. reveals that dual rubber closers suffered **-5.5 to -6.6 Bu/A.** losses compared to more aggressive "spike" type systems such as the dual Yetter Twisters and the Martin dual dimples.

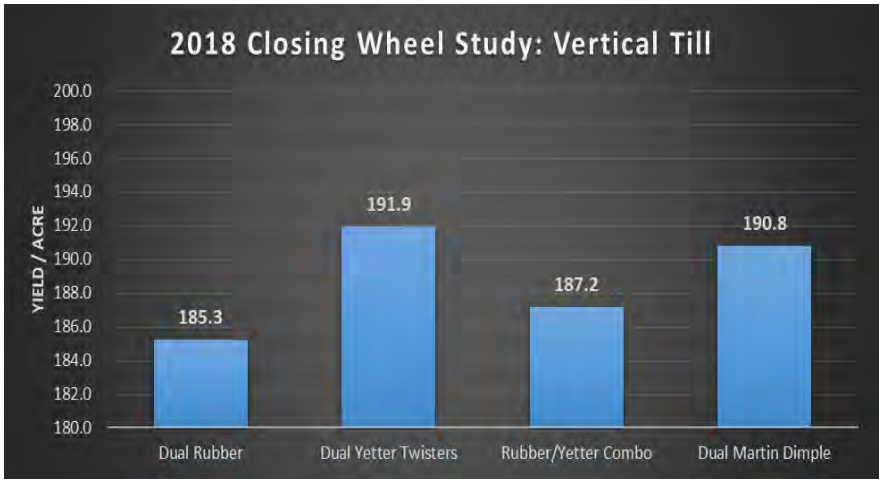


Table 3.

No- Till Results:

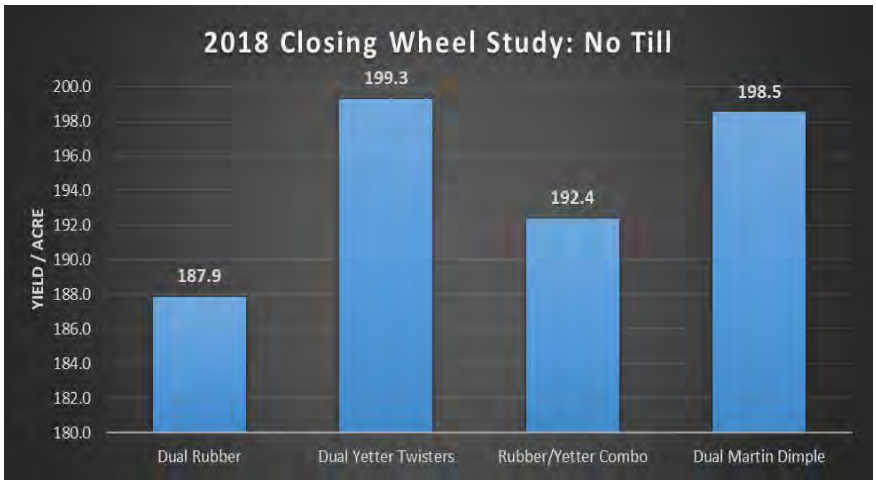


Table 4.

Planting directly into the center between last year's corn rows in a no-till environment showed the biggest differences in closing system performance. Dual rubber closers suffered large losses with **-10.6 to -11.4 Bu/A.** yields, compared to more aggressive "spike" type closers such as the dual Yetter Twisters or Martin dual dimples (Table 4).

Adding a single spike to a rubber wheel (Rubber/Yetter Combo) improved yields by +4.5 Bu/A., however still under-performed in closing by **-6.1 to -7.9 Bu/A.** in comparison to the more aggressive "spike" type closers.

The aggressive "spikes" offered the best performance in the no-till system, however with only 0.8 Bu/A. differences between the two closing systems.

Table 5. highlights the average yield and returns for each closing system over all four tillage systems compared to dual rubber closers. All other three closing systems offered +2.2 to +5.0 Bu/A. average yield gains with returns ranging from +$8.75 to +$17.50/A.

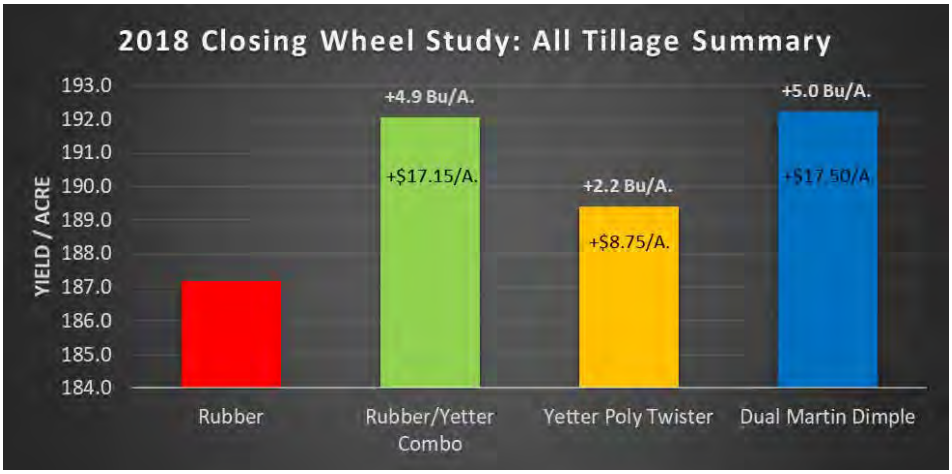


Table 5.

Planting Date: 5/5 *Hybrid: Wyffels 7696VTPro* *Population: 36K* *Row Width: 30"* *Rotation: CAC* *Corn Price: $3.50*

2018 PTI Results

Closing Wheel Pressure Study

Objective: To evaluate seed to soil contact aggressiveness with planter closing wheel pressure settings. In this study, we varied the spring pressure on dual Yetter Twister closing wheels from the least to most aggressive settings.

Results: This study proves that closing wheel performance can cause severe yield penalties if not set correctly. Table 1. illustrates that Notch 2 offered the optimum closing position and out-yielded Notch 0 (least aggressive) by 26.2 Bu/A. with additional revenue of over $91/A. (Table 2)

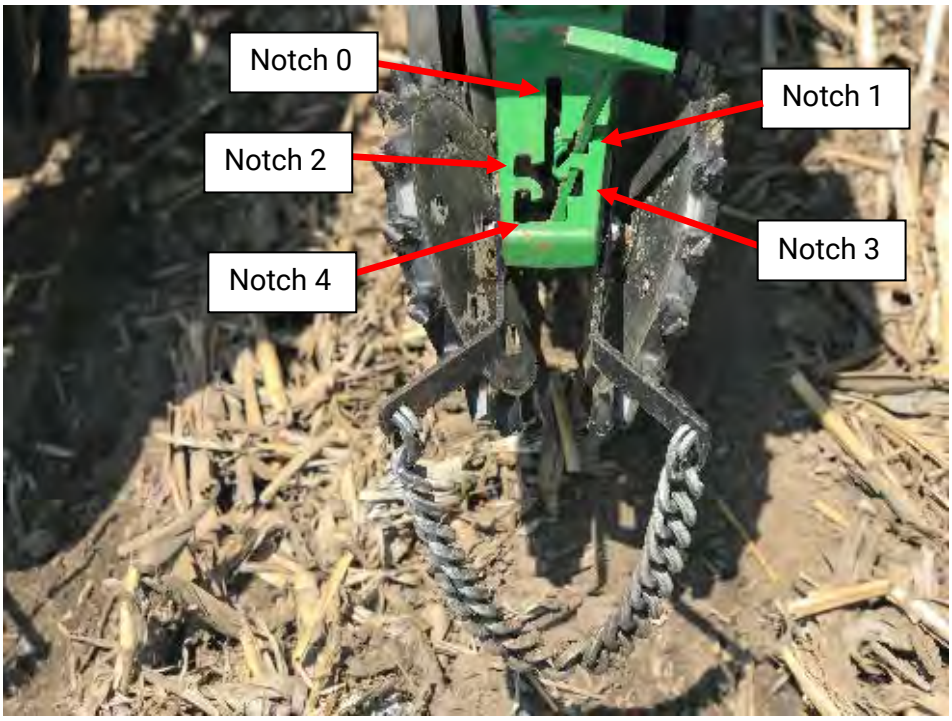


Table 1

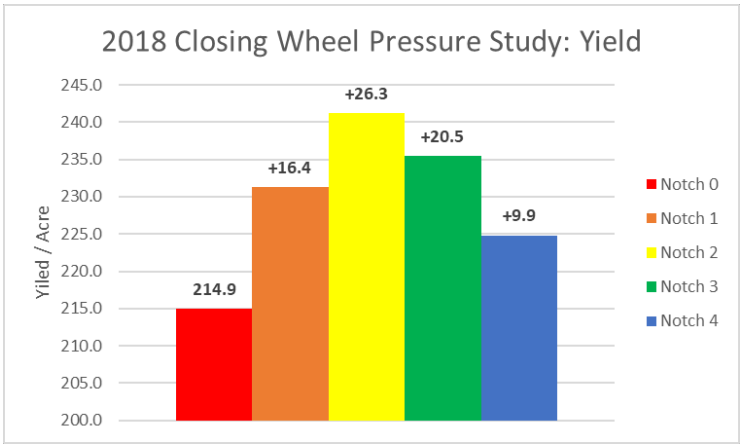
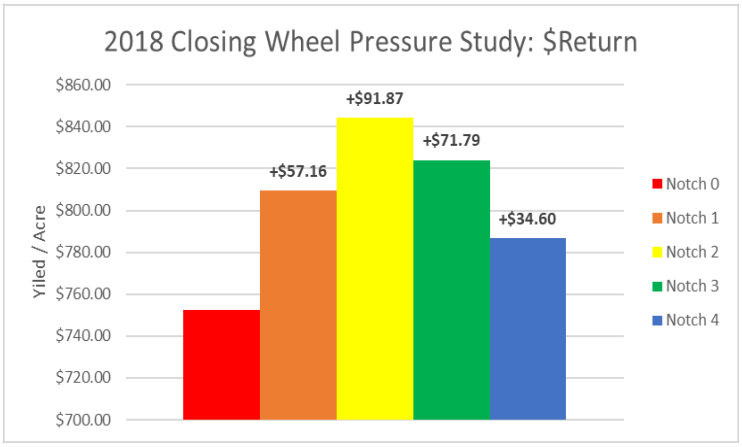


Table 2



Planting Date: 5/16 *Hybrid: Pioneer 1366AMXT* *Population: 36K* *Row Width: 30”* *Rotation: CAB* *Corn Price: $3.50*

2018 PTI Results

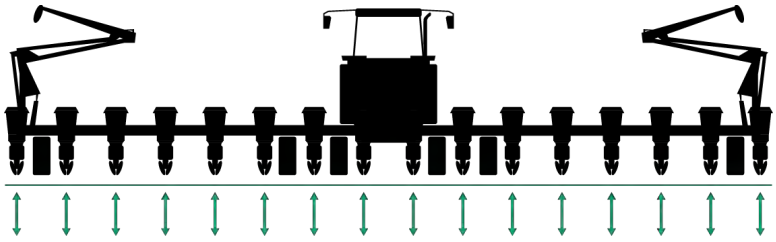
DownForce® Study:

Figure 1

Objective: Planter row unit downforce is a common agronomic issue that often goes unaddressed. This study evaluates yield impact of implementing proper downforce compared to too light or too heavy row unit settings. When downforce matches field conditions, depth of planting is consistent and correct. Too light of row unit downforce causes planting depth to shallow up , potentially placing seed in dry soil, creating poorly rooted plants that struggle for water and nutrients. Conversley, too much downforce can lead to furrow smearing and side-wall compaction also creating an environment that can cause plants to struggle to access water and nutrients.

DeltaForce replaces the springs or air bags on your planter with hydraulic cylinders (Figure 1). It automatically increases or reduces weight on each row individually. When one row encounters conditions different than another (wheel tracks, old road beds, clay knobs, headlands), each will adjust independently (Figure 2). Row by row, foot by foot, depth stays exactly where you want it without creating compaction. Row by row, foot by foot, even seed by seed, you produce an environment that fosters uniform germination, optimum growth and maximum yield.

Figure 2.



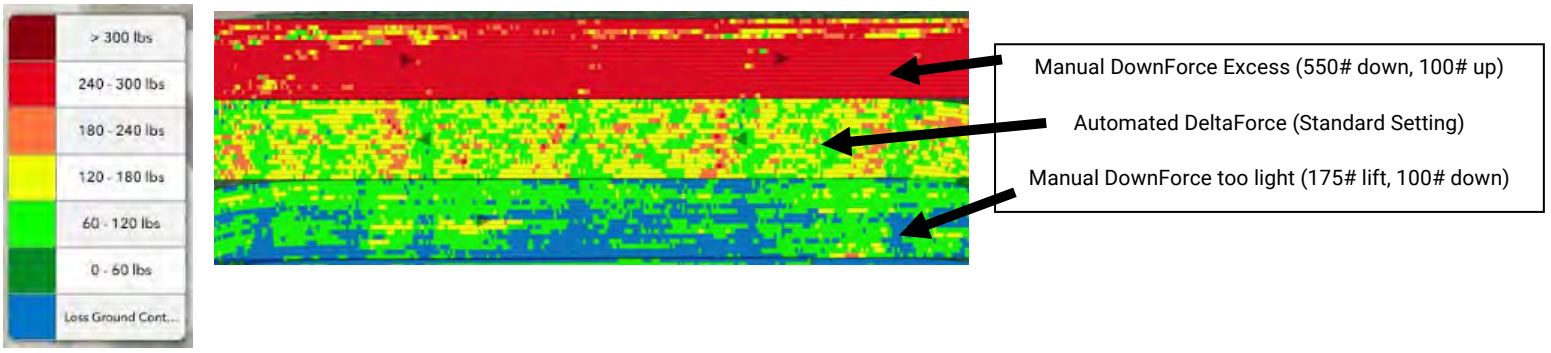
2018 PTI Results

DownForce Study Continued:

Results: Table 1. illustrates the yield response of DeltaForce automated control compared to excess and too light downforce settings. Too light of downforce resulted in the largest losses of the study with yield losses of -12.8 Bu/A., while excess downforce offered losses of -4.8 Bu/A.

Table 2. reveals the economics of the automated downforce system. DeltaForce automated downforce resulted in increased revenue of +$16.87/A. compared to heavy settings and +$44.95/A. to the light setting, ultimatley averaging overall gains of +$30.91/A.

Figure 3



Weight carried on gauge wheels.

Table 1.

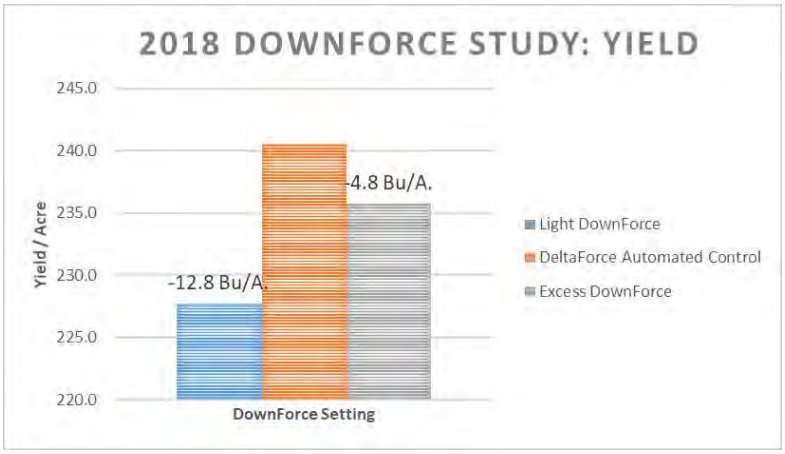
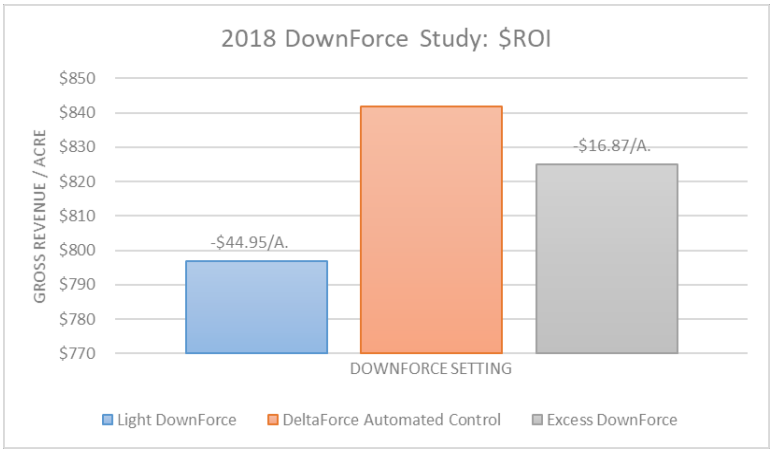


Table 2.



Planting Date: 5/16 Hybrid:Pioneer 1366AMXT Population: 36K Row Width: 30" Rotation:CAC Corn Price: $3.50

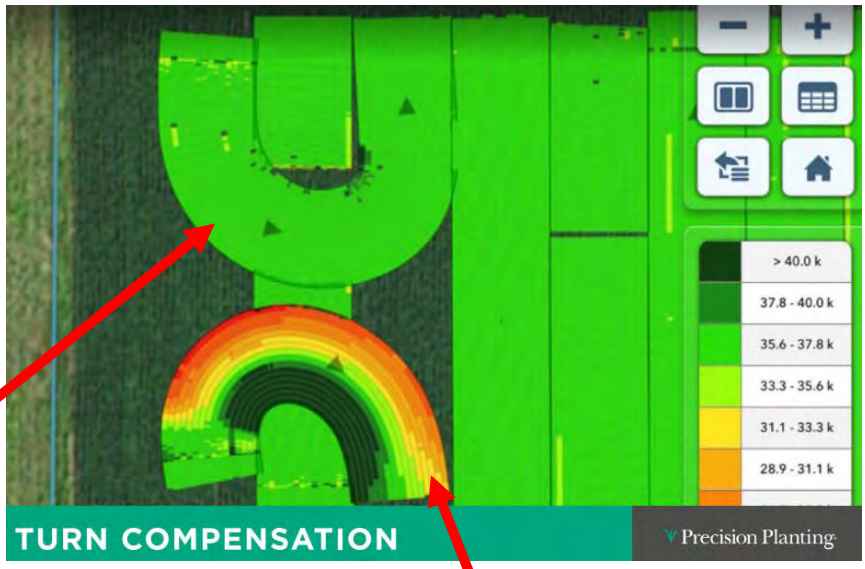
2018 PTI Results

Turn Compensation Study:

Figure 1. vDrive

Objective: To evaluate the impact of corn yield when planting around curves without turn compensation. Turn compensation is planter technology that uses electric motors to control seeding rate on an individual row basis. Standard drives do not allow individual rows from the outside row to the inside row of the planter, to adjust around curves. With vDrive® (Figure 1), each row adjusts independently, for accurate populations on curves.

Figure 2: 2018 Turn Compensation Trial



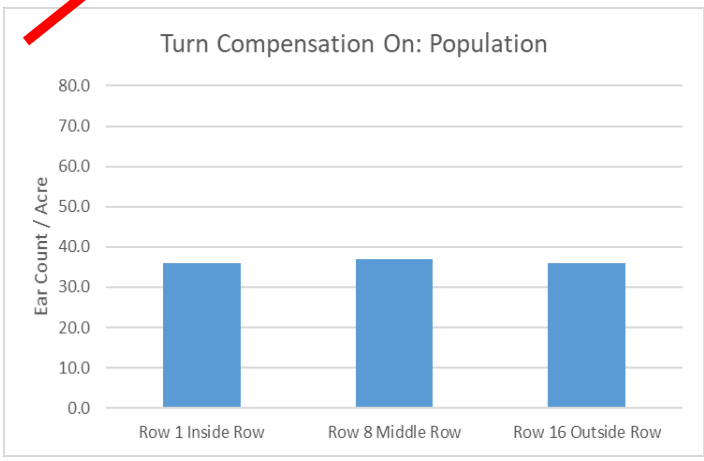


Table 1: Turn Compensation On: Seed Population

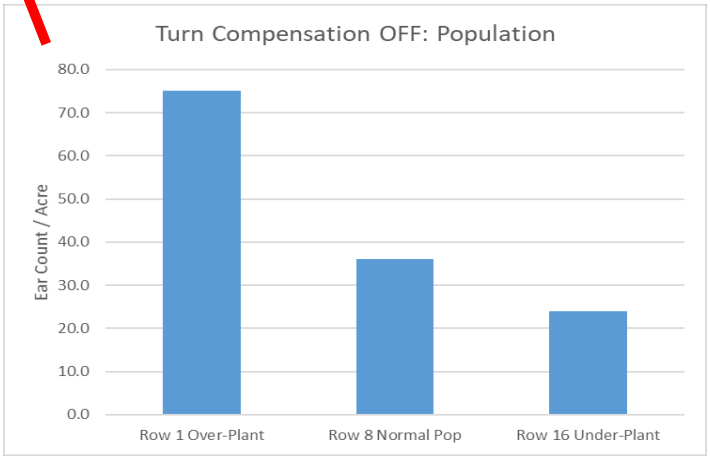


Table 2: Turn Compensation Off: Seed Population

Turn Compensation Study Continued:

Results: Figures 2. illustrates final seeding rates when using vDrive to control population on an individual row basis. The population of 36,000 seeds/A. set on the 20|20, delivered an average of 36,300 seeding rates across all rows of the planter while planting through the curve (Figure 1). The consistent seeding rates equated to only +1% seeding rate variance. However, when turn compensation was turned off, the inside row of the curve (Row 1) delivered seeding rates of 74,000 seeds/A., a **+208%** increase of desired planting rate. The outside row (Row 16) planted at rates of 24,000 seeds/A., a **-33%** reduction of desired planting rate.

Figures 5-6. tabulate the yield results and reveal that when turn compensation was implemented, row to row yields only varied by 3.5 Bu/A. Conversley, when turn compensation was turned off, the inside row suffered yield losses of **-63.8 Bu/A.** by overplanting, while the outside row resulted in yield losses of **-24.4 Bu/A.** by underplanting. These yield losses equated to economic losses of **-$40.55 to -$369.48/A.**

Table 3.

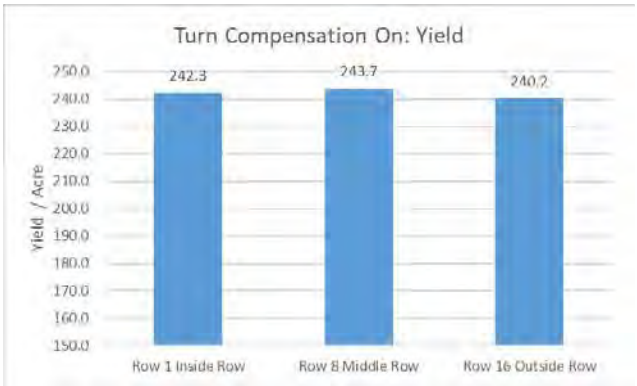


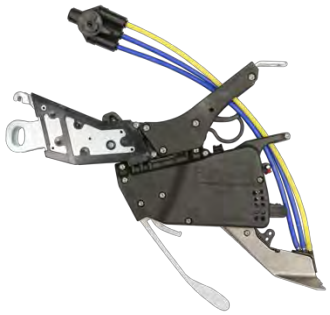
Table 4.

Table 5.

Table 6.

2018 PTI Results

Corn Starter Fertilizer Response by Planting Date Study:



Objective: To monitor the performance of starter fertilizer at various planting dates. When does starter fertilizer give the highest returns? Does starter fertilizer respond differently at earlier planted dates versus later? In this study we evaluate five planting dates consisting of April 13th, April 25th, May 6th, May 11th, and May 17th and how a Marco fertilizer 6-20-4-.25Z-2.7S applied via FurrowJet in a triband application at 10 gallons/acre responds throughout the planting season.

Table 1.

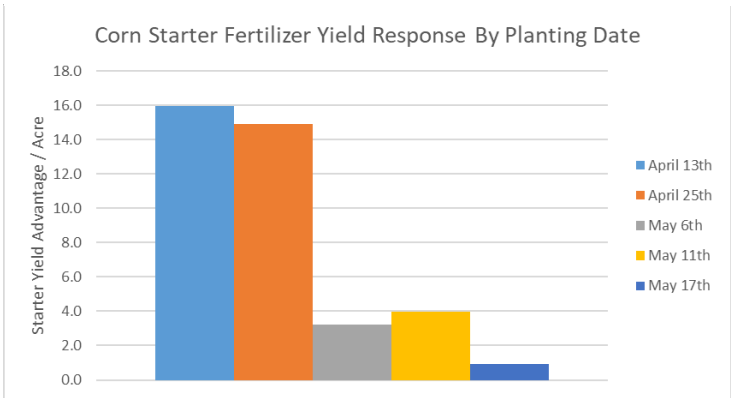
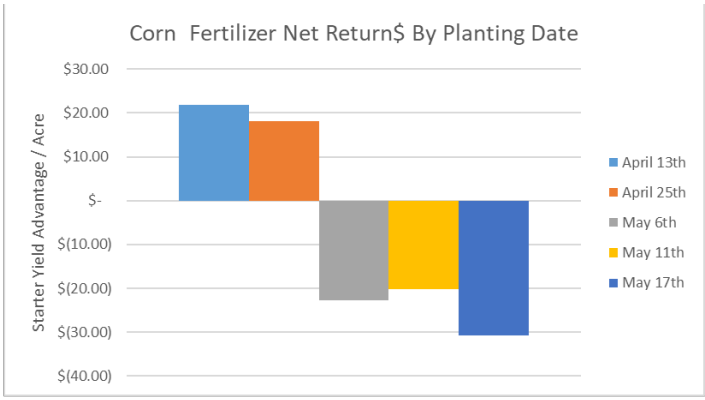


Table 2.



Results: Starter fertilizer response garnered the highest yield during the two early April corn planting dates. Both April planting dates saw starter advantages of 14.9 – 15.9 Bu/A. with a return on investment near $20/A. (Tables 1-2)

As corn planting dates were made later in the planting season in May, yield response fell to less than 5 Bu/A. and resulted in average economic losses just over $24/A.

Planting Date: Varied *Hybrid: Pioneer 1197AMXT* *Population: 34K* *Row Width: 20"* *Rotation: CAC* *Corn Price: $3.50*

2018 PTI Results

Starter Fertilizer Response by Genetic Study

Objective: To evaluate the individual response of various corn genetics to starter fertilizer. Table 1. displays the overall hybrids throughout our study in 2018. Table 2. illustrates the starter fertilizer products applied as part of the program, as well as total use rates and cost/A.

Table1. Starter Program

Conceal Dual Band:	20 Gal/A 32% UAN
	8 Gal/A Ammonium Thiosulfate
	2 Qt/A Boron + 2 Qt/Zn
FurrowJet Center :	4oz Stimulate, 5 Gal InVigoron
FurrowJet Wings:	10 Gal/A 6-20-4-.25Zn-2.7S

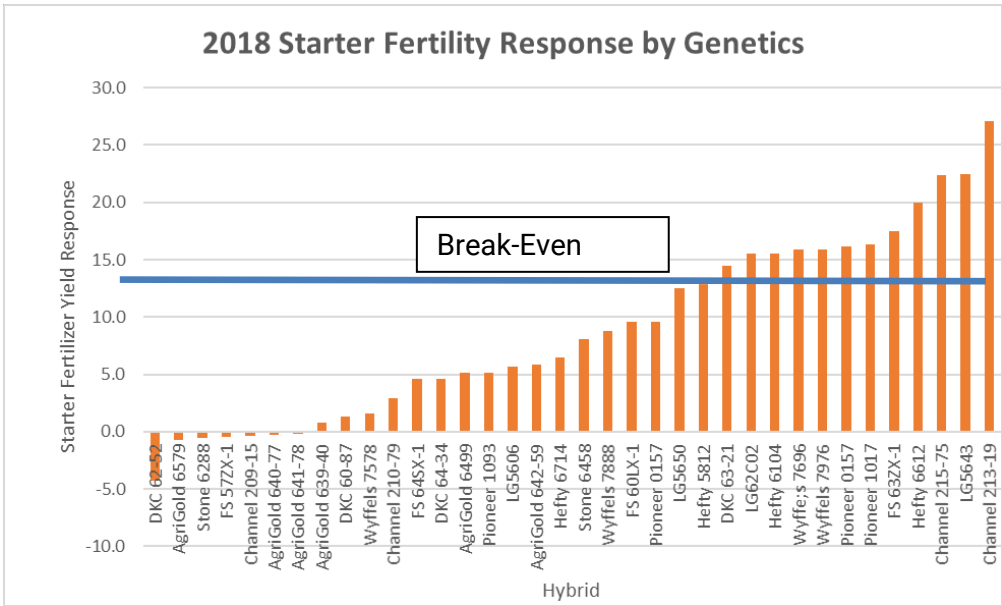
Total Cost of Program = $47/14/A. or 13.5 Bushel Break-Even Yield

Table 2. Hybrids Used

LG62C02SS
LG5650SS
Wyffels 7888SS
Pioneer 1366AMXT
Wyffels 7578SS
Wyffels 7696VT2P
Wyffels 7976VT2P
AgriGold 642-59STX
Channel 215-75VT2P
FS 63-ZX1SS
Channel 213-19VT2P
Hefty 6714SS
AgriGold 6499STX
Stone 6458SS
Hefty 6104SS
AgriGold 6579STX
DKC 63-21SS
FS 64SX-1SS
AgriGold 639-40VT2RIB
LG5643SS
LG5606SS
Stone 6288SS
DKC 62-52SS
AgriGold 641-78
Pioneer 0825AMXT
Channel 210-79DGVT2P
DKC 64-34SS
FS 60LX-1SS
Channel 209-15VT2P
AgriGold 640-77STX
Pioneer 1017AMXT
DKC 60-87SS
Pioneer 1093AMXT
FS 57ZX-1SS
Hefty 6612VT2P
Hefty 5812VT2P
Pioneer 0157AMXT

Results: Table 3. illustrates twenty nine (81%) of the 36 total corn hybrids resulted in agronomic yield gain from starter fertilizer, leaving seven (19%) hybrids proving no positive yield response. Twelve (33%) of the hybrids exhibited enough significant yield gain to achieve a positive return on investment.

Table 3.



Planting Date: 5/5 *Hybrid: Multiple* *Population: 34K* *Row Width: 30"* *Rotation: CAS* *Corn Price: $3.50*

2018 PTI Results

Starter Fertilizer Response by Organic Matter Study

Objective: To evaluate the correlation of starter fertilizer yield response by organic matter (OM) levels, sensed and recorded by SmartFirmer® (Figure 1).

Nachurs Rhyzo-Link® is a 100% ortho-phosphate 3-10-13-1S-.1Zn with PowerBlend™ biological technogy (Figure 3) that was applied at rates of 2 to 6 gallons/acre applied as an in-furrow treatment in spatial management zones that consist of both high and low organic matter levels (Figure 2).

Figure 1. SmartFirmer®

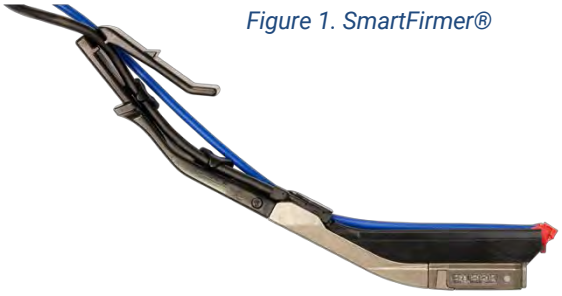
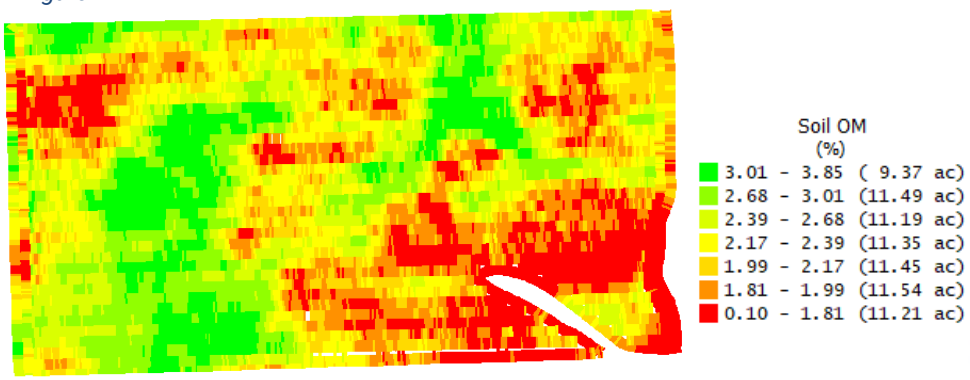


Figure 2.



Results: Table 1. Illustrates that the lower OM soils proved higher yield responses to a liquid starter fertilizer compared to higher OM soils. Higher OM soils resulted in minimal yield gains of 2-4 Bu/A., however lower OM soils responded with yield gains ranging from +2.9 to +10.5 Bu/A.

Low OM soils reached agronomic optimum rate at 3 Gal/A. and responded with yield gains of +7.0 Bu/A. compared to high OM soils respectively.

Figure 3.

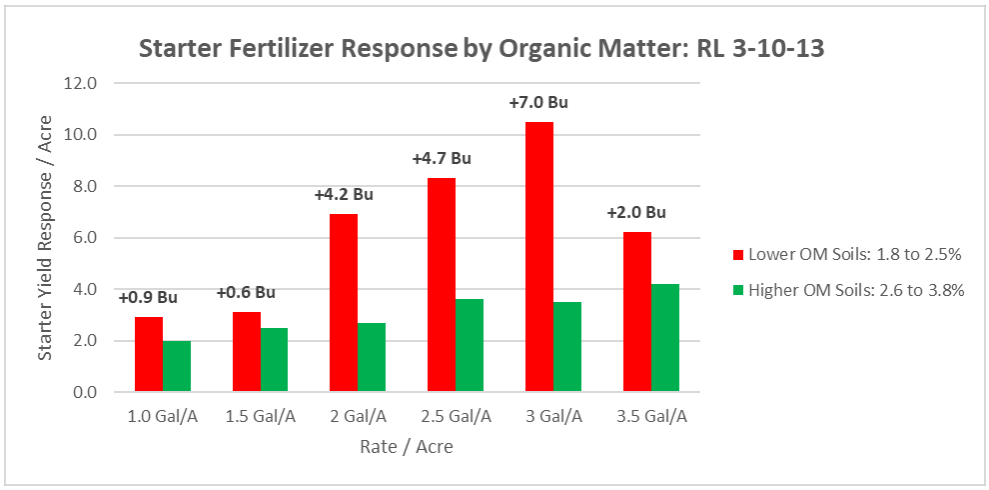
3-10-13-1S-.1Zn Liquid Fertilizer

Nutrients Supplied
(pounds per gallon)

Total Nitrogen (N)	0.32
Available Phosphate (P_2O_5)	1.07
Soluble Potash (K_2O)	1.39
Sulfur (S)	0.107
Zinc (Zn)	0.011

Derived from: urea, ammonium hydroxide, ammonium thiosulfate, phosphoric acid, potassium hydroxide, potassium acetate and zinc EDTA.

Table 1.



NACHURS® Rhyzo-Link® 3-10-13 CONTAINS NON-PLANT FOOD INGREDIENTS:
This Rhyzo-Link® product contains the following colony forming units (cfu)
4,010,000 cfu/milliliter
15,179,454,000 cfu/gallon

Bacillus subtilis	1x10⁶ cfu/ml
Bacillus methylotrophicus	1x10⁶ cfu/ml
Bacillus amyloliquefaciens	1x10⁶ cfu/ml
Bacillus megaterium	1x10⁶ cfu/ml
Bacillus licheniformis	1x10⁶ cfu/ml

cfu/ml = colony forming units/milliliter

Planting Date:April 28 *Hybrid:Wyffels 7696VT2Pro* *Population: 34K* *Row Width: 30"* *Rotation:CAS* *Soil Type: Elliot, Ashkum Silty Clay Loam*

2018 PTI Results

Starter Fertilizer Placement Study

Objective: To evaluate the yield and economic impact of a traditional dry fertilizer program compared to a Nachurs all liquid fertilizer program and its individualized treatment performance.

Table 1. Control: 100% Dry Fertilizer Program

Product	Description	Application	Rate	Timing
18-46-0	Diammonium Phosphate	Broadcast	185#	Fall
0-0-60	Muriate of Potash	Broadcast	205#	Fall

Table 2. Nachurs 100% Liquid Fertilizer Program

Product	Description	Application	Rate	Timing
InVigoron™	10-18-4	In-Furrow	7 Gal	Plant
K-Fuel™	0-0-24	In-Furrow	1 Gal	Plant
Calcium	3% EDTA	In-Furrow	1 Pt	Plant
10-34-0	75% Polyphosphate	2X2	5 Gal	Plant
Rhyzo-Link™	0-0-15	2X2	1 Gal	Plant
CropMax®	2-0-2-.1B-.15Cu-.3Fe-1.5Mn-.005Mo-4Zn	2X2	1 Qt	Plant
K-Fuse®	6-1-12-12S	Side-Dress	4 Gal	V4
Boron	10% EDTA Boron	Side-Dress	1 Pt	V4
CropMax®	2-0-2-1B-.15Cu-.3Fe-1.5Mn-.005Mo-4Zn	Side-Dress	1 Qt	V4
Finish Line®	8-4-6-.1B-.2Cu-1Mn-1Zn	Foliar	1Qt	V4
K-Fuel™	0-0-24	Foliar	1 Gal	V10
InVigoron™	10-18-4	Foliar	1 Gal	V10
K-Fuel™	0-0-24	Foliar	2 Gal	Tassel
Headline Amp®	Fungicide	Foliar	10oz	Tassel
Triple Option®	4-13-17-1S	Foliar	1 Gal	R2
Boron	10% EDTA Boron	Foliar	1 Pt	R2

2018 PTI Results

Results: The Nachur's liquid fertilizer program used in this study out-yielded the dry fertilizer program by +24.8 Bu/A. (Table 1), most likely due to the multiple placements, applications, high concentrated banding and the efficiency associated with it. Even with this large yield advantage, the liquid fertilizer program was only able to return an additional +$4.81/A. over the dry fertilizer program due to higher fertilizer cost (Table 2). All liquid treatments totaled an additional +$81.99/A over the dry fertilizer program.

Table 3. Illustrates the individual treatment performance of all liquid products. All products recorded positive yield gains, however the in-furrow and 2X2 treatments offered the highest response at +12.6 and +5.2 Bu/A. All remaining treatments generated yield responses ranging from +3.7 to +1.3 Bu/A.

Table 1.

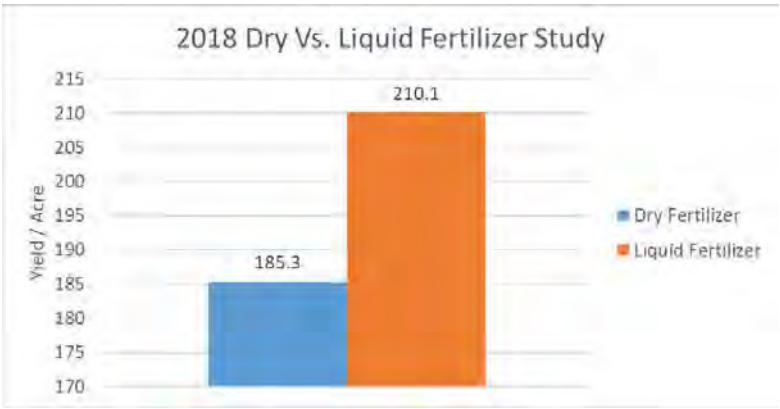
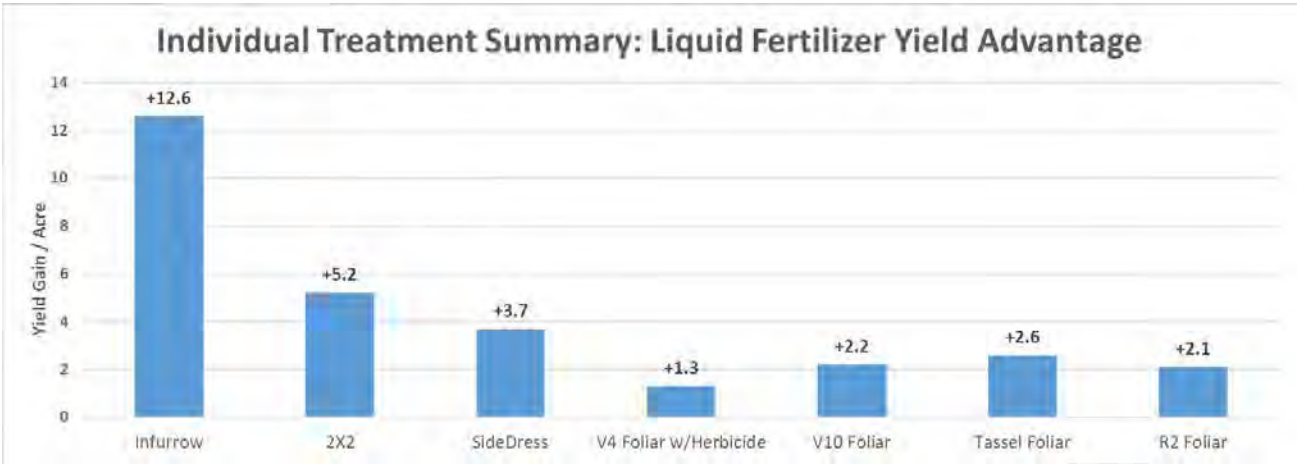


Table 2.

Table 3.

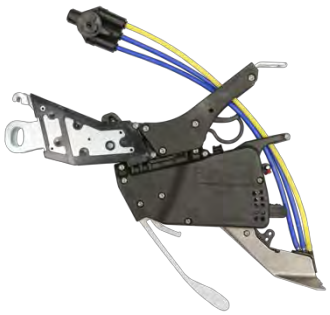


Planting Date: 5/10 Hybrid: DKC 63-21SS Population: 36K Row Width: 30" Rotation: CAB Corn Price: $3.50

Fertilizer Pricing: DAP: $430/T 0-0-60:$210/T imPulse:$3.50/Gal K-Fuel: $5.90/Gal Ca:$11.45/Gal Rhyzo-Link:$18.50 CropMax:$15.55/Gal

K-Fuse: $4.55/Gal Triple Option: $4.90 Finish Line: $20/Gal Boron:$21.52/Gal 10-34-0: $2.58/Gal V10,VT,R2 Application:$8/A

Marco QuickGrow™ LTE FurrowJet® Study



Objective: To evaluate the yield and net return of Marco Fertilizer's QuickGrow LTE 6-20-4-.25Zn-2.7S liquid starter fertilizer. Five different rates were used in a tri-band FurrowJet application at planting. QuickGrow LTE is a 70% polyphosphate and 30% orthophosphate formulation of nitrogen, phosphorus, potassium, sulfur, and EDTA Zn.

Results: 100% of FurrowJet treatments of QuickGrow LTE proved positive yield increases. Rates from 4-12 gal/A. averaged 9.1 Bu/A. 8 gallons provided the largest yield increase of +11.1 Bu/A.

In regard to return on investment, the economic optimum rate in this study proved to be 8 gal/A., netting an additional $11.53/A. over the untreated control. Rates at 4-8 gal/A. all proved profitable, however rates applied at the higher spectrum of 10-12 gal/A. did not achieve enough yield gains to pay for the cost of fertilizer. These rates proved negative returns of **-$1.52 and $6.49/A** respectively.

Table 1: Yield Response

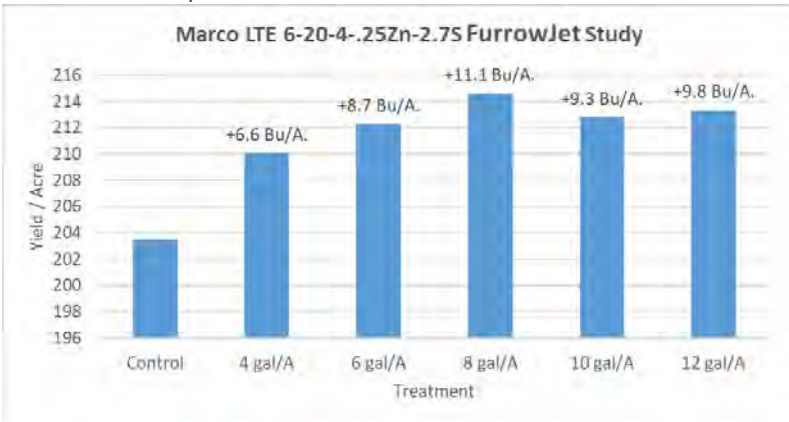
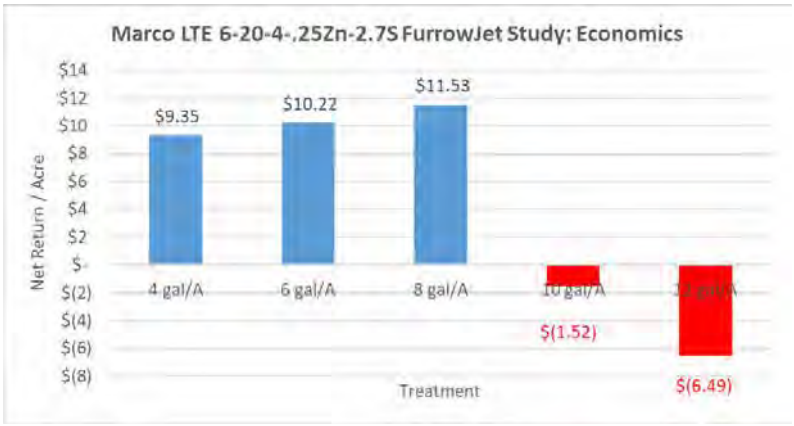


Table 2: Economic Return



Planting Date: 5/10 Hybrid: DKC 63-21SS Population: 36K Row Width: 30" Rotation: CAB Corn Price: $3.50

Fertilizer Pricing: Marco LTE 6-20-4-.25Zn-2.7S $3.40/Gal $30 DAP Reallocation

2018 PTI Results

AgroLiquid Starter Fertilizer FurrowJet® Study

Objective: To evaluate the yield and net return of a blend of AgroLiquid starter fertilizers (Table 1). The following products are used in this in-furrow study as a single at-plant application:

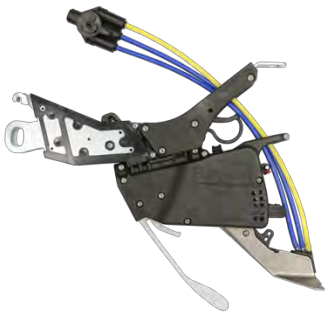
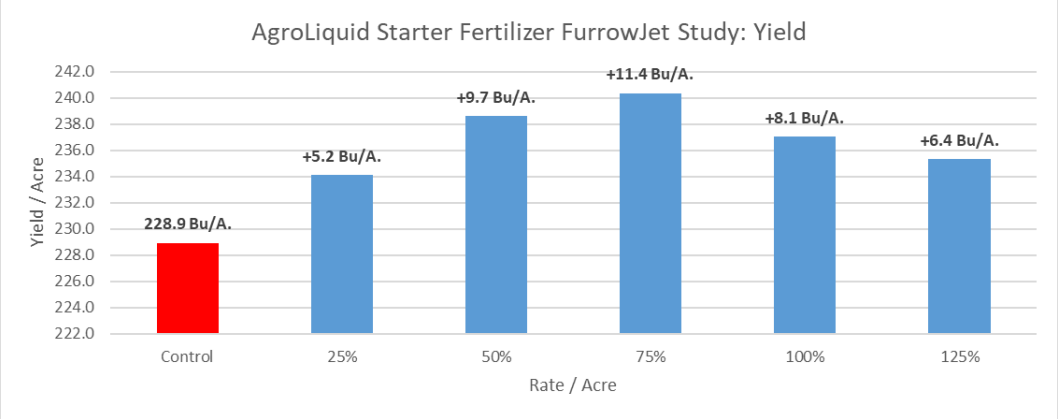


Table 1.

Product		Application
2 Gal Pro-Germinator®	9-24-3	FurrowJet
6 Gal Kalibrate™	2-1-6	FurrowJet
3 Qt Micro 500™	.02B-.25Cu-.37Fe-1.2Mn-1.8Zn	FurrowJet
1 Qt C-Tech®	Hydrophobic Fulvic Acid	FurrowJet
2 Gal accesS®	7-0-0-17S-.25Fe-.05Mn-.05Zn	Conceal
2pt Boron		Conceal

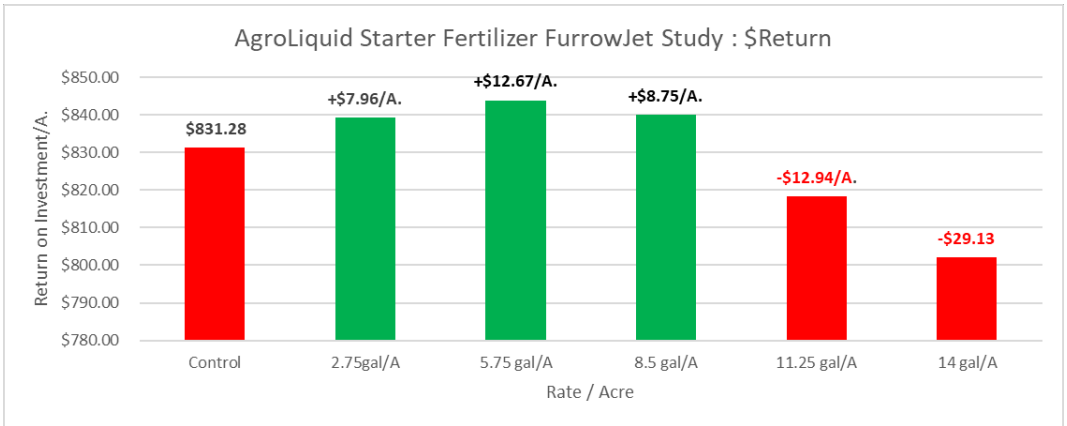
Results: The 75% rate achieved agronomic optimum yield at 240.3 Bu/A., 11.4 Bu/A. over the untreated control. In general, all applied rates offered positive yield response but yield rose to the 75% rate and then decreased as rates were applied up to 100% and 125% rates (Table2).

Table 2



Economic optimum rate was achieved at the 25% rate with a net return of +$0.63/A. Each rate from 50%-125% suffered economic losses ranging from **-$2.66 to -$66.46/A**. (Table 3).

Table 3



Planting Date: 5/10 Hybrid: DKC 63-21SS Population: 36K Row Width: 30" Rotation: CAB Corn Price: $3.50

Fertilizer Pricing: $30/A DAP Re-allocation Pro-Germinator $5.80/Gal, Kalibrate $5.70/Gal, Micro500 $8.25/Gal, C-Tech $24/Gal, AccesS $4.40/Gal

2018 PTI Results

Precision Planting

Nachurs impulse® Starter Fertilizer FurrowJet Study

Objective: To evaluate the yield and net return of Nachur's imPulse liquid starter fertilizer (Table 1) applied at two to six gallons per acre applied through a 3-way FurrowJet® band. 2 gal/A. of ammonium thiosulfate and 1 Qt/A. of Cropmax® (Table 2.) were tankmixed and applied at the base rate of 4 gal/A.

Results: All rates of 10-18-4 achieved positive yield and economic response, however 2 gal/A. proved economic optimum rate with a yield gain of 8.3 Bu/A. with a net return of +$18.47/A.

Table 1.

10-18-4 Liquid Fertilizer

Nutrients Supplied (pounds per gallon)	
Total Nitrogen (N)	1.06
Available Phosphate (P_2O_5)	1.91
Soluble Potash (K_2O)	0.42

Derived from: ammonium hydroxide, urea, phosphoric acid, potassium acetate, and potassium hydroxide.

Table 1.

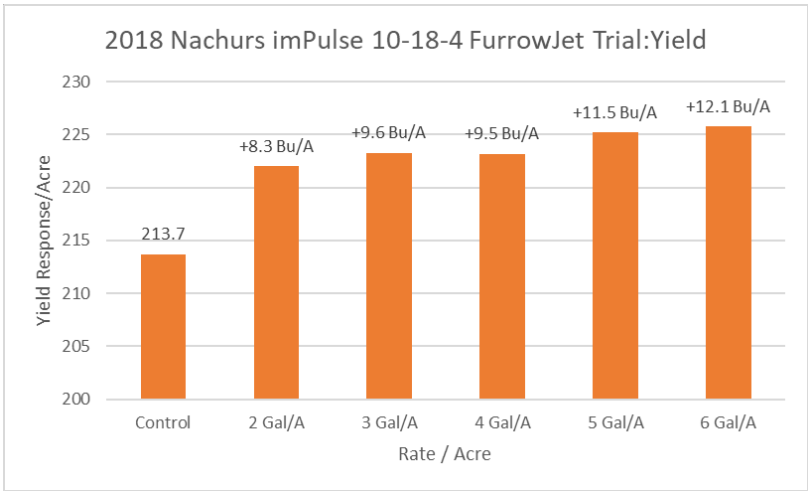


Table 2.

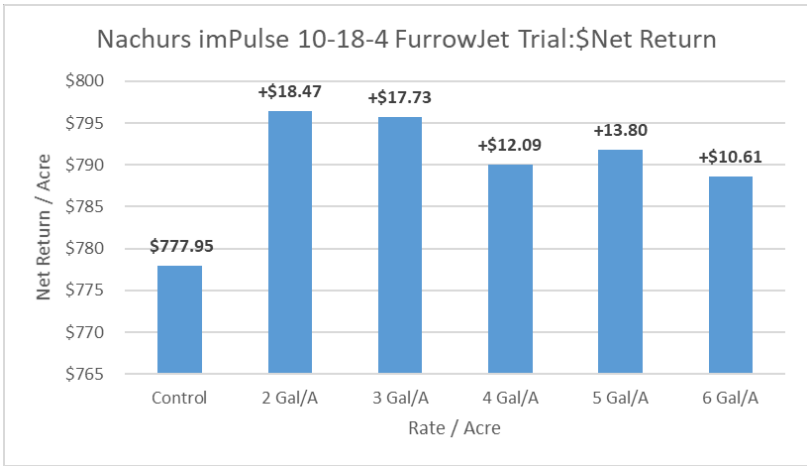
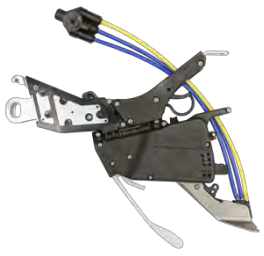


Table 2. CropMax

2-0-2-.1B-.15Cu-.3Fe-1.5Mn-.0005Mo-4Zn Liquid Fertilizer

Nutrients Supplied (pounds per gallon)	
Total Nitrogen (N)	0.204
Soluble Potash (K20)	0.204
Boron (B)	0.010
Copper (Cu) EDTA	0.015
Iron (Fe) EDTA	0.031
Manganese (Mn) EDTA	0.153
Molybdenum (Mo)	0.00005
Zinc (Zn) EDTA	0.409

Derived from: ammonium hydroxide, potassium hydroxide, boric acid, copper EDTA, iron EDTA, manganese EDTA, sodium molybdate, zinc EDTA



Planting Date: 5/10 *Hybrid: DKC 63-21SS* *Population: 36K* *Row Width: 30"* *Rotation: CAB* *Corn Price: $3.50*

Fertilizer Pricing: $30/A DAP Re-Allocation imPulse: $3.50/Gal *ATS: $1.76/Gal* *CropMax: $14.55/Gal*

2018 PTI Results

Conklin Starter Fertilizer Study

Objective: To evaluate the yield and net return of a blend of Conklin starter fertilizer products. The following products in Table 1. are used in this study at base mix rate of 6 Gal/A. as a single at-plant application applied via FurrowJet® and/or Conceal™. Rates are then applied at 50%, 100%, 125%, 150%, and 175% of base rate.

Table 1.

Product	Description	Rate/A.	Application
Feast® 2-15-19-3S	100% Orthophosphate Liquid Fertilizer	3-15 Gal	FurrowJet 3-Way
Feast® Micro Master™ Zinc	9% EDTA Zinc 100% Chelated	1pt	FurrowJet 3-Way
Syntose FA™	Sugars, Molasses, and Fulvic Acid	1pt	FurrowJet 3-Way
Intensify®	Gibberellic Acid + Indole-3-butyric Acid	.25oz	FurrowJet 3-Way
Feast® Micro Master™ Boron	10% Complex Derived from Boric Acid	1pt	Conceal Dual Band

Results: All starter treatments realized positive yield gains ranging from +5.9 to +13.5 Bu/A. Agronomic optimum yield occurred at the 12 Gal/A. rate (150%) with 13.5 Bu/A. gains.

In regard to economics, no individual treatment tallied positive net returns as starter losses ranged from -$5.03 to -$100.45/A.

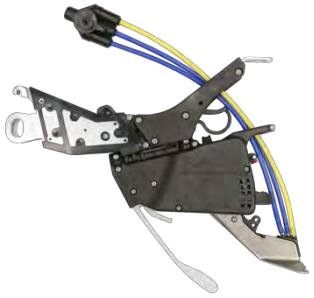


Table 2.

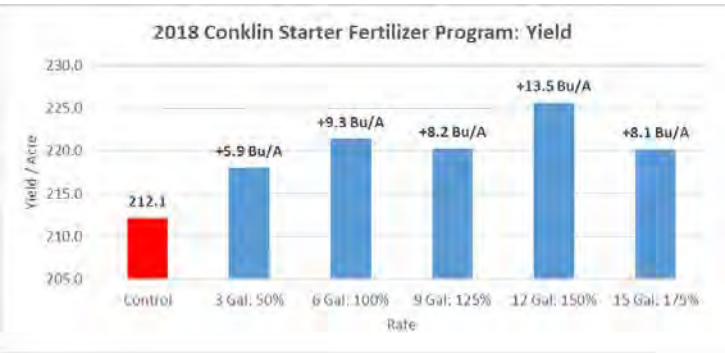


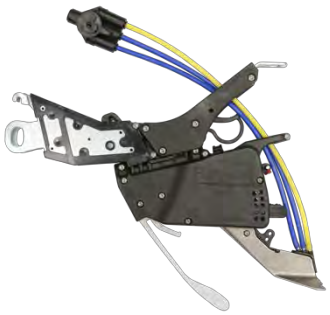
Table 3.

Planting Date: 5/10 Hybrid: DKC 63-21SS Population: 36K Row Width: 30" Rotation: CAB Corn Price: $3.50

Fertilizer Pricing: $30/A DAP Reallocation Feast 2-15-19-3S: $6.78/Gal Zinc:$3.14/Pt Boron:$2.69/Pt Intensify: $16/oz Syntose FA::$1/#

2018 PTI Results

10-34-0 FurrowJet® Study



Objective: To evaluate the yield and net return of 10-34-0 liquid starter fertilizer. Five different rates were used in a tri-band FurrowJet application at planting. 10-34-0 is a 70% polyphosphate formulation of nitrogen and phosphorus.

Results: The three lowest rates of 4-8 gal/A. of 10-34-0 provided yield gains of 0.4 – 3.9 Bu/A. However, the two higher rates at 10 - 12 gal/A. suffered yield losses of -1.5 – 2.2 Bu/A.

Considering return on investment, the economic optimum rate in this study proved to be only 4 gal/A., however only netting an additional $0.47/A. over the untreated control. All other rates at 6-12 gal/A. proved negative with losses ranging from -$1.86 - $38.70/A.

Table 1: Yield Response

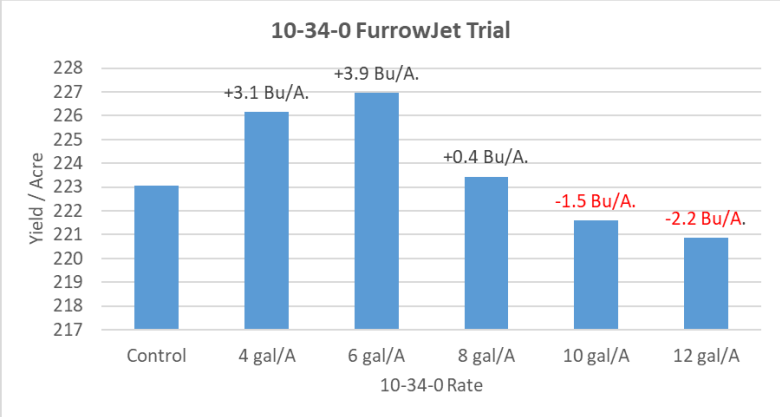
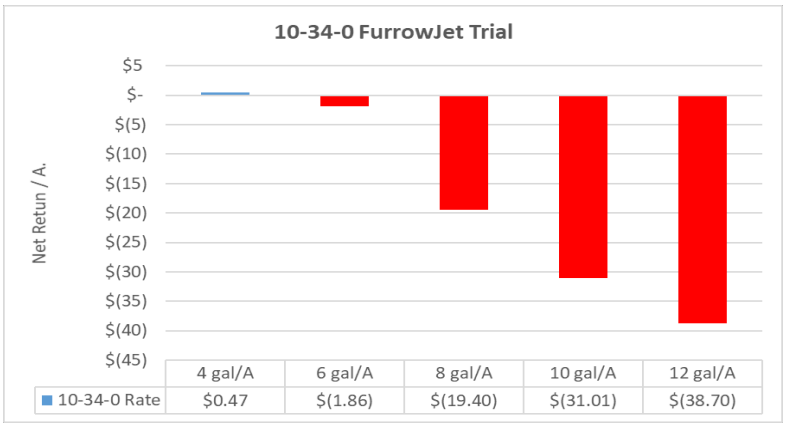


Table 2: Economic Return



Planting Date: 5/10 *Hybrid: DKC 63-21SS* *Population: 36K* *Row Width: 30"* *Rotation: CAB* *Corn Price: $3.50*

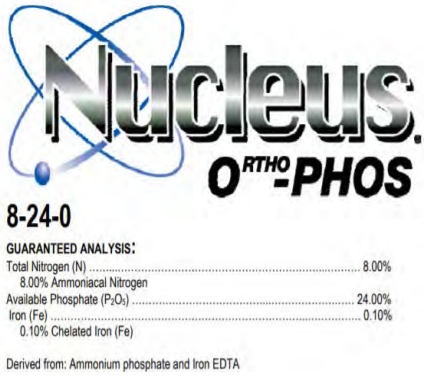
Fertilizer Pricing: 10-34-0 $2.58/Gal *$30 DAP Reallocation*

2018 PTI Results

Helena Nucleus® O-Phos FurrowJet® Study

Objective: To evaluate the yield and net return of Helena's Nucleus O-PHOS 100% orthophosphate 8-24-0 (Table 1) applied with and without 10-34-0 liquid polyphosphate fertilizer.

Figure 1.



Results: All Ortho-Phos treatments proved higher yields ranging from +5.9 to 11.2 Bu/A. (Table 1), with individual O-Phos/Zinc treatments averaging +10.2 Bu/A. yield responses and economic gains +$1.14 to +6.49/A. (Table 2).

The addition of 10-34-0 did not increase yields from stand-alone O-Phos treatments. In fact, the lack of yield response from 10-34-0 actually caused economic losses ranging from **-$1.66 to -$12/A.** (Table 2).

Table 1. Yield Response

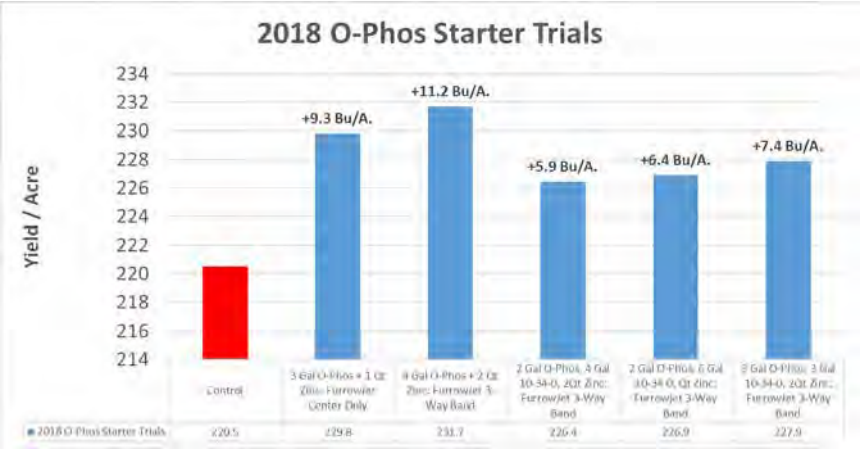


Figure 2.

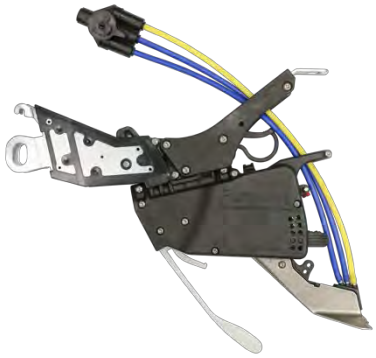


Table 2. Economic Response

Planting Date: 5/14 *Hybrid: DKC 63-21SS* *Population: 36K* *Row Width: 30"* *Rotation: CAB* *Corn Price: $3.50*

Fertilizer Pricing: 10-34-0 $2.18/Gal *$30 DAP Re-allocation* *O-Phos: $7/Gal* *Kickstand Zinc: $20/Gal*

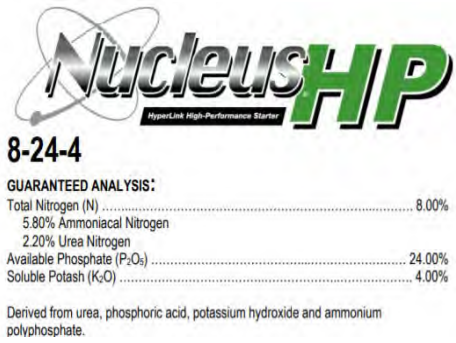
2018 PTI Results

Helena Nucleus® HP FurrowJet® Study

Objective: To evaluate the yield and net return of Helena's HP 50% orthophosphate/ 50% polyphosphate 8-24-0 applied with Zinc via FurrowJet 3-way band application.

Results: FurrowJet applications of Nucleus HP proved yield gains of +11 to +11.8 Bu/A. (Table 1), however the lower 3 Gal rate was the only treatment that sustained positive yield gains at +$9.95/A. The higher 6 Gal/A. rate exhibited the highest yield, but after cost of products proved economic losses of -$2.21/A. (Table 2).

Figure 1.



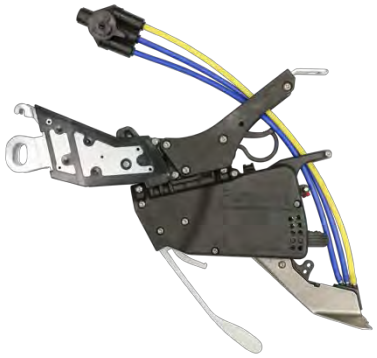


Table 1. Yield Response

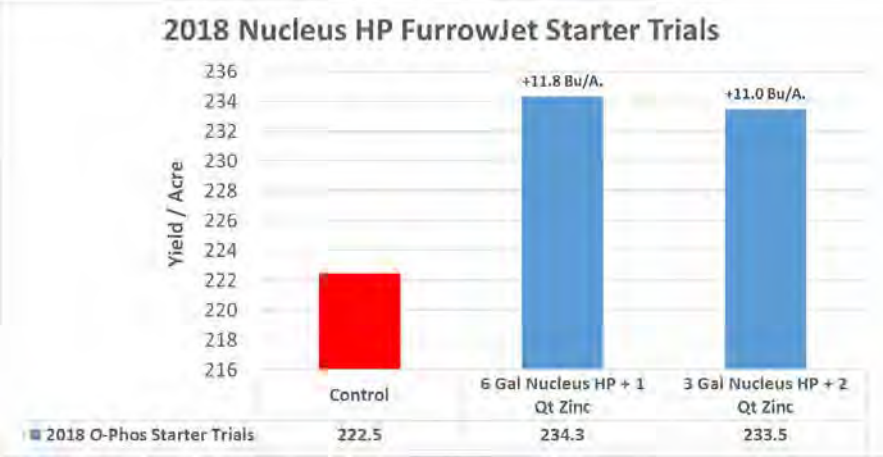
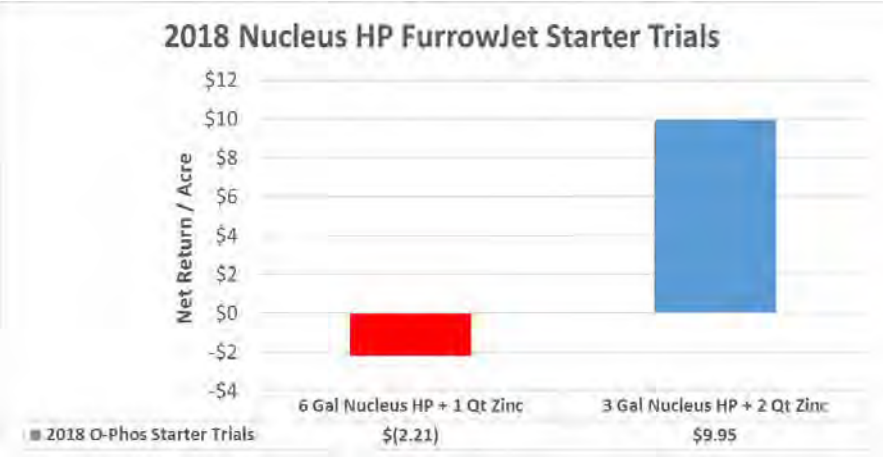


Table 2. Economic Response



Planting Date: 5/14 Hybrid: DKC 63-21SS Population: 36K Row Width: 30" Rotation: CAB Corn Price: $3.50

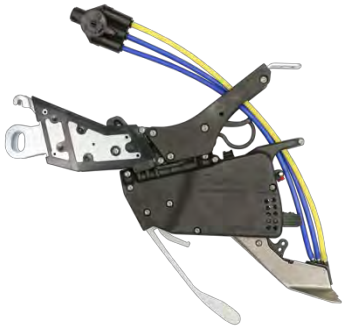
Fertilizer Pricing: $30 DAP Re-allocation Nucleus HP: $6.50/Gal Trafix Zinc: $18/Gal

2018 PTI Results

Concept Ag Total-Phos® FurrowJet Trial

Objective:

This FurrowJet application trial evaluates the yield and net return of Concept Ag's soil and nutrition program containing the following products:



TOTAL-PHOS	8-29-2
MICRO-PAK	S, Cobalt, Mn, Mo, Zn
BIOVATE®	Food Source to boost microbial populations
CONCEPT-S17	17% S, Humic Ac.
BUNCHABUGS®	Beneficial Soil Microbes

Results: All treatments of Concept Ag's soil and nutrition program proved positive yield increases. Rates from 2-6 gal/A. averaged +8.3 Bu/A. Four gallons provided the largest yield increase at +9.5 Bu/A.

With the consideration of return on investment, the economic optimum rate in this study proved to be 3 gal/A., netting an additional $11.85/A. over the untreated control. Rates at 2 and 4 gal/A. also proved profitable at +$10.96 and +$8.11/A. respectively. The higher two rates at 5-6 gal/A. resulted in economic losses of **-$0.40 - $9.49/A.**

Table 1: Yield Response

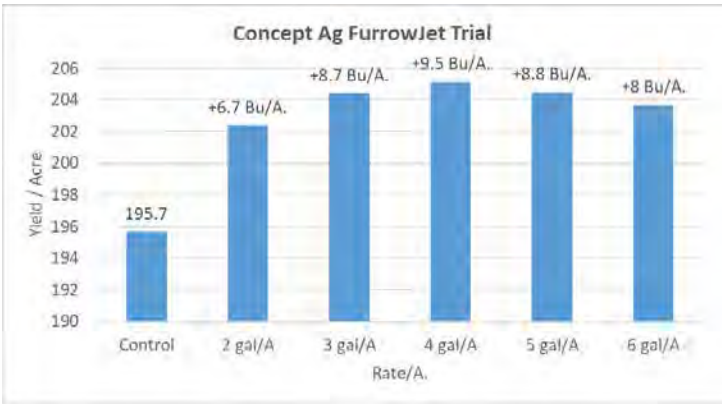


Table 2: Economic Return

Planting Date: 5/10 Hybrid: DKC 63-21SS Population: 36K Row Width: 30" Rotation: CAB Corn Price: $3.50

Fertilizer Pricing: $6.25/Gallon Avg. for Total Products $30 DAP Re-allocation

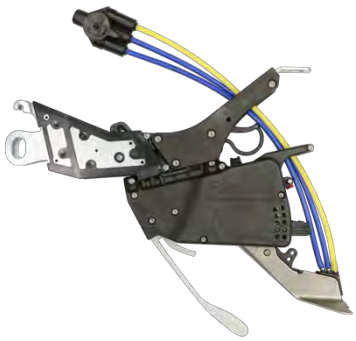
2018 PTI Results

Levesol™ Zinc Study

Objective: This FurrowJet® application trial evaluates the yield, net return of Levesol Zn. Levesol Zn is a 4-0-0 4.5% Zn chelating agent made from liquid urea nitrogen, and an ortho-ortho EDDHA chelate (Table 1). The chelating agent makes micronutrients, both in the, soil or a tank mix, soluble for uptake. After uptake, the chelating agent increases translocation within the plant and by keeping micronutrients in a soluble form, Levesol prevents them from binding with phosphorous (P). This leaves more phosphorus (P) free for uptake and increases overall nutrient efficiency.

Figure 1

Grade 4-0-0
GUARANTEED ANALYSIS
Total Nitrogen (N) 4.0%
4.0% Ammoniacal Nitrogen (N)
Zinc (Zn) 4.5%
4.5% Chelated Zinc (Zn)
Derived from: Aqua Ammonia, Zinc EDDHA and Zinc EDTA.



Results: Table 1. illustrates Levesol Zn treatments provided best gains when applied at the higher rates of the Marco LTE 6-20-4. Rates of ten and twelve gallons/A. provided yield gains of 5.9 and 6.3 Bu/A. These higher rates provided a return on investment of +$5.70 and +$7.07 respectively. All other rates applied at lower rates of four, six, and eight gal/A. resulted in net losses of **-$10.38 to -$17.45/A**. (Table 2).

All Levesol Zn treatments were applied at 2 Qts/A. and tank-mixed with 4-12 Gal/A. of Marco LTE 6-20-4-2.7S.

Table 1

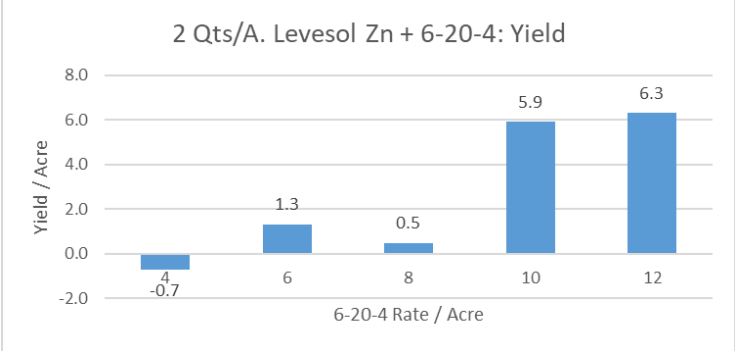
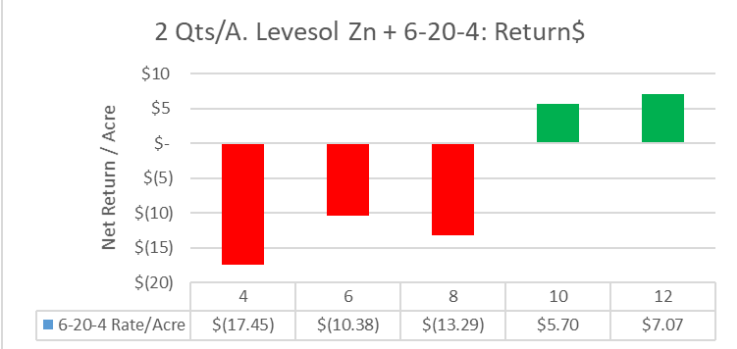


Table 2



Planting Date: 5/10 *Hybrid: DKC 63-21SS* *Population: 36K* *Row Width: 30"* *Rotation: CAB* *Corn Price: $3.50*

Levesol: $7.50/Qt *Marco 6-20-4: $2.92/Gal*

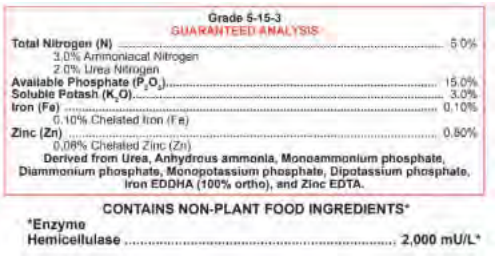
2018 PTI Results

Paralign™ In-Furrow Study

Objective: This FurrowJet® application trial evaluates the yield and net return of Paralign, a 5-15-3-.8Zn-.1Fe% starter fertilizer with Levesol, a chelating agent made from liquid urea nitrogen and an ortho-ortho EDDHA chelate (Table 1). This chelating agent makes micronutrients, both in the soil or a tank mix making it soluble for uptake.

Paralign also contains a biological enzyme that aids in overall plant health and stress management.

Figure 1



Results: Table 1. illustrates average yield gains of +7.2 Bu/A. from use rates of 3 Gal/A. of Paralign. However, Table 2 reveals net returns averaging a loss of **-$2.92/A.** using $3.50 corn and $9.33/Gal. of Paralign.

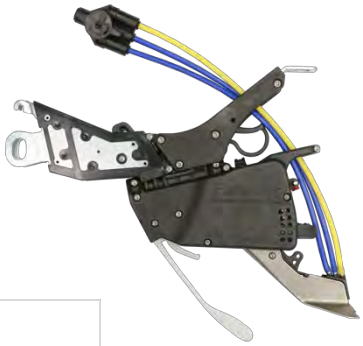


Table 1

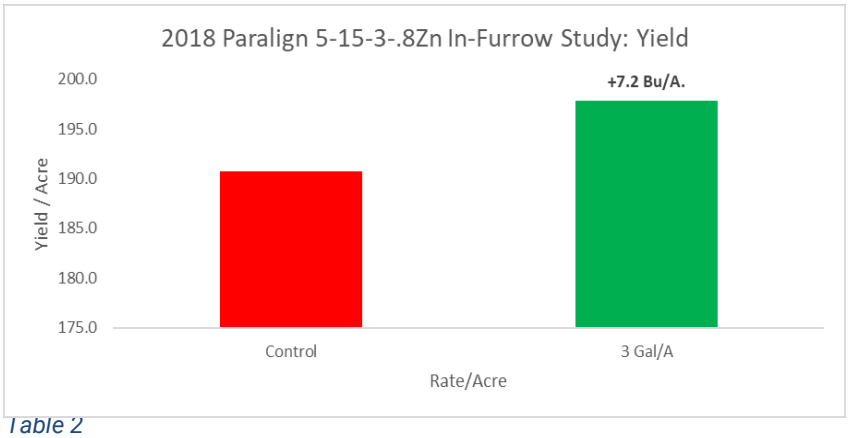
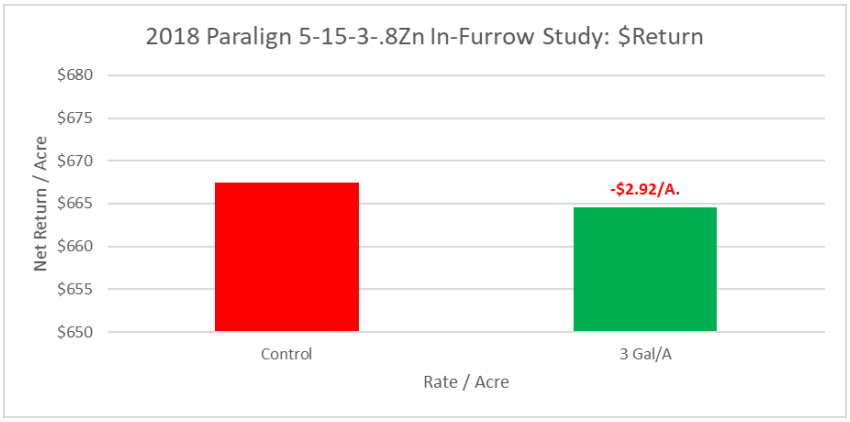


Table 2



Planting Date: 5/6 *Hybrid: DKC 63-21SS* *Population: 36K* *Row Width: 30”* *Rotation: CAB* *Corn Price: $3.50*

Paralign: $9.33/Gal

2018 PTI Results

Manticor™ LFR® Study

Objective: This FurrowJet® application trial evaluates the yield and net return of Manticor LFR. This fungicide/insecticide is an in-furrow product for protection against early season corn diseases and below-ground insect pests, like corn root worm, in a liquid-fertilizer-ready (LFR) formulation.

Manticor LFR combines Headline® a strobilurin fungicide (0.67#/gal Pyraclostrobin) and Capture® LFR®, a pyrethroid insecticide (1.33#/gal Bifenthrin) (Figure 1). When applied in-furrow on corn, Manticor LFR in-furrow fungicide and insecticide provides control of seedling fungal diseases, such as Rhizoctonia solani, and soil insect pests, such as corn rootworm larvae, wireworm, grubs, seedcorn maggot, cutworm and others that can damage corn seeds and seedlings.

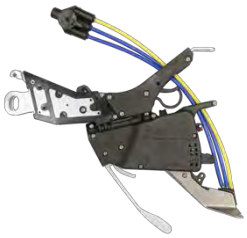


Figure 1

Active Ingredients:	
Bifenthrin*	14.4%
Pyraclostrobin: (carbamic acid, [2-[[[1-(4-chlorophenyl)-1*H*-pyrazol-3-yl]oxy]methyl]phenyl]methoxy-, methyl ester)	7.2%
Other Ingredients:	78.4%
Total:	100.0%

Results:

Manticor LFR FurrowJet treatments resulted in positive yield gains of +5.6 Bu/A. with a net return on investment of +$3.39/A. (Tables 1-2).

Table 1.

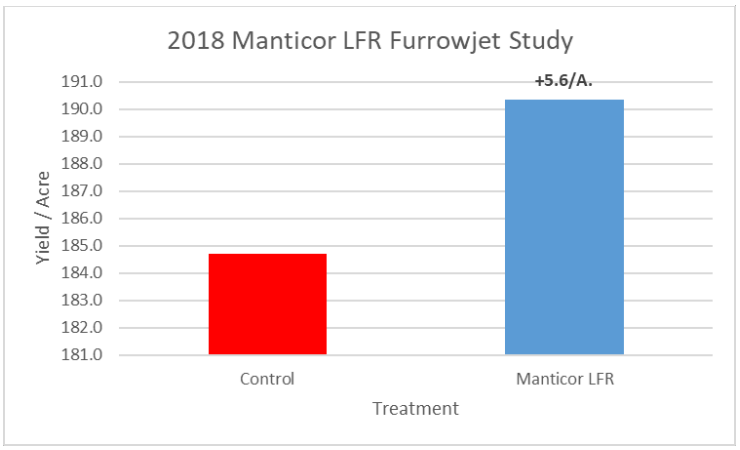
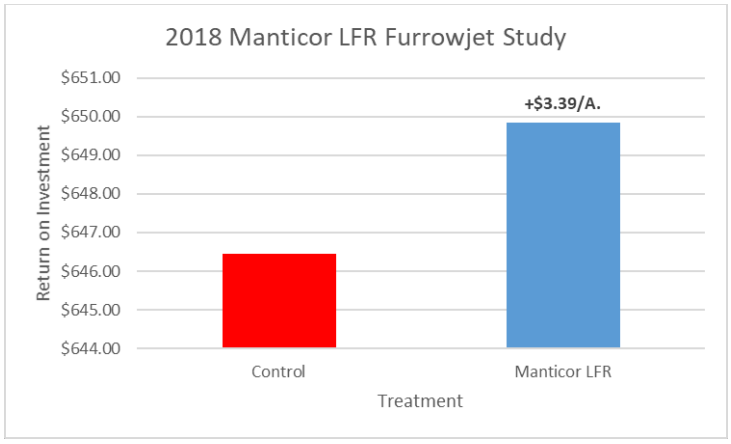


Table 2.



Planting Date: 5/10 *Hybrid: DKC 63-21SS* *Population: 36K* *Row Width: 30"* *Rotation: CAB* *Corn Price: $3.50*

Manticor LFR: $220/Gal

2018 PTI Results

Xanthion® In-Furrow Study:

Objective: This FurrowJet® application trial evaluates the yield and net return of Xanthion in-furrow fungicide. Xanthion protects against damaging corn seedling and root diseases, including Rhizoctonia, Fusarium, and Pythium.

Figure 1.

Active Ingredient*: (Component A)
Bacillus amyloliquefaciens, strain MBI 600** 6.12%
Other Ingredients: 93.88%
Total: 100.00%
*Contains not less than 2.2 x 10^{10} viable spores per mL
**Formerly named *Bacillus subtilis* strain MBI 600

Active Ingredient*: (Component B)
pyraclostrobin: (carbamic acid, [2-[[[1-(4-chlorophenyl)-1*H*-pyrazol-3-yl]oxy]methyl]phenyl]methoxy-, methyl ester). 23.60%
Other Ingredients:** 76.40%
Total: 100.00%
*Equivalent to 2.09 pounds of pyraclostrobin per gallon
**Contains petroleum distillates

Zanthion is a combination of a chemical fungicide and a biofungicide, containing the same active ingredients as in Headline® fungicide, and an EPA registered biofungicide, providing two modes of action to help protect and improve seedling health (Figure 1).

Results: Xanthion FurrowJet treatments offered yield advantages of +3.0 Bu/A., however failed to prove a positive return on investment at **-$0.94/A.** (Tables 1-2.)

Table 1.

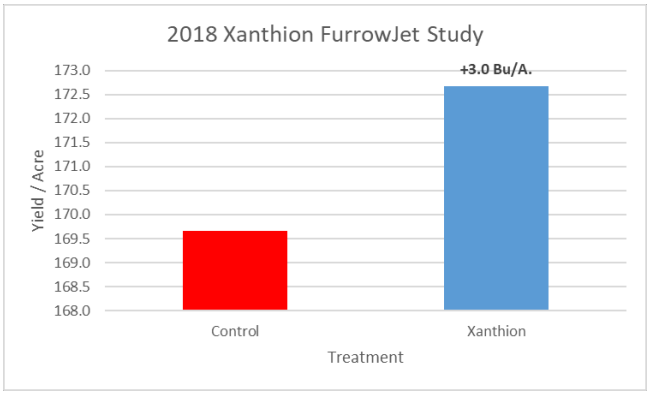
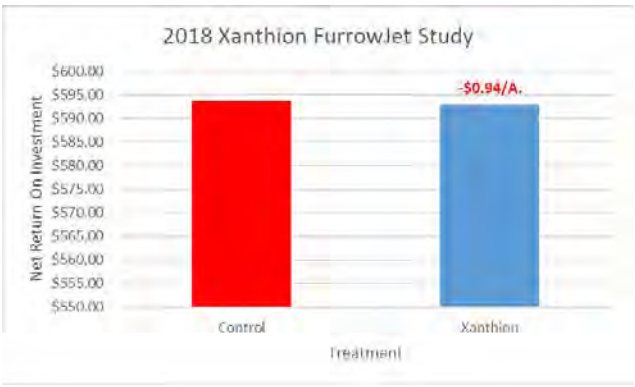


Table 2.



Planting Date: 5/6 *Hybrid: DKC 64-34SS* *Population: 36K* *Row Width: 30"* *Rotation: CAB* *Corn Price: $3.50*

Xanthion: $11.44/A

2018 PTI Results

TopGuard Terra® In-Furrow Study:

Objective: This FurrowJet® application trial evaluates the yield and net return of TopGuard Terra, an in-furrow fungicide that protects against damaging corn seedling and root diseases, including Rhizoctonia, Fusarium, and Pythium.

Figure 1.

EPA Reg. No. 279-3594 EPA Est. No. 70815-GA-001

ACTIVE INGREDIENT:	By Wt.
*Flutriafol	42.0%
OTHER INGREDIENTS:	58.0%
TOTAL:	100.0%

*Contains 4.16 pounds per gallon of the active ingredient flutriafol.
Suspension concentrate.

TopGaurd Terra contains the active ingredient Flutriafol, a highly-systemic Group 3 single site mode of action fungicide (Figure 1).

Results: TopGaurd Terra FurrowJet treatments offered yield advantages of +3.2 Bu/A., however failed to prove a positive return on investment at **-$5.21/A**. (Tables 1-2).

Table 1.

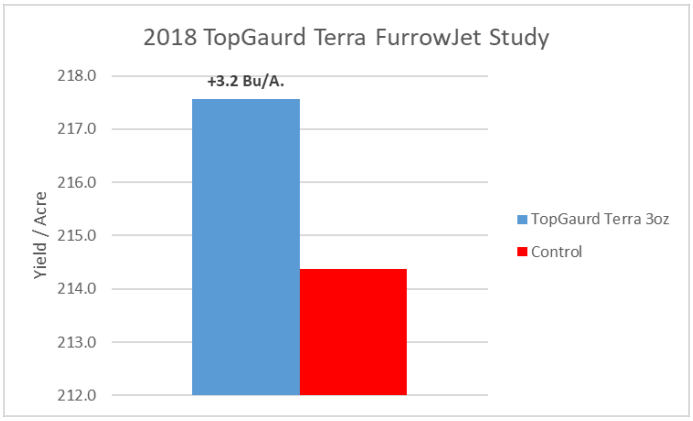
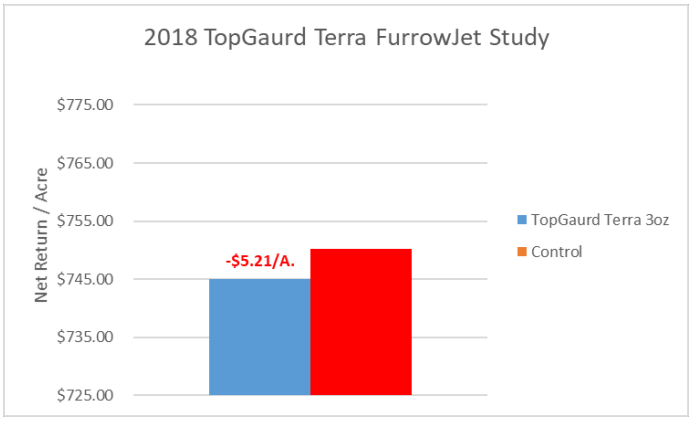


Table 2.



Planting Date: 5/6 *Hybrid: DKC 64-34SS* *Population: 36K* *Row Width: 30"* *Rotation: CAB* *Corn Price: $3.50*

Topgaurd Terra: $700/Gal

2018 PTI Results

Ethos™ XB In-Furrow Study:

Objective: This FurrowJet® application trial evaluates the yield and net return of Ethos XB, an insecticide/fungicide that combines the active ingredient of Capture® LFR® insecticide with a broad-spectrum biofungicide. This combination defends against insects pest such as corn rootworms, wireworms, grubs, seed corn maggots, cutworms and common stalk borers and disease defense including Fusarium, Pythium, Rhizoctonia and Phytophthora.

Figure 1.

ACTIVE INGREDIENTS:	By Wt.
Bifenthrin *	15.67%
Bacillus amyloliquefaciens strain D747 **	5.00%
Other Ingredients	79.33%
Total:	100.00%

*Cis isomers 97% minimum, trans isomers 3% maximum
** Contains a minimum of 1x 10^{10} colony-forming units (cfu) per milliliter of product.
This product contains 1.5 lbs bifenthrin per gallon.

The biofungicide in Ethos XB insecticide/fungicide forms a protective barrier on root surfaces and builds over time as spores germinate and colonize roots and root hairs.

Results: Ethos XB treatments applied through FurrowJet offered positive yield gains of +8.1Bu/A. which resulted in a return on investment of +$8.03/A. (Tables 1-2).

Table 1.

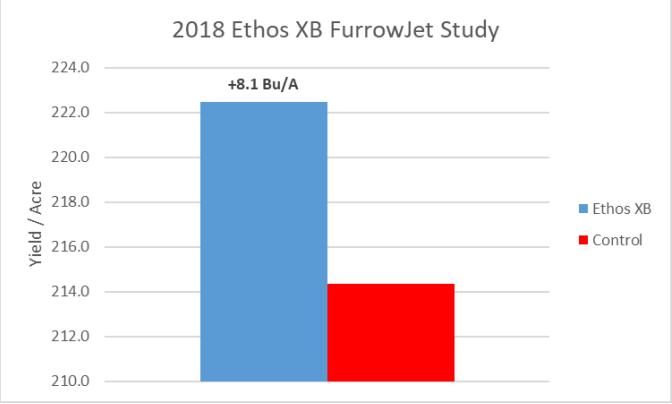
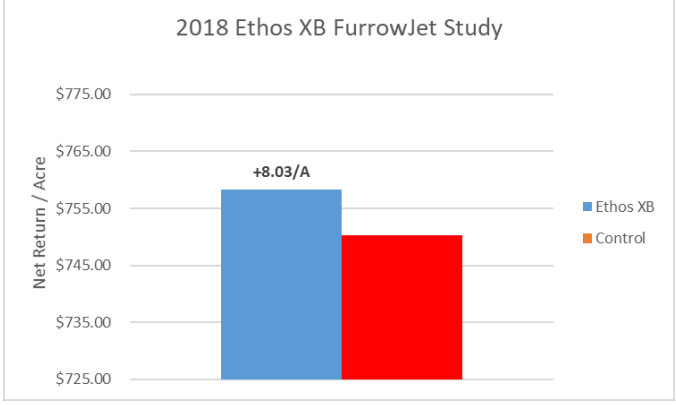


Table 2.



Planting Date: 5/10 *Hybrid: DKC 63-21SS* *Population: 36K* *Row Width: 30"* *Rotation: CAB* *Corn Price: $3.50*

Ethos XB: $306/Gal

2018 PTI Results

Capture® LFR® In-Furrow Study:

Objective: This in-furrow FurrowJet® application trial evaluates the yield and net return of Capture LFR, an in-furrow liquid insecticide containing the active ingredient Bifenthrin (Figure 1) in a liquid fertilizer ready (LFR) formulation.

Figure 1.

EPA Reg. No. 279-3302	**EPA Est. 279-NY-1**
Active Ingredient:	**By Wt.**
Bifenthrin*:	17.15%
Other Ingredients:	82.85%
	100.0%

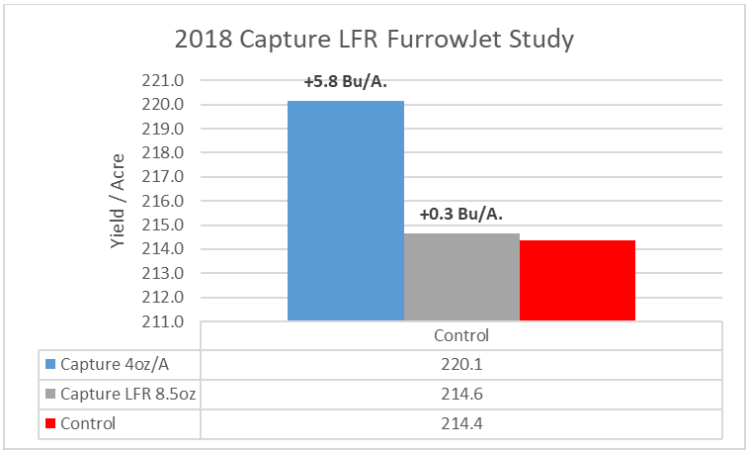
*Cis isomers 97% minimum, trans isomers 3% maximum.

This product contains 1.5 pounds active ingredient per gallon.

Capture LFR controls seed and seedling pests such as wireworm, corn rootworm, cutworm, grubs, armyworm, seed corn maggot and common stalk borer.

Results: Capture LFR treatments of 4 oz/A. achieved +5.8 Bu/A. yield gains, which corresponded to net returns of +$11.68/A. Higher rates resulted in minimal yield response and consequently lost **-$17.13/A.**

Table 1.



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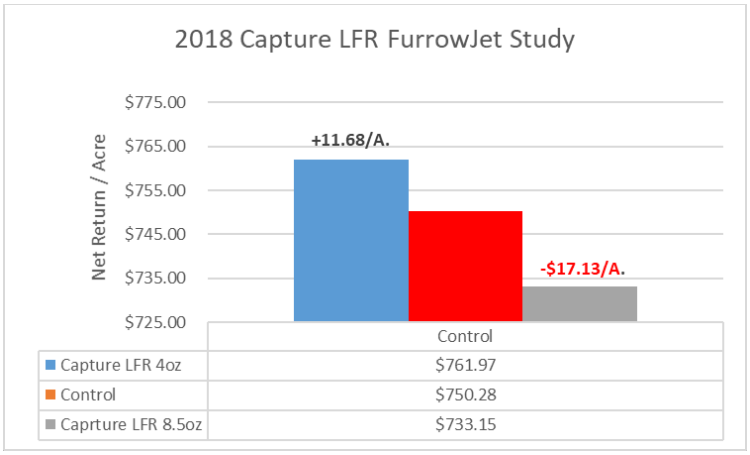


Planting Date: 5/10 Hybrid: DKC 63-21SS Population: 36K Row Width: 30" Rotation: CAB Corn Price: $3.50

Capture LFR: $272/Gal

2018 PTI Results

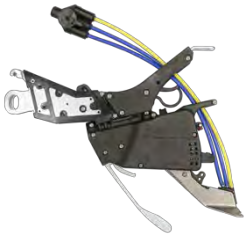
Temitry™ LFR® In-Furrow Study:

Objective: This FurrowJet application trial evaluates the yield and net return of Temitry LFR. This fungicide/insecticide is an in-furrow product for protection against early season corn diseases and below-ground insect pests, like corn root worm, in a liquid-fertilizer-ready (LFR) formulation.

Figure 1.

ACTIVE INGREDIENTS:	By Wt.
Bifenthrin*	14.4%
Pyraclostrobin: (carbamic acid, [2-[[[1-(4-chlorophenyl)-1H-pyrazol-3-yl]oxy]methyl] phenyl]methoxy-, methyl ester)	7.2%
Other Ingredients	78.4%
Total:	100.0%

Temitry LFR combines Headline® a strobilurin fungicide (0.67#/gal Pyraclostrobin) and Capture® LFR®, a pyrethroid insecticide (1.33#/gal Bifentrin) (Figure 1). When applied in-furrow on corn, Temitry LFR in-furrow fungicide and insecticide provides control of seedling fungal diseases, such as Rhizoctonia solani, and soil insect pests, such as corn rootworm larvae, wireworm, grubs, seedcorn maggot, cutworm and others that can damage corn seeds and seedlings.



Results: Temitry LFR treatments resulted in average yield gains of +4.1 Bu/A., but failed to offer a positive return on investment with losses of **-$1.98/A.** (Tables 1-2).

Table 1.

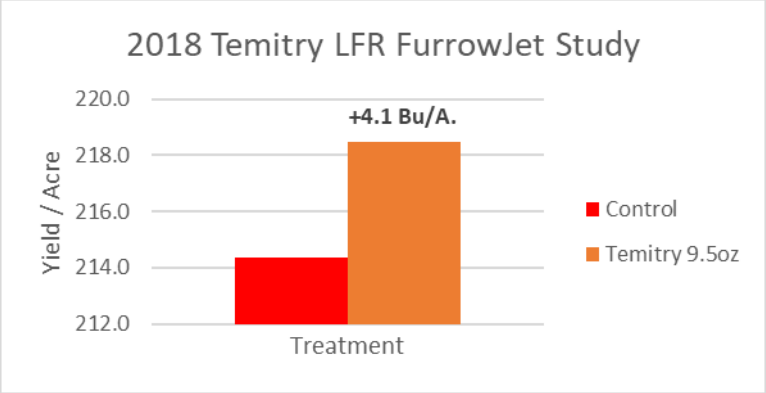
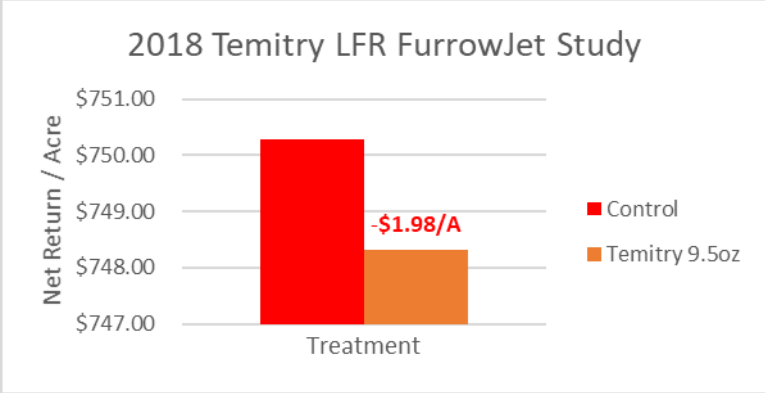


Table 2.



Planting Date: 5/6 *Hybrid: DKC 63-21SS* *Population: 36K* *Row Width: 30"* *Rotation: CAB* *Corn Price: $3.50*

Temitry LFR: $220/Gal

2018 PTI Results

SabrEx™/Exellorate™ In-Furrow Study:

Objective: This FurrowJet® application trial evaluates the yield and net return of SabrEx and Excellorate from Advanced Biological Marketing.

Excellorate is a 2-2-1 liquid blend of glucoheptonate carbohydrates, essential plant nutrients, beneficial enzymes and naturally occurring plant and soil stimulants. It represents a next generation of technology, combining complex carbohydrates, essential growth factors and is formulated to supplement biological activity (Figure 1).

Figure 1. Excellorate

Guaranteed Analysis:

Total Nitrogen (N)	2.0%
Available Phosphate (P_2O_5)	2.0%
Soluble Potash (K_2O)	1.0%
Boron (B)	0.05%
Cobalt (Co)	0.002%
Copper (Cu)	0.14%
Iron (Fe)	0.10%
Manganese (Mn)	0.10%
Molybdenum (Mo)	0.002%
Zinc (Zn)	0.05%

SabrEx is a formulation of two biological Trichoderma fungi strains. Trichoderma colonizes with the plants root system and feeds from the starches and sugars produced by the plant, while exuding beneficial enzymes and proteins for the host plants use. As a result, the plant produces a larger root system improving its nitrogen and water use efficiency (Figure 2).

Figure 2. SabrEx Root Innoculant

CONTAINS NON-PLANT FOOD INGREDIENTS
Guaranteed Analysis :
Active Ingredients: 0.10% - (Total microbial count $8x10^7$ cfu/ml *Trichoderma harzianum* 4×10^7 cfu/ml and *Trichoderma atroviride* 4×10^7 cfu/ml
Inert Ingredients: 79.9%-water, 20.0%-proprietary liquid

Results: Tables 1-2. illustrate SabrEx Corn IF treatments resulted in yield gains of +2.6 Bu/A., with a return on investment of +$3.13/A. Excellorate treatments offered gains of +1.4 Bu/A., just breaking even at +$0.38 Bu/A.

Tank-mixing both products as a combination treatment did offer a synergistic effect by increasing yields to +4.8 Bu/A., while capturing positive net returns of +$6.43/A.

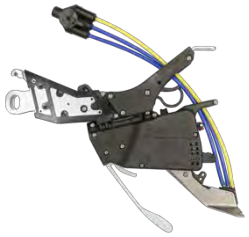


Table 1.

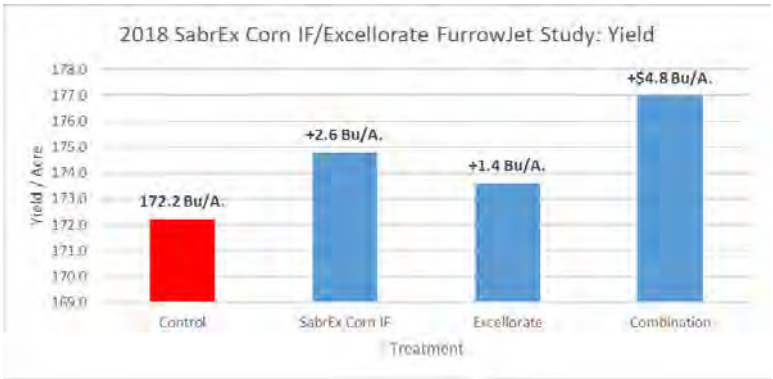
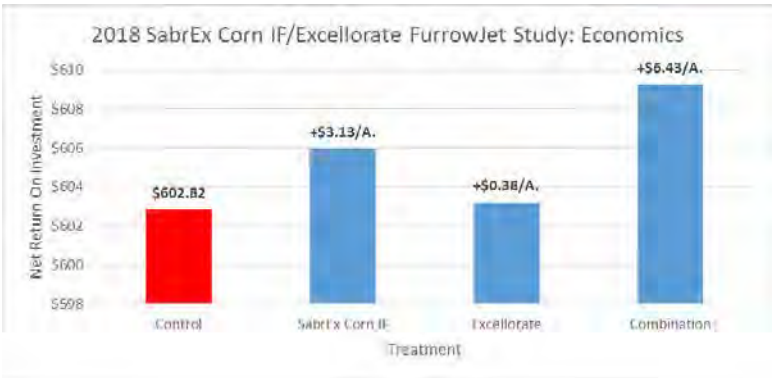


Table 2.



Planting Date: 5/6 Hybrid: DKC 63-21SS Population: 36K Row Width: 30" Rotation: CAB Corn Price: $3.50

SabrEx: $5.85/A Excellorate: $1.10/oz

Corn Summary of 2018 FurrowJet® Applications:

Agronomic Optimum			Economic Optimum		
Product:	**Rate/A.**	**+/- Yield**	**Rate/A.**	**Net $**	**Classification**
Nachurs imPulse®	6gal/A.	+12.1Bu/A.	2gal/A.	+$18.47	Starter
AgroLiquid	8.5gal/A.	+11.4Bu/A.	5.5gal/A.	+$12.67	Starter
Concept Ag Total-Phos®	4gal/A.	+9.5Bu/A.	3gal/A.	+$11.85	Starter/Biological
Capture® LFR®	4oz/A.	+5.8Bu/A.	4oz/A.	+$11.68	Insecticide
Marco QuickGrow™ LTE	8gal/A.	+11.1Bu/A.	8gal/A.	+$11.53	Starter
Helena Nucleus® HP	6gal/A.	+11.8Bu/A.	3gal/A.	+$9.95	Starter
Ethos™ XB	8.5oz/A.	+8.1Bu/A.	0.5oz/A.	+$8.03	Insecticide/Fungicide
Levesol™ Zinc	12gal/A.	+6.3Bu/A.	12gal/A.	+$7.07	Starter
Helena Nucleus® O-Phos	4gal/A.	+11.2Bu/A.	3gal/A.	+$6.49	Starter
SabrEx™/Excellorate™	5oz/A.	+4.8Bu/A.	5oz/A.	+$6.43	Biological
Manticor™ LFR®	9.5oz/A.	+5.6Bu/A.	9.5oz/A.	+$3.39	Fungicide
10-34-0	6gal/A.	+3.9Bu/A.	4gal/A.	+$0.47	Starter
Xanthion®	7.2oz/A.	+3Bu/A.	7.2oz/A.	-$0.94	Fungicide
Temitry™ LFR®	9.5oz/A.	+4.1Bu/A.	9.5oz/A.	-$1.98	Insecticide/Fungicide
Paralign™	3gal/A.	+7.2Bu/A.	3gal/A.	-$2.92	Starter
Conklin	12gal/A.	+13.5Bu/A.	3gal/A.	-$5.03	Starter
TopGuard Terra®	3oz/A.	+3.2Bu/A.	3oz/A.	-$5.21	Fungicide

Planting Date: 5/6 Hybrid: DKC 63-21SS Population: 36K Row Width: 30" Rotation: CAB Corn Price: $3.50

SabrEx: $5.85/A Excellorate: $1.10/oz

2018 PTI Results

Fertility Relay and Placement Study:

Objective: This study evaluates the performance of various rates and placements of starter fertilizers on the planter. The initiative of this study concentrates on sequential relay applications to stimulate yield. A relay treatment is a sequential dual product treatment rather than single product application. Treatments in this study consist of the following:

1.	In-Furrow Center Only:	3 Gallons/A. 10-34-0 Applied with FurrowJet® Center
2.	In-Furrow Wings Only:	5 Gallons/A. Marco LTE 6-20-4-.25Zn-2.7S with FurrowJet Wings
3.	In-Furrow Center + Wings: 4-.255Zn-2.7S	3 Gallons/A. 10-34-0 with FurrowJet Center + 5 Gallons/A Marco LTE 6-20- with FurrowJet Wings
4.	Rate Increase: In-Furrow Center + Wings 4-.25Zn-2.7S	5 Gallons/A. 10-34-0 with FurrowJet Center + 10 Gallons/A Marco LTE 6-20- with FurrowJet Wings

Results: As we evaluate both single treatments, FurrowJet wing only applications out-yielded FurrowJet center treatments by +5.4 Bu/A. with an average net return advantage of +$9.52/A.

If we average the single application yields, treatment yields were 266.3 Bu/A. However, when both single treatments were combined as a relay application, yields responded by an additional +9.4 Bu/A. with additional net returns of +$20.59/A. As rates were increased to 5 gal/A. of 10-34-0 and 10 gal/A. of 6-20-4-.25Zn-2.7S, yields responded by an additional 4.7 Bu/A., but did not prove to achieve higher net returns over the lower rate relay application of 3 gal/A. and 5 gal/A. respectively.

Table 1.

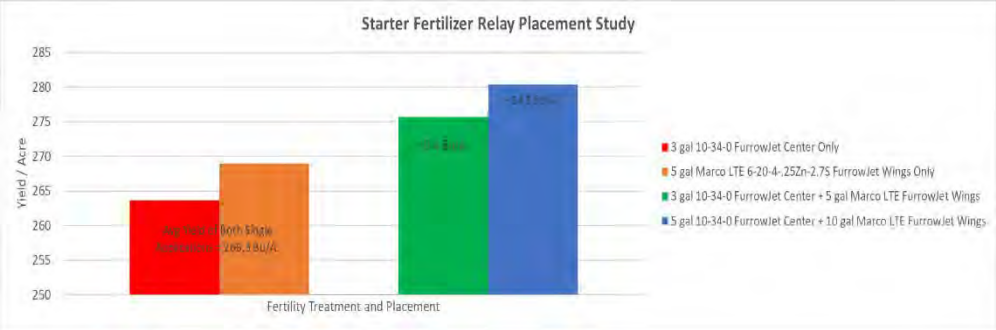


Table 2.

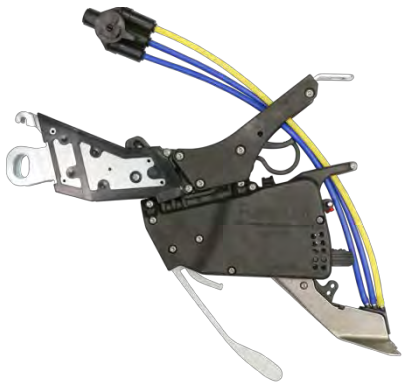
Planting Date: 5/10 Hybrid: Pioneer 1366AMXT Population: 36K Row Width: 30" Rotation: CAB Corn Price: $3.50

Fertilizer Pricing: 10-34-0 $2.58/gal Marco LTE 6-20-4-.25Zn-2.7S $3.40/Gal

2018 PTI Results

FurrowJet® Side-Wall Study

Figure 1. FurrowJet Planter Attachment



Objective: FurrowJet is a planter fertilizer attachment that enables placement of not only an in-furrow starter fertilizer, but also a tri-band of fertilizer 3/4" on each side of the seed. To achieve this tri-band placement, the wings on FurrowJet angle downward to cut into the sidewall and place fertilizer alongside the seed in a dual-band. By doing this, lifting and fracturing can occur that potentially could remove soil smearing or compaction created by disc openers. Additionally, closing wheel systems following FurrowJet wings have a better opportunity to close the seed trench, remove air pockets, and allow for good seed-to-soil contact.

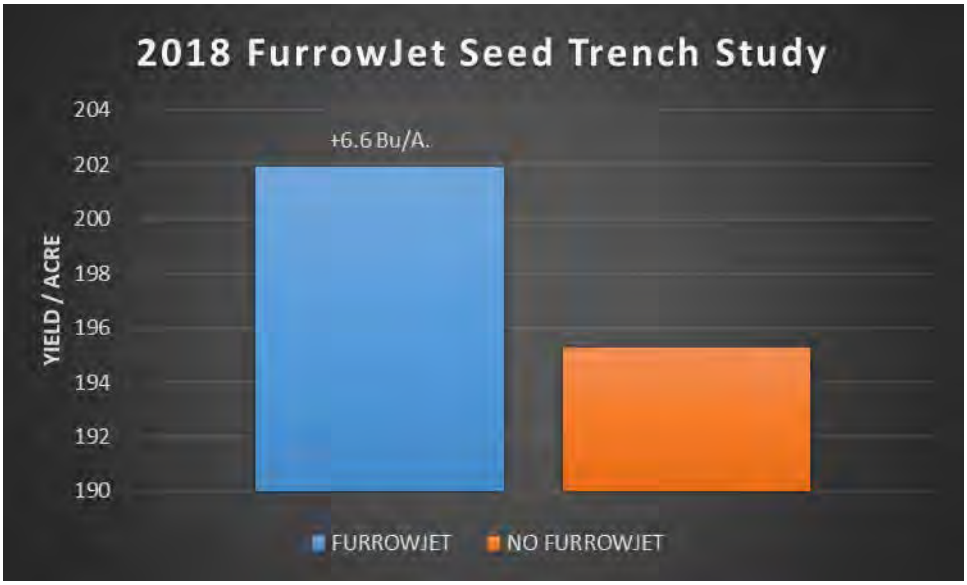
This study evaluates FurrowJet wings offering the ability to remove side-wall compaction in the seed furrow. For this particular study, no liquid fertilizer was applied through FurrowJet.

Figure 2: FurrowJet Dual-Band Wings Fracturing Side-Walls

Results: Table 3. illustrates that FurrowJet out-yielded the control by +6.6 Bu/A. At a cost of $300/row for FurrowJet on a 16-row planter and corn prices at $3.50, return on investment would occur at only 206 acres.

Adding starter fertilizer to this scenario could offer even more yield potential, increase revenue and help lower break-even acres to return on investment.

Table 1.



Planting Date: 5/16 *Hybrid: Pioneer 1366AMXT* *Population: 36K* *Row Width: 30”* *Rotation: CAC* *Corn Price: $3.50*

2018 PTI Results

Phosphorus Placement Study

Figure 1. FurrowJet planter fertilizer placement

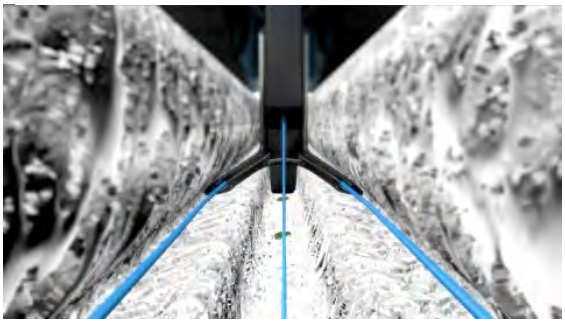


Figure 2. Conceal Dual band fertilizer

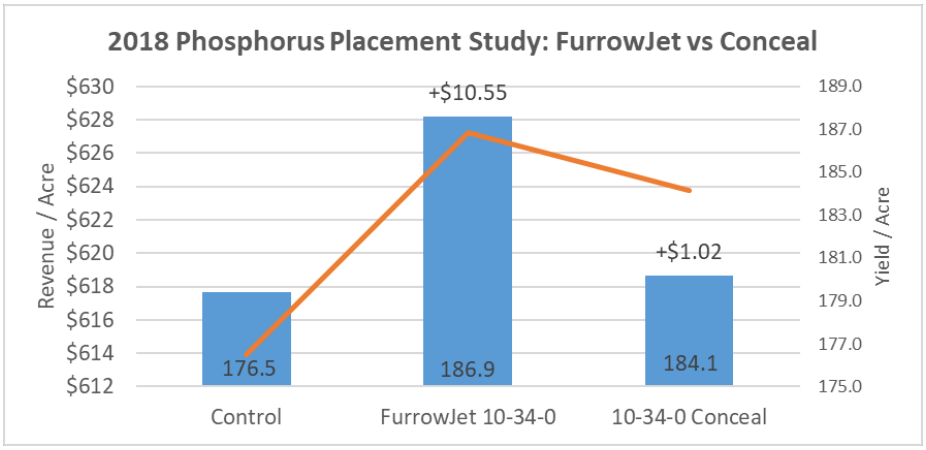
Objective: To evaluate starter fertilizer placement impact of placing ten gallons/A. of 10-34-0 liquid fertilizer in a FurrowJet® tri-band versus a Conceal dual band application.

FurrowJet is a planter fertilizer attachment, which enables you to place not only an in-furrow starter fertilizer, but also a band of fertilizer 3/4" on each side of the seed (Figure 1). Wings on FurrowJet angle downward to cut into the sidewall and place fertilizer alongside the seed in a band. Being near the furrow, this placement gives the seedling and crown roots immediate and continuous access to the starter fertilizer.

Conceal is new unique planter attachment that allows growers to place nitrogen in a high concentration dual or single band positioned 3" away from the seed trench (Figure 2) in depths of 1". Conceal uses existing planter space, utilizing a backswept knife located with-in the center of the planter's gauge wheels (Figure 1) As nitrogen is applied, it is sealed within the soil profile, preventing potential volatilization losses typically seen with surface type nitrogen applications.

Results: Table 1. illustrates FurrowJet placement of 10-34-0 provided net returns of +$10.55/A., while Conceal placement just broke-even at +$1.02/A. This may be the result of applying the phosphorus liquid starter fertilizer closer to the seed and early seedling roots. Since phosphorus is a non-mobile nutrient, Conceal dual band placements may be too far away to achieve maximum early plant uptake compared to in-furrow FurrowJet placement.

Table 1.



Planting Date: 5/16 *Hybrid: DKC 47-27RIB* *Population: 36K* *Row Width: 30"* *Rotation: CAB* *Prices: Corn $3.50, N $0.45/#, 10-34-0 $2.58/Gal*

2018 PTI Results

pH Acidity Study: Corn

Objective: To evaluate the long-term yield and economic impact of acidic soil pH in corn.

When the PTI farm was acquired in the fall of 2017, a soil test revealed some major issues with soil pH on a particular area of the east side of the farm. Soil test results indicated average pH values of 5.1, with lows of 4.7 pH. This acidic area offered an opportunity to evaluate the yield response of acidic soils compared to corrected basic or neutral pH soils. Lime was applied in 2017, however plots were left un-limed to represent long-term pH testing.

What is soil pH? The term pH stands for the potential (p) of hydrogen ions (H+) in water, and indicates a measure of the relative acidity or alkalinity of the soil solution. Soil pH is calculated on a 14-point scale, where a value of 7.0 is considered neutral or basic (Figure 2). Lower values on the pH scale denote increasing H+ ions and acidity, while higher values represent increasing hydroxyl (OH-) ions and alkalinity. Because pH is expressed on a logarithmic scale, each change of 1 pH unit actually represents a 10-fold increase in soil acidity or alkalinity.

Figure 3. indicates the influence of soil pH on nutrient availability of various macro and micronutrients.

Figure 1. 2017 Soil Test pH

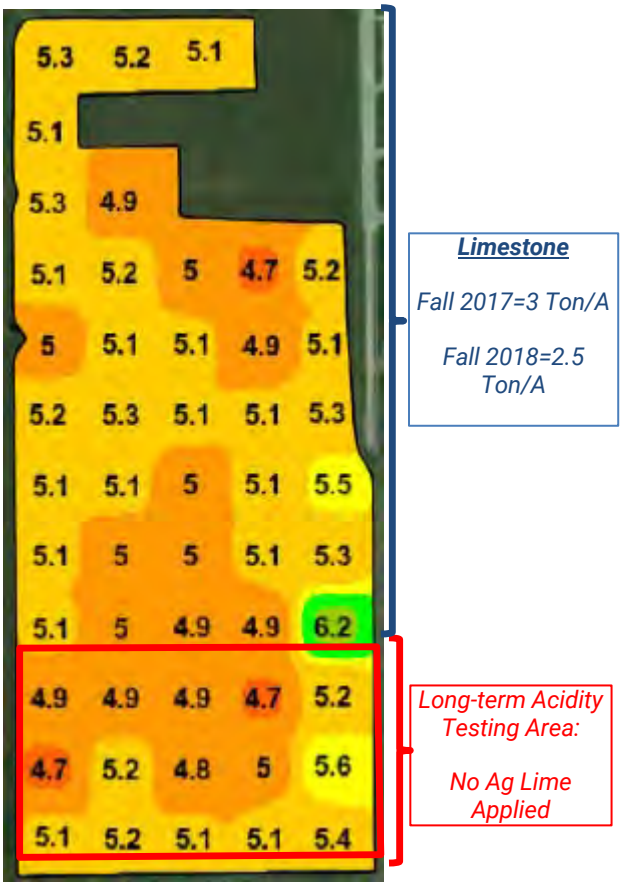


Figure 2. The pH Scale

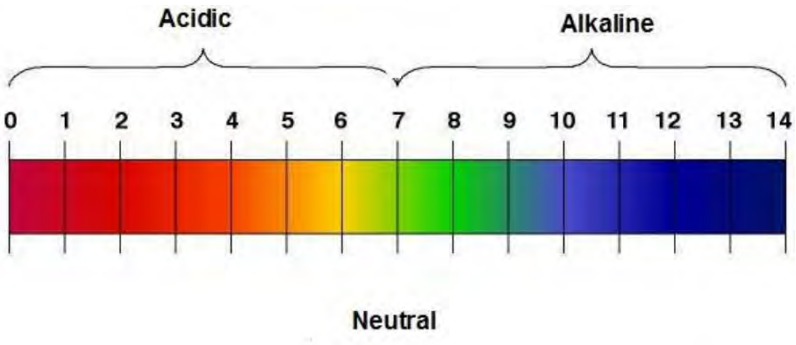
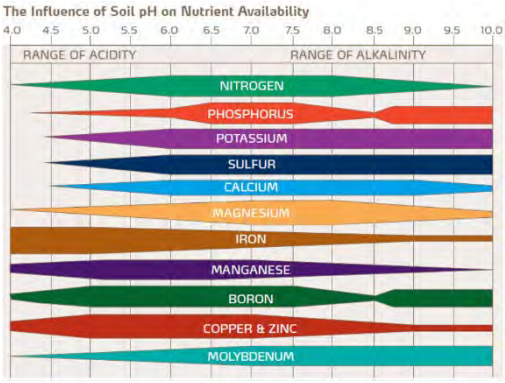


Figure 3. Application of Ag Lime Fall 2017



pH Acidity Study Continued:

Results: Table 1. illustrates that in our first year of this soil acidity study in corn, there was no significant yield loss in acidic soils near 5.1 pH. 2018 yield data revealed only a **-1.3 Bu/A.** yield loss in a corn rotation. Being designed as a long-term multi-year study, we will continue this trial over the years to come to monitor yield, nutrient deficiencies, or other stress factors.

Table 1.

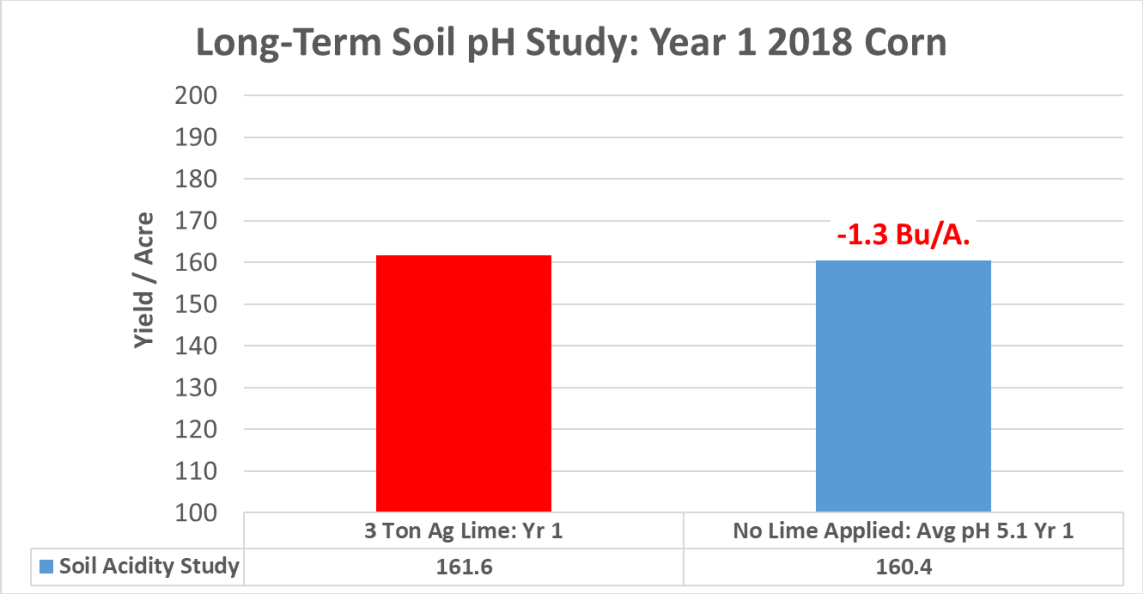


Figure 5. Fall 2017 3 Ton/A. Ag Lime Application

Figure 4. Fall 2018 2.5 ton/A. Ag Lime Application

Planting Date: 5/16 *Hybrid: Wyffels 7696VT2Pro* *Population: 36K* *Row Width: 30"* *Rotation: CAC* *Prices: Corn $3.50*

2018 PTI Results

100% Single Application Pre-Emerge Nitrogen Study: Conceal vs. WNF

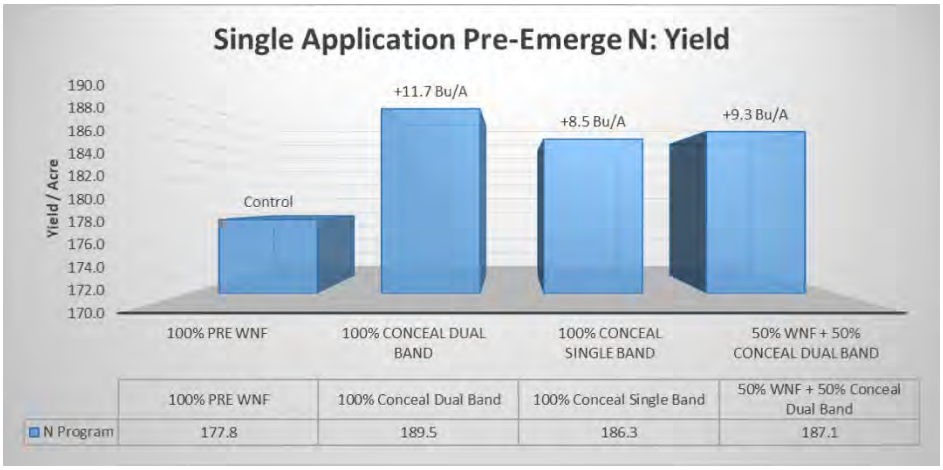
Objective: To compare 100% single applications of traditional surface applied broadcast Weed-N-Feed (WNF) 32% UAN treatments to Conceal dual and single band at-plant nitrogen applications. Conceal is new unique planter attachment that allows growers to place nitrogen in a high concentration dual or single band positioned 3" away from the seed trench (Figure 2) in depths of 1". Conceal uses existing planter space, utilizing a backswept knife located with-in the center of the planter's gauge wheels (Figure 1). As nitrogen is applied, it is sealed within the soil profile, preventing potential volatilization losses typically seen with surface type nitrogen applications.

Results: Table 1. Illustrates that Conceal dual band applications of nitrogen out-yielded traditional WNF applications by +11.7 Bu/A.

Single band conceal treatments performed very similar, yielding within **-3.2 Bu/A.** of dual Conceal and +8.5 Bu/A. over the WNF.

Reducing WNF treatments to 50% and adding the remaining 50% as a complimenting dual band Conceal treatment added +9.3 Bu/A. over the stand-alone WNF 100% treatment.

Table 1. 2018 Yield Results



	100% PRE WNF	100% Conceal Dual Band	100% Conceal Single Band	50% WNF + 50% Conceal Dual Band
N Program	177.8	189.5	186.3	187.1

Figure 1. Conceal Knife Design within Gauge Wheel

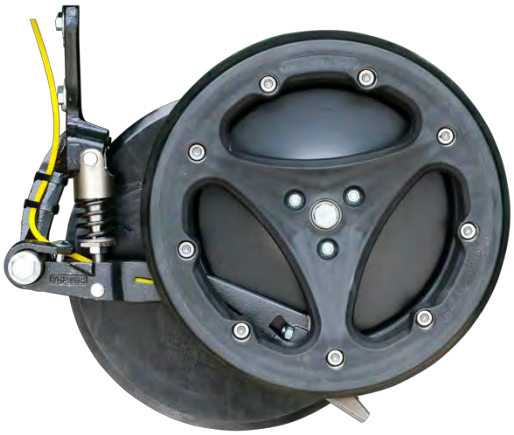


Figure 2. Conceal Dual Placement 3" from Seed Trench

Planting Date: 5/6 *Hybrid: DKC 64-34SS* *Population: 36K* *Row Width: 30"* *Rotation: CAB* *Corn Price: $3.50*

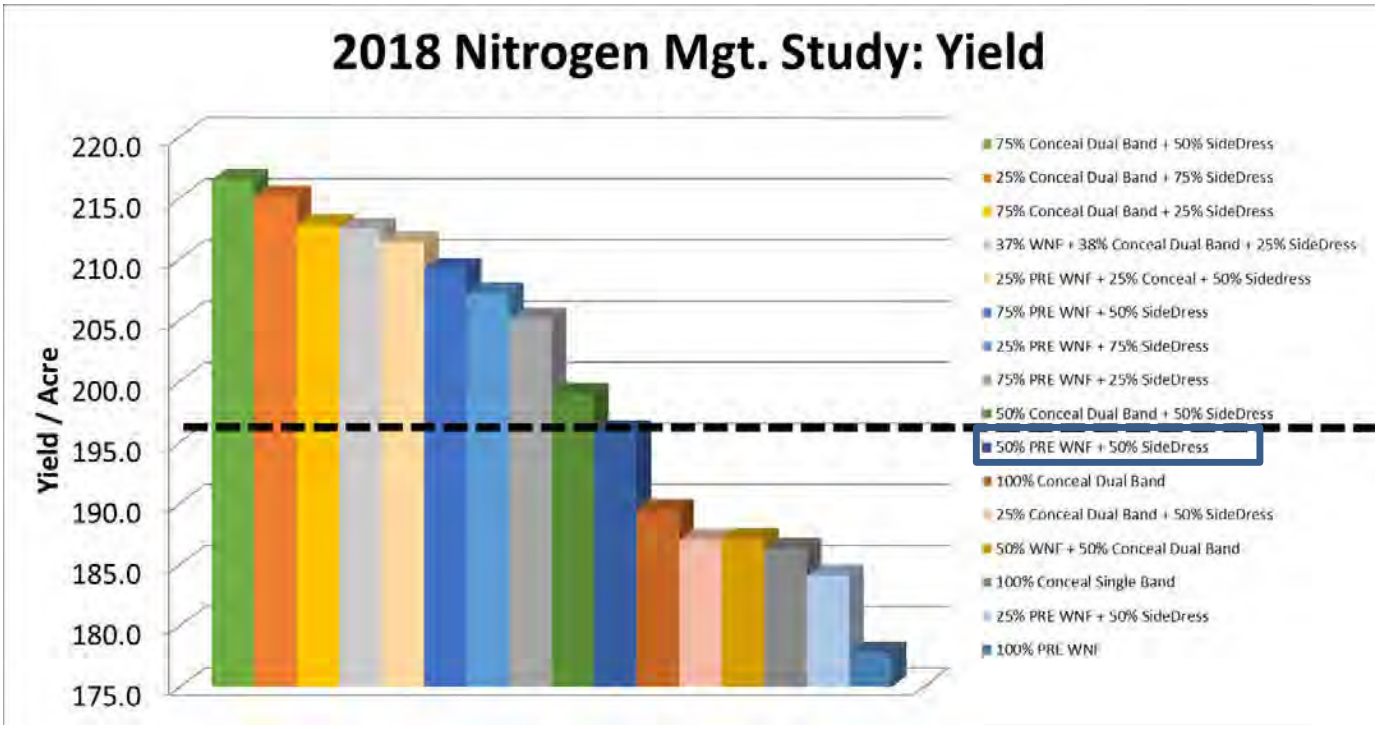
2018 PTI Results

Conceal™ Nitrogen Rate/Placement Study

Objective: This study evaluates the performance of sixteen different nitrogen rate and placement programs. These sixteen programs consist of single one and done nitrogen programs, 2-way split applications, and even 3-way split programs. All treatments are applied using 32% UAN liquid nitrogen. As a baseline, the 50% WNF + 50% V6 Side-Dress (Treatment #5) will be facilitated as the control for this trial.

1.	100% Weed-N-Feed (WNF):	200# N applied as surface applied 32% UAN	Single
2.	100% Conceal Single Band:	200# N applied with Conceal single 3" N band	
3.	100% Conceal Dual Band:	200# N applied with Conceal dual 3" N bands	
4.	50% WNF+50% Conceal Dual Band:	100# N WNF + 100# N Conceal dual 3" N band	
5.	**50% WNF+50% Side-Dress:**	**100# N WNF+ 100# N V6 side-dress: "Control"**	
6.	50% Conceal Dual Band+50% Side-Dress:	100#N Conceal Dual Band + 100# N V6 Side-Dress	
7.	25% WNF+75% Side-Dress:	50# N WNF + 150# V6 Side-Dress	
8.	25% Conceal Dual Band+75% Side-Dress:	50# N Conceal dual 3"bands + 150# V6 Side-Dress	Dual Split Applications
9.	25% WNF+50% Side-Dress:	50# N WNF + 100# N V6 Side-Dress (50# Under-Application)	
10.	25% Conceal Dual Band+50% Side-Dress:	50# N WNF + 100# N V6 Side-Dress (50# Under-Application)	
11.	75% WNF+50% Side-Dress:	150# N WNF + 100# N V6 Side-Dress (50# Over-Application)	
12.	75% Conceal Dual Band+50% Side-Dress:	150# N Conceal Dual 3" bands + 100# N V6 Side-Dress (50# Over-Application)	
13.	75% WNF+25% Side-Dress:	150# N WNF + 50# N V6 Side-Dress	
14.	75% Conceal Dual Band+25% Side-Dress:	150# N Conceal dual 3" bands + 50# UAN 32% V6 Side-Dress	
15.	25% Conceal+25%WNF+50% Side-Dress:	50# N WNF + 50# N Conceal 3" dual bands + 100# V6 Side-Dress	Triple Split Applications
16.	37% Conceal+38%WNF+25% Side-Dress:	74# N WNF + 76# N Conceal 3" dual bands + 50# V6 Side-Dress	

Table 1.

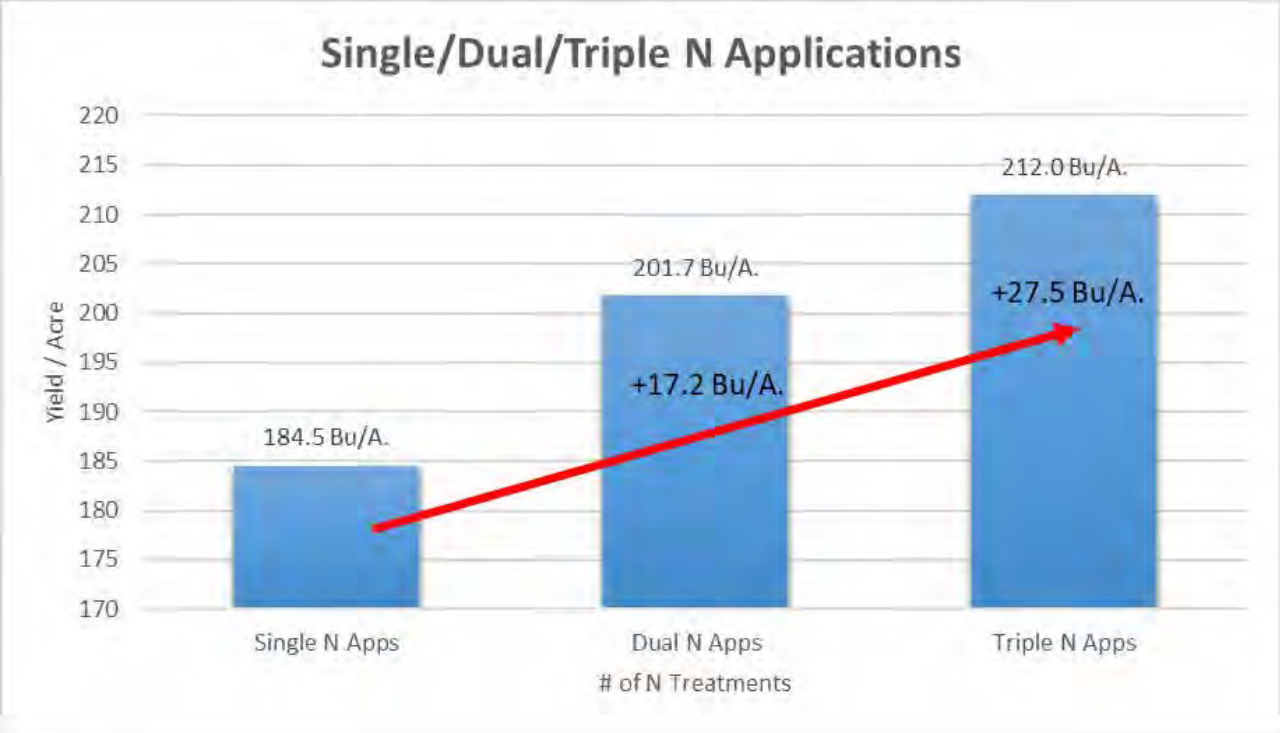


Nitrogen Management Rate/Placement Study Continued

Results: Table 1. illustrates the overall yield results of all 16 nitrogen programs. Conceal dual band nitrogen programs in general, accounted for all top five treatments in the study. In comparison to the control (50% WNF + 50% Side-Dress), these top five treatments out-performed the control by an average yield of 17.8 Bu/A.

All four single applications of nitrogen (Treatments 1-4), proved the lowest performance in the study tallying in at four of the five bottom rankings. Due to heavy June rainfall events (9" of rain in a ten day timespan), early single nitrogen applications suffered too much N loss. Dual nitrogen programs (Programs 5-14) out-yielded single programs by 17.2 Bu/A., while triple programs (Programs 15-16) out-yielded them by 27.5 Bu/A.

Table 2.



Planting Date: 5/6 *Hybrid: DKC 64-34SS* *Population: 36K* *Row Width: 30"* *Rotation: CAB* *Corn Price: $3.50*

Nitrogen Management Rate/Placement Study Continued:

Table 3. depicts a deciding story by calculating net return after cost of nitrogen. Again, the top five nitrogen programs all contain Conceal dual band applications. Nine of the sixteen programs (56%) garnered higher returns in comparison to the control.

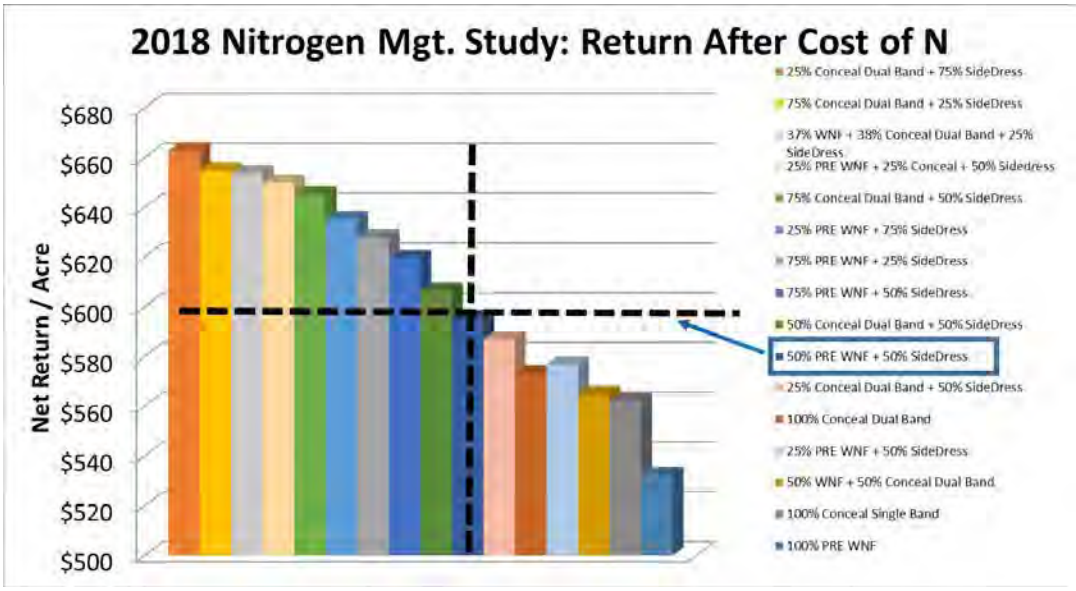
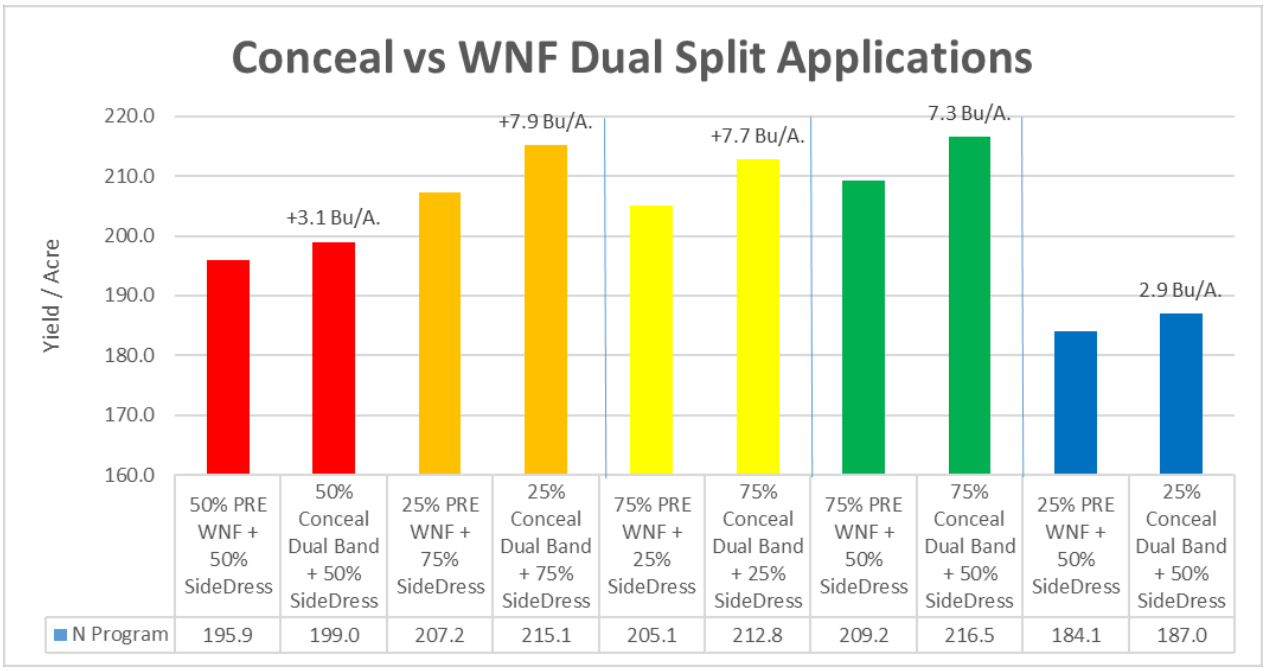


Table 3

Table 4. illustrates yield response of Conceal dual band nitrogen treatments compared to the same rates in a WNF surface applied broadcast application. These Conceal treatments achieved an average of +5.8 Bu/A. increased yields along with net returns of an additional $20.23/A.

Table 4



Nitrogen Management Rate/Placement Study Continued:

Table 5. illustrates multi-year data from 2017 -2018 and the net return associated with each nitrogen program used over the past two growing seasons. Conceal dual band programs occupy the top six spots of the thirteen total programs, netting additional returns of +$10.56 to +$61.68/A. above the control. The triple application of 25% WNF + 25% Conceal dual band + 50% Side-dress took top honors at +$61.68/A. over the control treatment.

Multi-year single applications reveal net losses of **-$10.21 to -$53.92/A.**, with 100% WNF treatments suffering the highest losses.

Table 5.

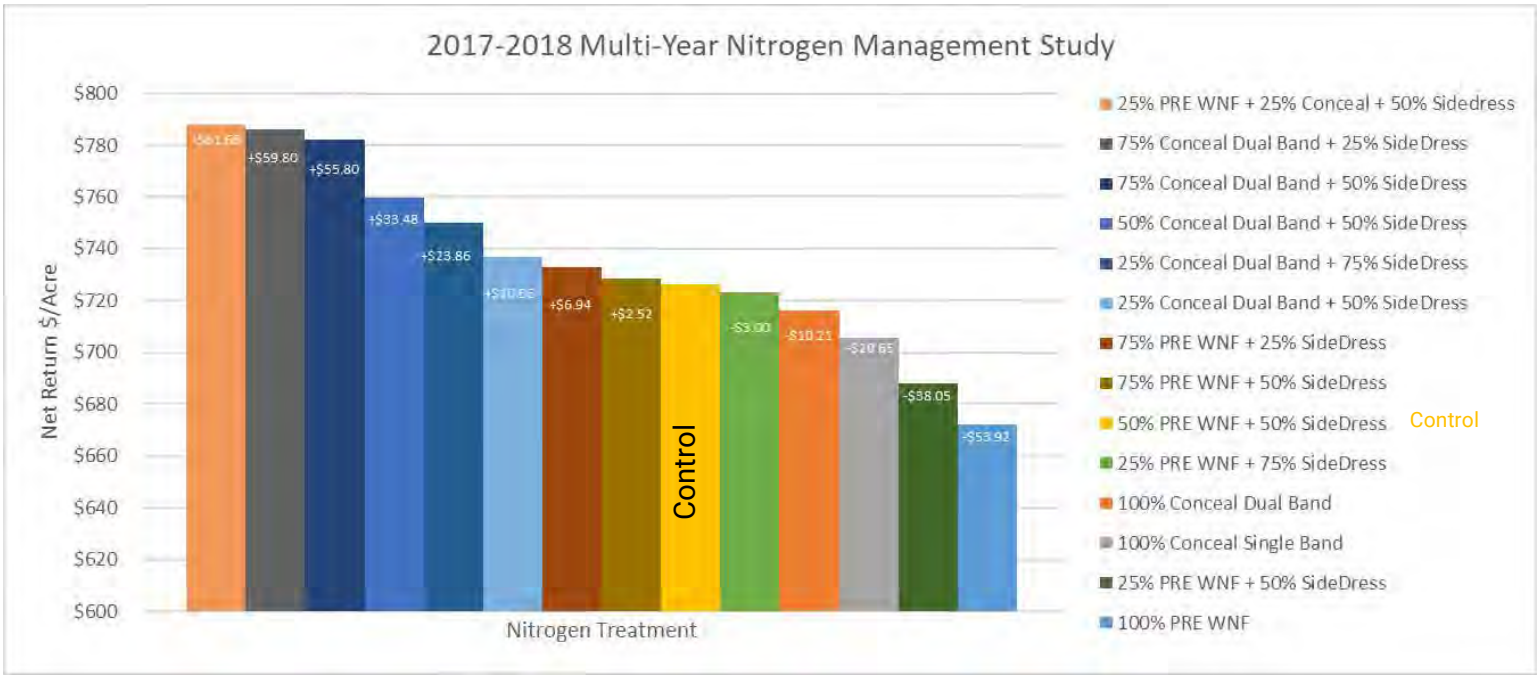


Figure 1. Weed-N-Feed Application (WNF)

Figure 2. Conceal 3" Dual Band Nitrogen

Figure 3. V6 Side-Dress Application

2018 PTI Results

Nitrogen Sealer Study

Objective: To evaluate the yield and economic impact of implementing nitrogen sealers when side-dressing corn with liquid 28% nitrogen (N). Nitrogen sealers from Nitrogen Sealing Systems in Catlin, IL are a pair of coulters that attach to a sidedress unit behind the knife or high pressure injection nozzle (Figure 1-2). Sealers are designed to lift and redirect soil over top of the injection point of nitrogen, collapsing and sealing the trench, protecting nitrogen that could otherwise volatilize.

Volatilization is a form of N loss that occurs when nitrogen lays on the soil surface without incorporation by tillage or rainfall events. In this event, applied nitrogen converts to ammonia, a gaseous form that can easily escape into the atmosphere. In a side-dress situation, this can occur when nitrogen is applied and not sealed or covered properly. If coulter slots open up or become exposed to sunlight, air, wind, and increased temperatures after application, volatilization can occur.

Results: Tables 1-2. illustrate nitrogen sealers offering yield gains of +5.5 Bu/A., while capturing an additional $19.12/A. At a cost of $255/row on a 15-knife side-dress applicator, break-even acres would occur at 200 acres.

Figure 1. Nitrogen Sealers

Figure 2. Sealed row with soil berm

Table 1.

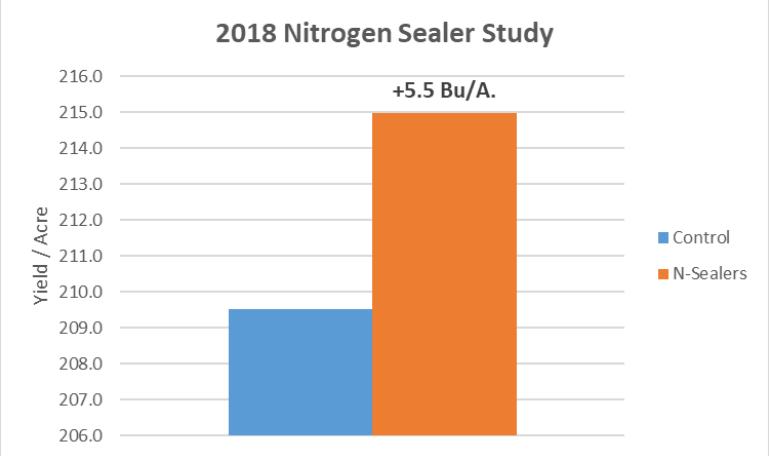
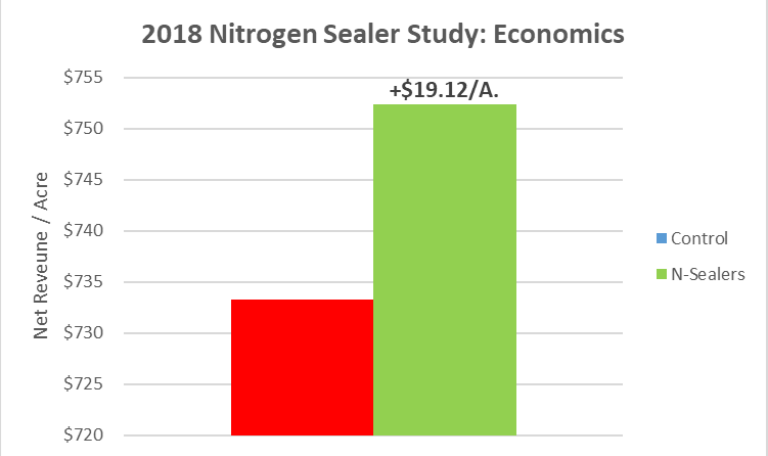


Table 2.



Planting Date: 5/1 *Hybrid: Dekalb 64-34SS* *Population: 36K* *Row Width: 30"* *Rotation: CAC* *Corn Price: $3.50*

Side-Dress Timing: V3 *Sealers from Nitrogen Sealing Systems $255/Row*

2018 PTI Results

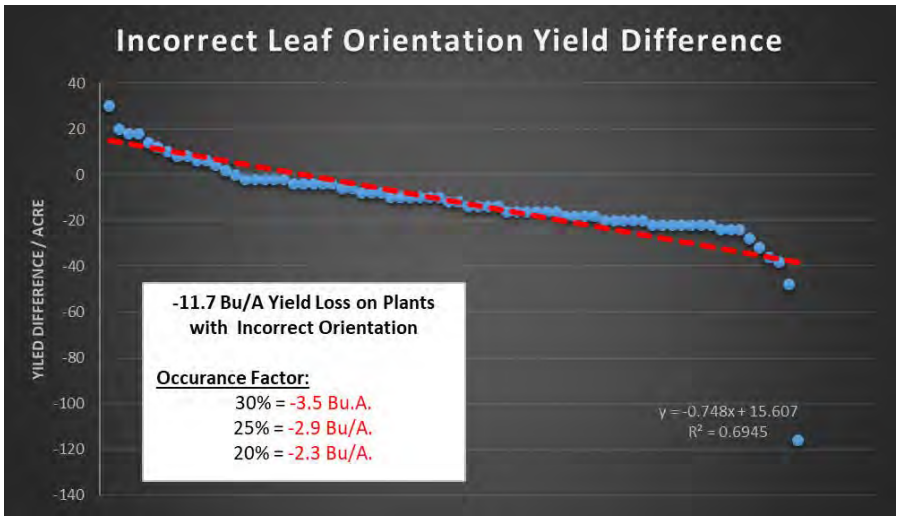
Corn Leaf Orientation Study

Figure 1. Correct Leaf Orientation

Figure 6. Incorrect Leaf Orientation

Objective: To study corn leaf orientation within the row and to understand the relationship of yield impact of corn leaves being positioned parrallel or perpendicular to the row (Figures 1-2). Correct leaf orientation offers benefits of increased light interception, less sunlight to encourage weed suppression, cooler in-canopy temperatures, and moisture preservation. This study evaluates the differences in corn yield between plants with correct and incorrect leaf orientation.

Table 1.



Results: Table 1. illustrates the results of 140 yield checks at the Precision Technology Insititute in 2018. On average, individual plant yield loss associated with incorrect leaf orientation resulted in **-11.7 Bu/A.** losses. However, in doing in-field scouting and evaluations, the occurance factor was documented at 25%. As a result, this 25% occurance factor would only equate to **-2.9 Bu/A.** average yield losses.

Work is being done at the Precision Technology Institute to establish solutions to help eliminate incorrect leaf orientation. Some of this work identifies seed placement in the seed furrow in an effort to manipulate direction of leaf placement. Early studies indicate that incorrect leaf orientation cannot be totally prevented, but trial data does suggest that manually placing seed in certain positions in the trench can improve results by +10%. In general, seed tip directional placement has been seen to improve emergence timing, while embryo directional placement may impact leaf orientation.

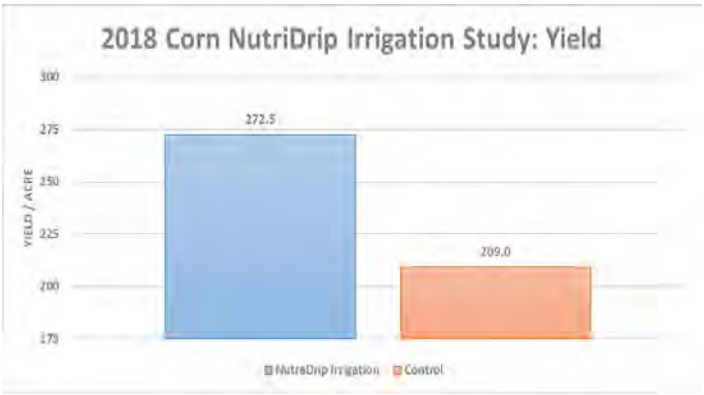
Hybrid: Pioneer 0825AMXT *Population: 34K* *Row Width: 20"* *Rotation: CAC* *Corn Price: $3.50*

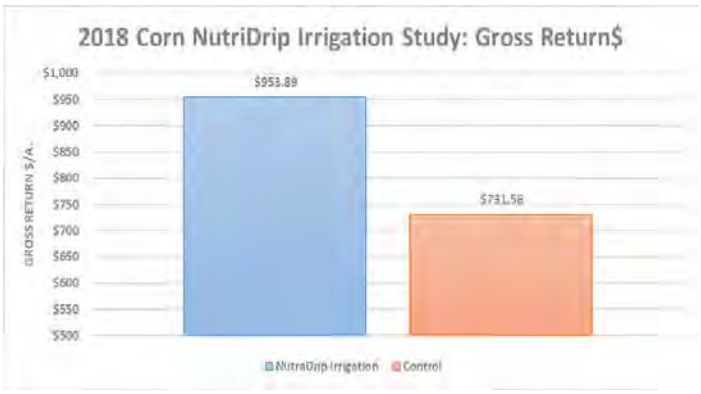
2018 PTI Results

High Yield Irrigation Study

Objective: This study evaluates the use of NutriDrip irrigation and its ability to feed corn with water and nutrients for high yield potential. This method of irrigating a crop uses a NETAFIM™ drip tape with small pressure regulated emitters evenly spaced at 24" apart. Drip tape in this study is not sub-surface irrigation, rather the team at PTI installed this system on the soil surface to demonstrate how the system works and to have mobility with irrigating trials at the PTI farm in the future. Water was accessed from the local Walmart® retention pond and pumped out through a 2" line and flexnet manifold system.

Results: NutriDrip irrigation resulted in yield gains of 63.5 Bu/A. over the non-irrigated control. This was mainly due to drought conditions that persisted 7 weeks in the last of half of July and thru the month of August. The equivalent of 9.4" inches of rain was applied through drip irrigation. Fertigation was also implemented to apply 60# of additional UAN 32% ($27.28), 2pts Boron ($5.38/A.), and 3 gallons of Conklin Feast® 2-15-19-3S ($20.34/A.). All treatments incurred additional expenses of $53/A., as well as $61/A. in pumping costs. NutriDrip irrigation resulted in net economic gains of $108.31/A.





Planting Date: 5/8 *Hybrid: Pioneer 1197AMXT* *Population: 36K* *Row Width: 30"* *Rotation: CAB* *Corn Price: $3.50*

2018 PTI Results

Multi-Genetic Planting Study:

Objective: To analyze the yield and economic benefit of implementing mSet single meter multi-genetic technology to place specific corn hybrids for individual spatial management zones.

mSet is a product that can be added to vSet and vDrive, which couples a seed selector added to the hopper to switch hybrids, and a seed pool level sensor in the meter. The level sensor tells the seed selector when the meter needs more seed, and it drops a dose of seed into the meter. This continually happens until it is time to switch hybrids. At hybrid change, the level sensor will let the seed pool run low, then call for a dose of the other hybrid to enter the meter just in time for the change, leading to a short transition between hybrids. The seed pool is controlled by the mSet selector, providing the correct hybrid in the meter, and allowing the vSet meter to accurately singulate those seeds. The ultimate result is the hybrid you select, planted in the area of the field you select, planted with highest accuracy of singulation.

Figure 1. mSet® Multi-Genetic Technology

Figure 2. mSet Seed Selector

Figure 3. Offensive and Defensive Spatial Management Zones

Multi-Genetic Planting Study Continued:

Results: AgriGold 6544VT2 was used as our offensive corn hybrid and 6542VT2 as the defensive hybrid and each genetic package was placed into the appropriate matching spatial management zone (Figure 3). Test blocks were planted to evaluate the yield performance when hybrids were placed correctly, as well as incorrectly.

Figure 4. Yield Results of Offensive Management Zone

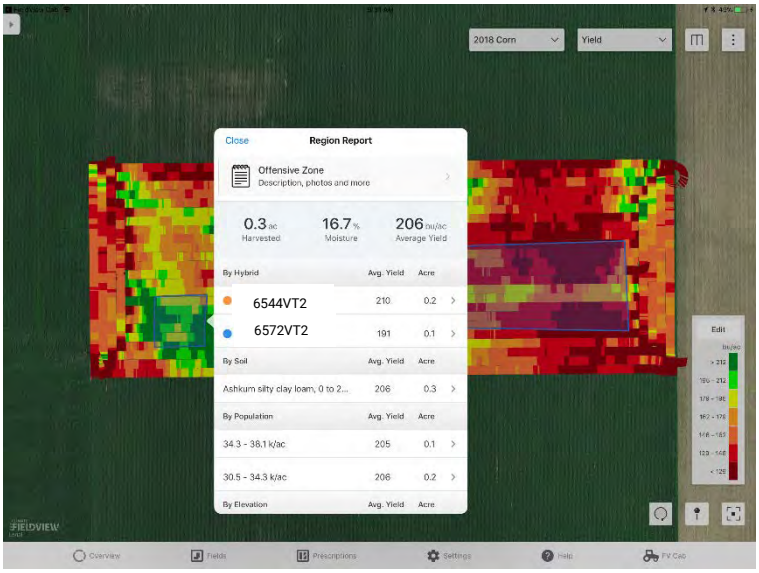


Figure 4. illustrates the results of placing an offensive hybrid (Agrigold 6544VT2) in higher productive and higher yielding soils. This placement resulted in yield gains of +19 Bu/A. compared to planting the defensive hybrid (AgriGold 6572VT2) in that management zone. This yield gain corresponded to economic advantages of $66.50/A.

Figure 5. Yield Results of Defensive Management Zone

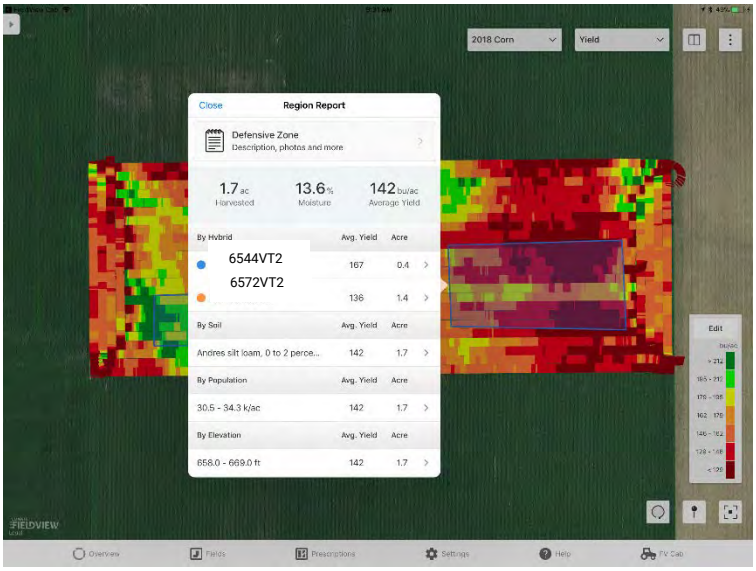


Figure 5. illustrates the results of placing a defensive hybrid (Agrigold 6572VT2) in the less productive and lower yielding soils. This placement resulted in yield gains of +31 Bu/A. compared to planting the offensive hybrid (AgriGold 6544VT2) in that management zone. This yield gain corresponded to economic advantages of $108.50/A.

mSet multi-genetic technology averaged yield gains of +25 Bu/A. and +$87.50/A. in increase revenue. If a grower invested $1000/row on a 16 row planter for multi-hybrid technology, these type of yield and economic gains would result in return on investment at only 183 acres.

These yield results confirm that if used properly, a multi-genetic system used to place corn hybrids on a spatial management zone basis has the opportunity to offer yield advantages and potentially large economic gains.

Planting Date: 5/2 *Hybrid:AgriGold 6442STX/6542STX* *Population: 34-36K* *Row Width: 30"* *Rotation:CAC* *Corn Price: $3.50*

2018 PTI Results

Ear Flex/Seeding Rate Study:

Objective: This multi-genetic planting study evaluates the impact of corn yield when varying seeding rates of flex and fixed ear type genetics. A fixed ear hybrid makes similar sized ears regardless of plant populations, and generally achieves highest yield performance at higher seeding rates. Flex ear hybrids have the ability to create a longer and/or girthier ear when plant competition is minimized.

Understanding this characterization of specific individual hybrids and knowing how to place them in the correct environment, is critical for maximizing performance in a multi-genetic planting system. This study evaluates Pioneer 0707AMXT as a fixed ear hybrid and Pioneer 0825AMXT as a flex ear hybrid.

Conclusion: Table 1. illustrates that the fixed ear hybrid achieved higher yields at every seeding rate above 28K populations. Optimum agronomic yield occurred at 36K populations, +23.1 Bu/A. better than the 28K rate.

Conversely, Table 2. reveals the flex hybrid did not respond to higher populations and actually offered yield losses at each seeding rate over the lowest 28K population. Average yield losses ranged from -5.7 to -6.9 Bu/A.

Table 1.

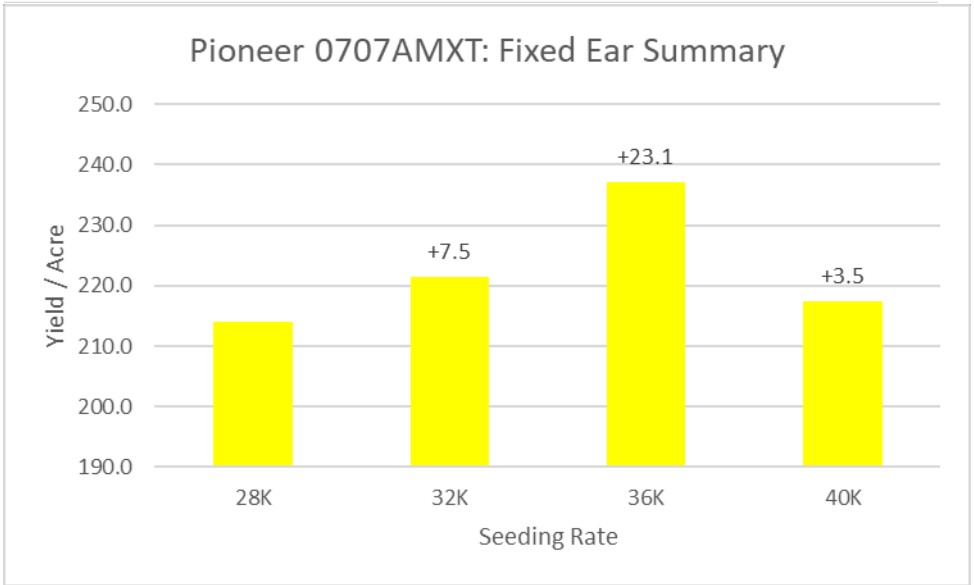


Table 2.

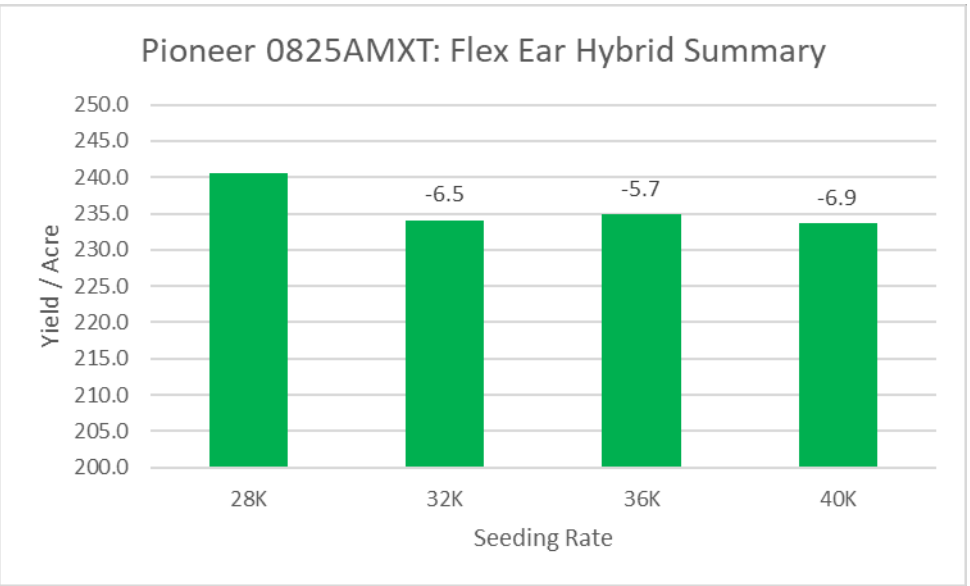
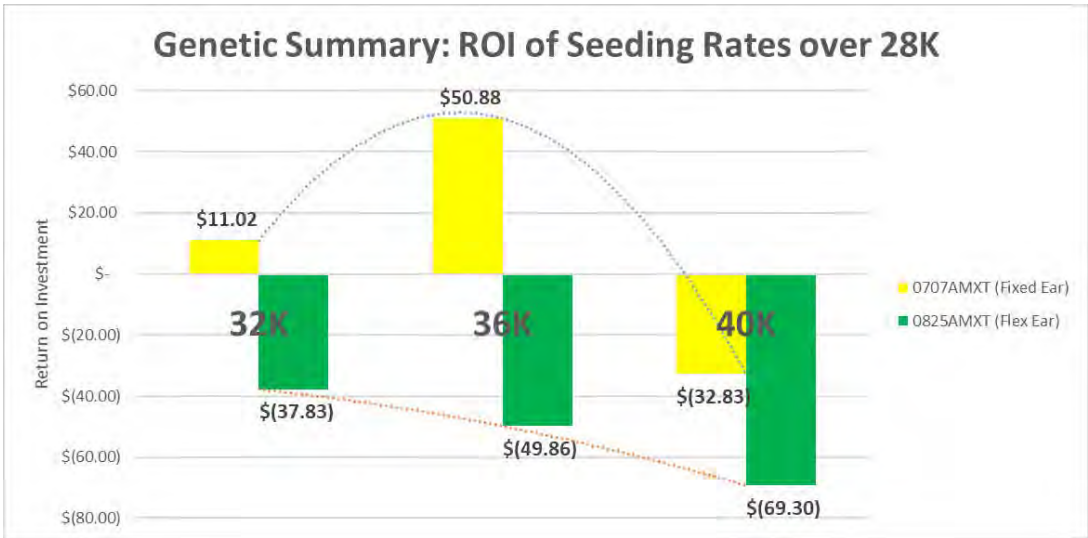


Table 3.

Table 3. illustrates the return on investment of both hybrids planted at seeding rates above 28K populations. All economics are based upon $300/bag seed corn, 80,000 seeds/bag, and $3.50/Bu. corn commodity price.



The fixed ear hybrid achieved economic optimum seeding rate at the 36K population. This 36K rate paid positive returns of +$50.88 over the lowest 28K population. Conversely, the flex ear hybrid did not respond to any of the higher seeding rates and incurred losses of **-$37.83 to -$69.30/A.** as planting poulations were increased over 28K. It is interesting to note that between the two hybrids planted at 36K populations, one offered a positive gain of +$50/A., while the other proved losses of the exact same amount. This just confirms the financial implications of incorrect placement and seeding rate.

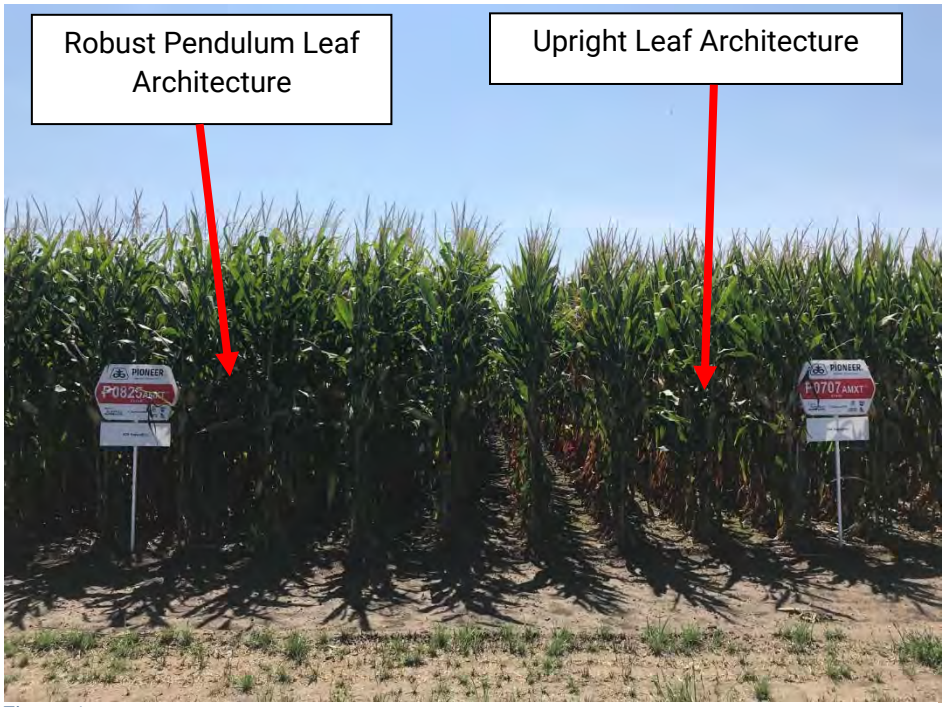


Figure 1.

Figure 1. is a picture of both hybrids at the R2 growth stage. As producers think of changing seeding rates, leaf architechure should also be addressed. Note P0707AMXT showing a more “upright” leaf structure, allowing more sunlight hitting the soil surface. P0825AMXT obtains a much more robust “pendulum” type leaf architechure which offers more shading and less sunlight into the row. As seeding rates are increased or decreased, the type of leaf acrhitechure should be considered agronomically.

2018 PTI Results

Strip-Till Freshener Study

Figure 1.

Objective: To evaluate Yetter 2984 strip-till freshener to facilitate consistent soil warming and bring existing strips to life. Original fall strips made in October after harvest were freshened in April before planting (Figure 1).

Features:

- 3-blade arrangement with rolling basket to condition strips
- Operates at 6 to 10 mph and 1 1/2" to 4" deep, depending on depth setting
- Precision Planting CleanSweep™ residue managers to clean rows while freshening strips

Results: Spring strip freshening increased yield by an average of 10.3 Bu/A. and resulted in net gains of $28.05/A. Custom costs of $8/A. were used for calculating cost of application. In general, strip-freshening created a beautiful seed bed for planting and resulted in some nice yield gains.

Table 1.

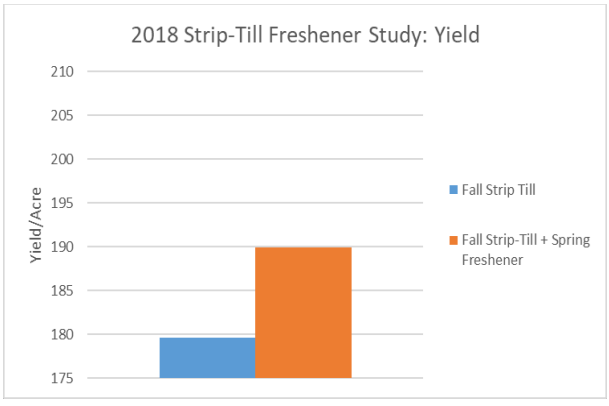
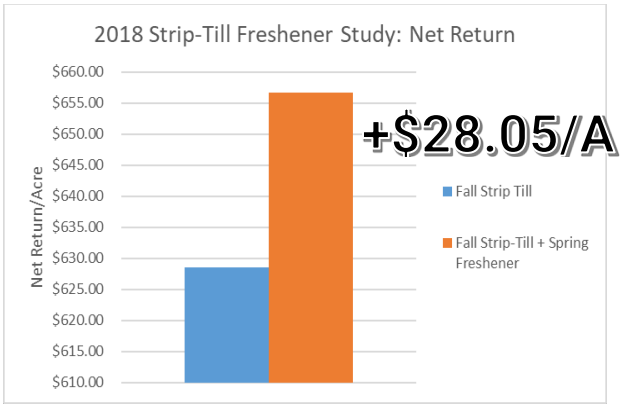


Table 2.



Planting Date: 4/25 *Hybrid: Pioneer 0825 AMXT* *Population: 34K* *Row Width: 30"* *Rotation: CAS* *Corn Price: $3.50*

Chopping Corn Head Study

Objective: To study the yield impact of utilizing a chopping corn head in a continuous corn conventional tillage rotation. A Capello Quasar™ chopping head (Figure 1-2) is used to create replicated strips of chop and non-chop residue management trials. The goal of this trial is evaluate sizing of residue (Figure 3) and allowing heavy stalks and residue to break down faster to advance the degradation process reducing the carbon penalty associated with continuous corn environments.

Results: Table 1. illustrates that chopping corn residue improved corn yields by 11.1 Bu/A. and increased gross revenue by $38.85/A. at a commodity price of $3.50/Bu.

Multi-year data from 2017 indicated similar results with chopping advantages of 9.2 Bu/A.

Figure 1.

Figure 2.

Figure 3.

Table 1.

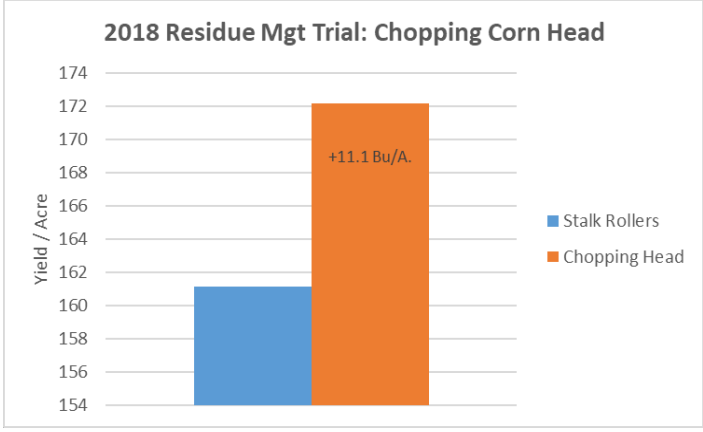
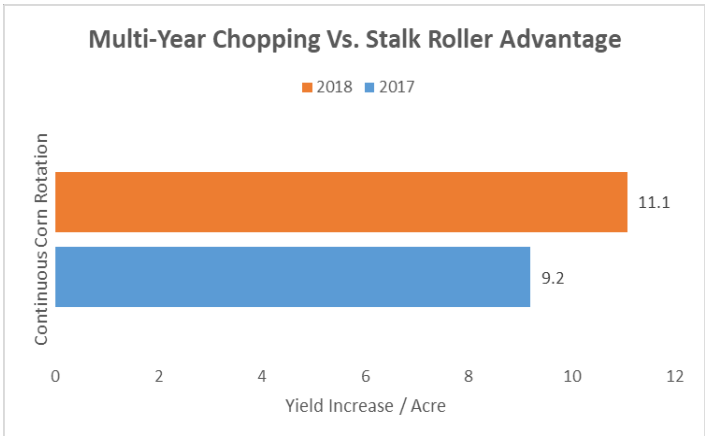


Table 2.



Planting Date: 4/26 *Hybrid: DKC 64-34SS* *Population: 36K* *Row Width: 30"* *Rotation: CAC* *Corn Price: $3.50*

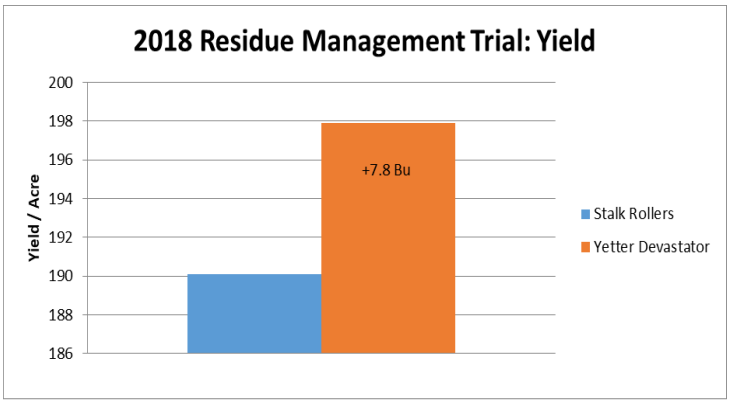
2018 PTI Results

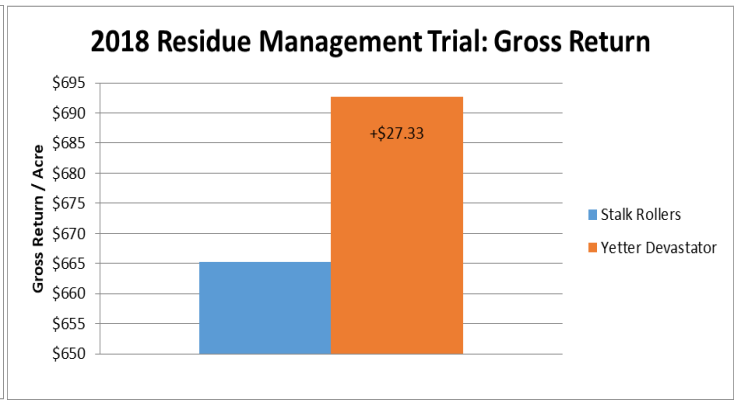
Yetter Devastator™ Study

Objective: This continuous corn, residue management study evaluates Yetter Manufacturing's 5000 Stalk Devastator. This corn head mounted device saves tires and tracks by knocking over and crushing stalks while leaving them attached, speeding up the cornstalk breakdown process and improving field conditions for spring planting. Features include the following:

- Prevents damage to tires, tracks, wires, and hydraulic hoses on combines, trucks, tractors, and implements
- Knocks over and crushes stalks for faster decomposition and microbial breakdown of residue
- Preserves residue cover, reducing soil erosion and keeping stalks in place in windy conditions

Results: Yetter Devastators provided 7.8 Bu/A. yield increases and a return on investment of +$27.33/A. and multi-year data from 2017-18 would indicate an average return on investment at +$24.87/A. At a purchase price of $5333 for an 8 row Devastator, break-even acres would occur at 215 acres. With corn after corn rotations, residue management needs consideration and tools like this have been advantageous.





Planting Date: 4/26 *Hybrid: DKC 64-34SS* *Population: 36K* *Row Width: 30"* *Rotation: CAC* *Corn Price: $3.50*

2018 PTI Results

Corn Tillage Study

Objective: To evaluate the yield and economic impacts of various tillage programs in a continuous corn rotation. Tillage programs include conventional tillage, strip-till, vertical till, and no-till.

Table 1. University of IL Machinery Cost Estimates

Conventional	Ripper	$	15.40
	Soil Finisher	$	10.10
	Plant	$	13.90
		$	39.40
Strip	Strip	$	23.20
	Plant	$	14.00
	Burndown	$	8.00
		$	45.20
Vertical	Vertical	$	12.10
	Burndown	$	8.00
	Plant	$	14.00
		$	34.10
NoTill	Burndown	$	8.00
	Plant	$	14.00
		$	22.00

Figure 1. Sunflower® 4630 Disc Ripper

Figure 2. Sunflower® 6833 Vertical Tillage Tool

Figure 4. AGCO Challenger® 1042 planting in No-Till

Figure 3. Case IH Steiger® Series pulling Strip-

2018 PTI Results

Continuous Corn Tillage Study Continued:

Results: To understand both yield and economics, the University of Illinois Machinery Cost Estimate Summary is used to calculate individual cost of each tillage program (Table 1). For reduced tillage programs, an $8/A. burn-down is also included.

Table 2. illustrates overall yield for each tillage segment. Yields varied within only 7.8 Bu/A. between all tillage programs with strip-till offering highest yields at 192.6 Bu/A.

After applying all appropriate costs to each individual tillage segment, Table 3. depicts the economics of each system. All the reduced tillage systems (strip, vertical, and no-till) performed very similar, all within only $4.10/A. of each other.

However, due to a two-pass system cost and the lowest over-all yields in the study, conventional tillage suffered comparative losses of near $20/A. This could be a result of the extended dry weather throughout July and August. Reduced tillage segments could have had an advantage due to higher moisture preservation and lower soil temperatures.

Table 7.

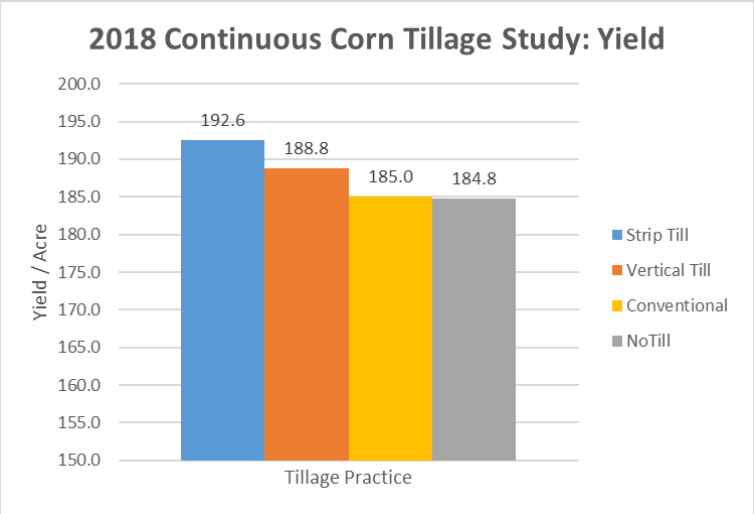
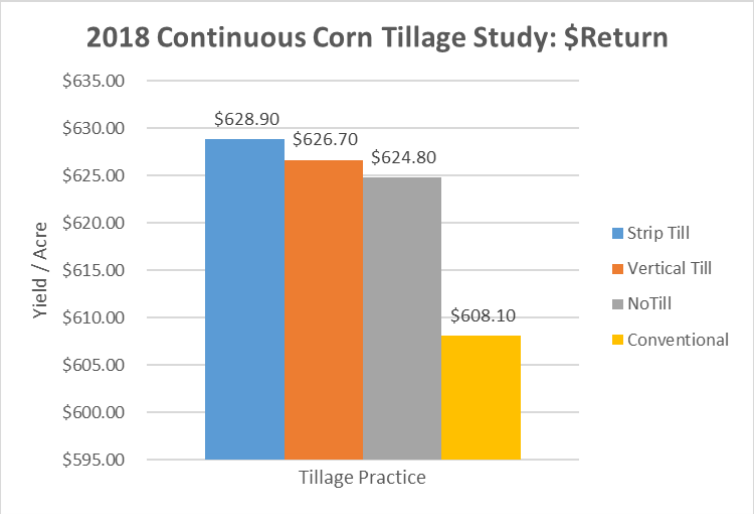


Table 8.



Planting Date: 5/5 *Hybrid: Wyffels 7696VTPro* *Population: 36K* *Row Width: 30”* *Rotation: CAC* *Corn Price: $3.50*

2018 PTI Results

Finish™ Line Sweep Study:

Objective: To evaluate the yield and economic impacts of Finish Line™ Sweeps (Figure 1), a field cultivator sweep that features a knife blade on the underside of the sweep designed to create a narrow slit below operating depth to fracture the soil density layer created by horizontal tillage systems.

Typical field cultivator sweeps lift and till the soil above them, but compact the soil below by creating a soil density layer at the lift point. Soil density is a form of soil compaction that occurs when soil particles press together, reducing pore space between them, consequently creating a greater density.

Compacted soils have a reduced rate of both water infiltration and drainage because large pores more effectively move water downward through the soil than smaller pores. This combination typically results in lower usable plant water and nutrition uptake, due to smaller root size and overall mass (Figure 4).

Figure 1. Finish Line Cultivator Sweep

Figure 2. Traditional Cultivator Sweep

Figure 3. Finish Line™ Sweeps on 9" Spacing

Figure 4. Fendt® 1042 tractor on Sunflower® 6833 Land Finisher

2018 PTI Results

Finish Line Sweep Study Continued:

Results: Finish Line sweeps offered +3.5 Bu/A. yield gains over traditional cultivator sweeps in our first year of testing this product (Table 1). Figure 5 illustrates an example of the advantage in overall corn root mass and size as a result of implementing the Finish Line sweeps.

It gets interesting to evaluate the economics of these sweeps, as the cost is only $4 over and above standard sweeps. The PTI team installed 45 Finish Line sweeps on a 30' Sunflower land finisher (Figure 5) for a total additional cost of only $180 over standard sweeps. Total farm size would then determine cost/acre for the sweeps (Table 2). Farm sizes of 500 to 2000 acres would range in cost from only $0.36/A. to $0.09/A.

With this low cost/A., net return is then calculated in Table 3. with a positive return on investment of +$11.92 to +$12.19/A., dependent on total farm size.

Table 1.

Table 2.

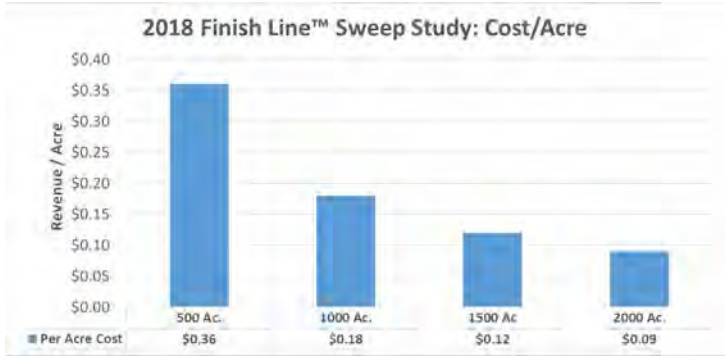


Table 3.

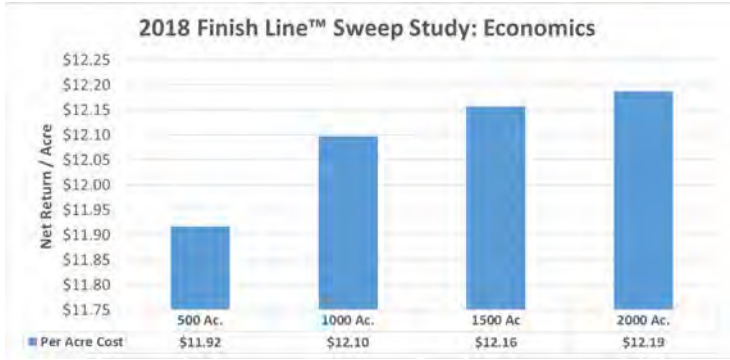


Figure 5. Root Comparison

Finish Line™ Sweeps	Standard

Planting Date: 4/25 Hybrid: Wyffels 7696VTPro Population: 36K Row Width: 30" Rotation: CAC Corn Price: $3.50 Finish Line Sweep: $4

2018 PTI Results

Yield by Organic Matter Study:

Objective: To evaluate the correlation of corn yield by organic matter (OM) levels, sensed and recorded by SmartFirmer®.

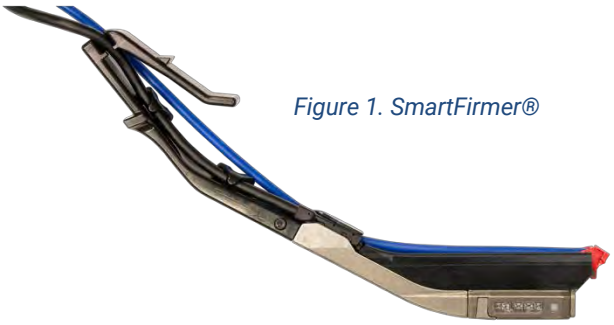


Figure 1. SmartFirmer®

SmartFirmer is a seed firmer with unprecedented sensing capability that allows farmers the ability to map organic matter on a row-by-row basis. SmartFirmer high definition real-time organic matter sensing can be used to better understand in-field spatial variability. As a result, precise prescriptions for planting population, seed hybrid, and fertility applications can then be developed and implemented by a grower and/or their trusted advisor.

There are numerous benefits to having higher stable organic matter levels for crop production. Table 1. illustrates three categories of benefits published by the Cornell University Department of Crop and Soil Sciences:

Table 1. Benefits of Higher Levels of Organic Matter: Cornell University Department of Crop and Soil Sciences Agronomy Fact Sheet 41

Chemical Benefits:	Physical Benefits:	Biological Benefits:
• Increases the soil's CEC or its ability to hold onto and supply over time essential nutrients such as calcium, magnesium and potassium. • Improves the ability of a soil to resist pH change; this is also known as buffering capacity. • Accelerates decomposition of soil minerals over time, making the nutrients in the minerals available for plant uptake.	• Enhances aggregate stability, improving water infiltration and soil aeration, reducing runoff. • Improves water-holding capacity. • Reduces the stickiness of clay soils making them easier to till. • Reduces surface crusting, facilitating seedbed preparation.	• Provides food for the living organisms in the soil. • Enhances soil microbial biodiversity and activity, which can help in the suppression of diseases and pests. • Enhances pore space through the actions of soil microorganisms. This helps to increase infiltration and reduce runoff.

http://nmsp.cals.cornell.edu/guidelines/factsheets.h

Results: SmartFirmer organic matter was collected at planting on a farm located in Kankakee County, (east central) Illinois. Data was recorded using a 16-row planter, each row equipped with its own SmartFirmer (Figure 2).

Figure 3 illustrates the organic matter spatial variability, with values having a narrow range from 3.0 to 3.6%. Figure 4. reveals the corresponding yield data from harvest with yields ranging from 130 to 240 Bu/A., indicating a yield swing of 135 Bu/A. across all organic matter spatial management zones.

Figure 2. SmartFirmer Real-Time O.M. Collection

Figure 3. SmartFirmer At-Plant Real-Time Collected Organic Matter

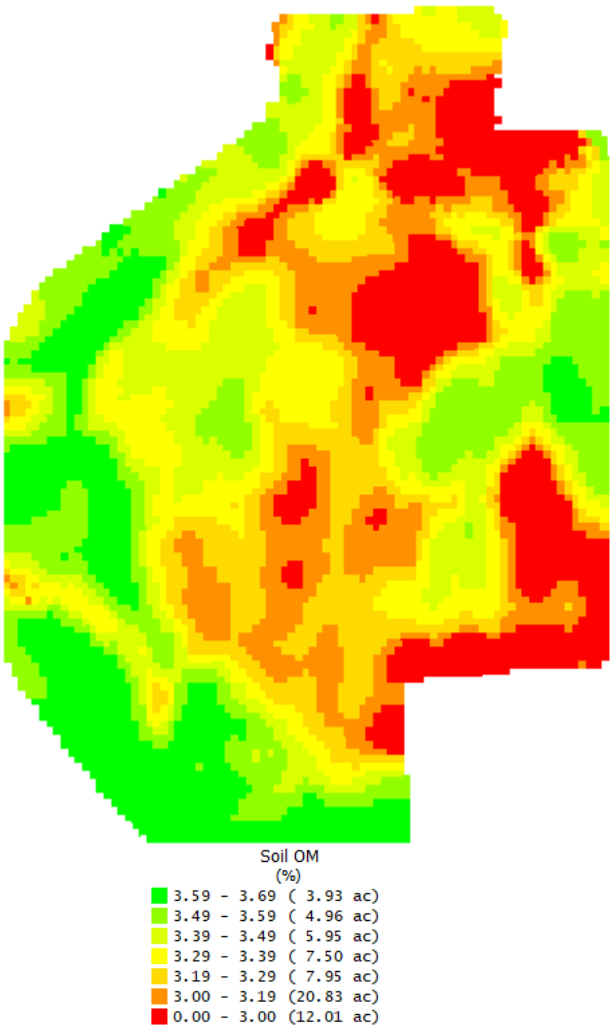
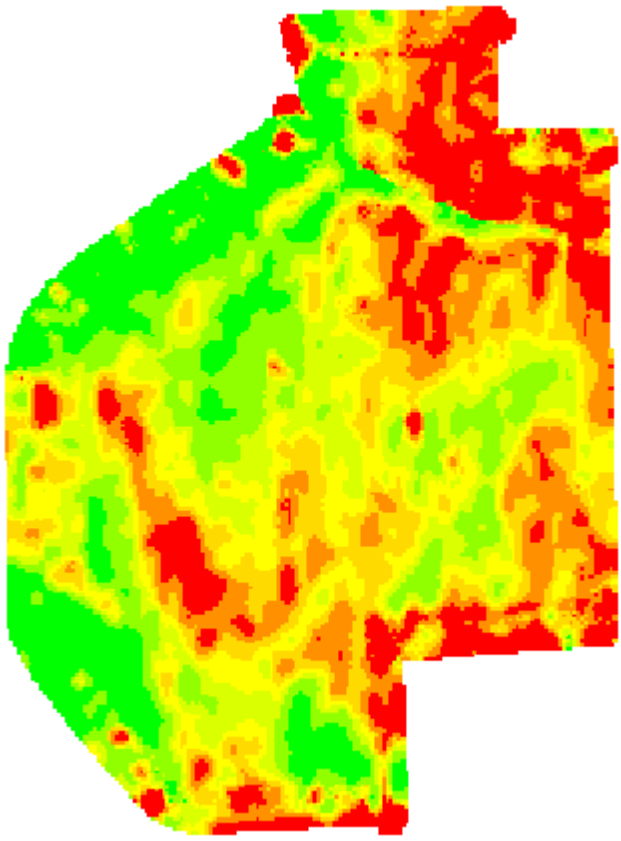


Figure 4. 2018 Grain Harvest Data



Yield by Organic Matter Study Continued:

Table 2. illustrates the correlation of yield to spatial levels of organic matter. As organic matter levels increased, yield increased with them 90% of the time. Table 3. depicts lowest, average, and highest corn yields by organic matter range levels, also depicting a very strong relationship of organic matter to corn yield.

Table 3. calculates the yield index of organic matter to harvest results. This yield index is calculated by dividing yield in (Bu/A.) by actual organic matter % levels. Overall, average organic matter equaled approximatley 55 Bu/A. corn yield. If we break the data into three tiers (low, average, high), lowest OM levels averaged 47 Bu/A., and highest OM levels resulted in average corn yield of 64 Bu/A. Now that we have access to accurate organic matter collection, it could be interesting over time to evaluate average yield index by organic matter spatial zones to help better understand production zones. This would in turn create valuable attributes for prescriptions such as seeding rate, multi-hybrid planting, and fertility.

Table 2.

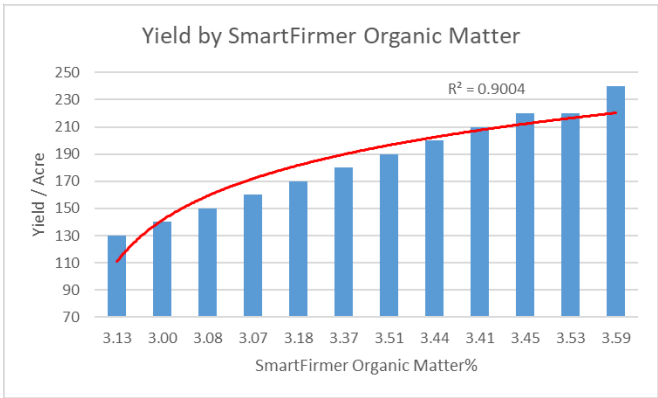


Table 3

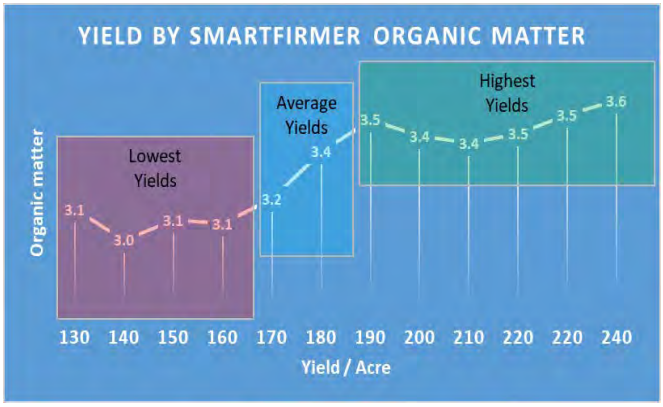
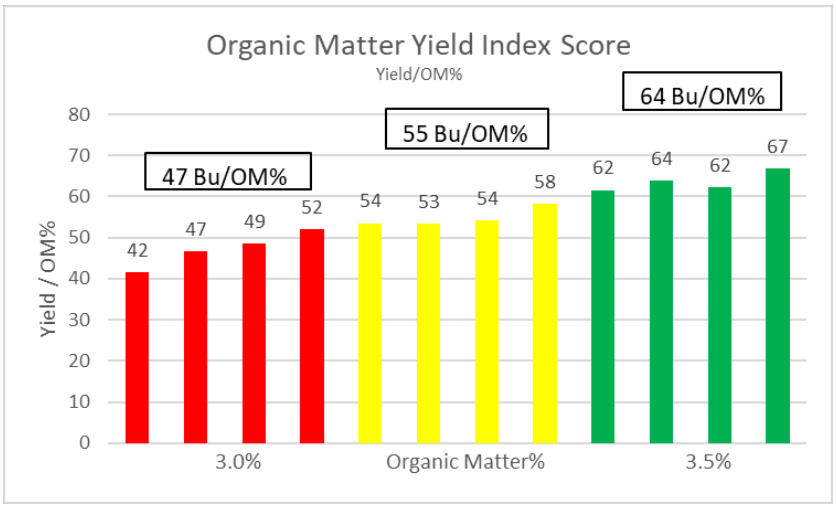


Table 4.



2018 PTI Results

Pre-Harvest Yield Estimation Study

Objective: To calculate pre-harvest yield estimations and compare the accuracy levels of ear weight/moisture versus kernels/Bu. formulas.

A common method used to perform pre-harvest yield estimations has been to calculate ear count multiplied by average kernels round, multiplied by average kernels in length, and divided by the number of kernels of a bushel of corn (Figure 1). The problem with this method has been that determining the number of kernels in a bushel of corn varies with different genetics due to size and weight of grain. Corn genetics can vary from hybrid to hybrid and even weather can commonly cause inconsistent test weights and kernel depth from location to another.

$$\frac{\text{(Avg. Ear Count * Avg Round * Avg Length)}}{\text{90,000 kernels/Bu}}$$

Figure 1. Kernel Count Calculation Method

Another pre-harvest yield estimate method is to calculate ear count multiplied by the actual average weight of the ears (Figure 2). Since a portion of the ear weight is water from the moisture level of the grain, a moisture reading must take place to differentiate the weight of the actual grain. This calculation accounts for the weight of the grain and more closely depicts yield estimation.

$$\frac{\text{Avg Ear Count * Avg Ear Weight lbs.}}{\text{(1.411\% * Grain Moisture) + 46.2}}$$

Figure 2. Ear Weight/Moisture % Method

Results: 34 corn hybrids evaluated in this study indicate that using the traditional kernel/Bu. method of calculating corn yield at 90,000 kernels, under-estimated yield by an average of -15%. Table 1. Illustrates the wide variance of yield calculation error varying from +0.05% to -0.33%. To correct the error, an average of 76,500 kernels should have been implemented to account for an average accurate yield range depiction.

Conversely, the ear weight and moisture yield estimation did under-estimate actual yield by -8%, but increased the accuracy by 53% versus the kernel/Bu. method. The interesting aspect using this formula is the very tight range of yield error, compared to the wide swings of the alternative method.

2017 resulted in the kernel/Bu. method being in error by -30% using 90,000 kernels/Bu. and the ear weight and moisture method -7%.

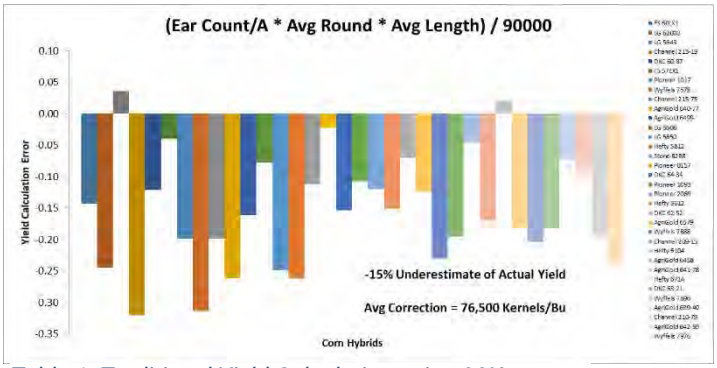


Table 1. Traditional Yield Calculation using 90K

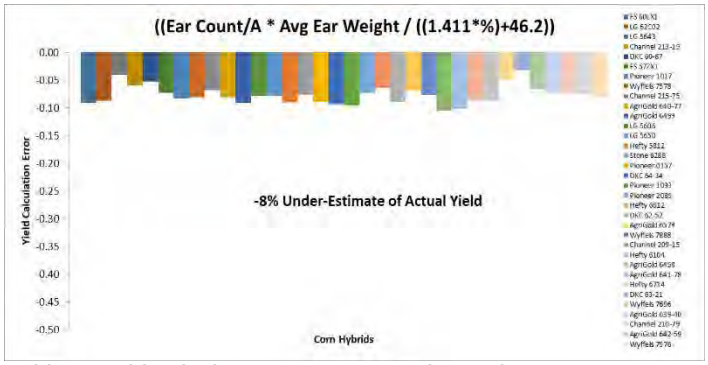


Table 2. Yield Calculation using ear weights and moisture

2018 PTI Results

Genetic Test Plot

Objective: To evaluate multiple corn genetics from various seed organizations to monitor yield performance.

Hybrid	
LG62C02SS	242.6
LG5650SS	240.6
Wyffels 7888SS	238.8
Pioneer 1366AMXT	231.8
Wyffels 7578SS	237.5
Wyffels 7696VT2P	236.7
Wyffels 7976VT2P	236.7
AgriGold 642-59STX	235.1
Channel 215-75VT2P	235.0
FS 63-ZX1SS	233.1
Channel 213-19VT2P	230.6
Hefty 6714SS	230.1
AgriGold 6499STX	228.6
Stone 6458SS	228.0
Hefty 6104SS	223.6
AgriGold 6579STX	222.9
DKC 63-21SS	220.8
FS 64SX-1SS	220.0
AgriGold 639-40VT2RIB	219.4
LG5643SS	218.9
LG5606SS	218.0
Stone 6288SS	216.5
DKC 62-52SS	215.5
AgriGold 641-78	214.0
Pioneer 0825AMXT	212.7
Channel 210-79DGVT2P	210.8
DKC 64-34SS	210.5
FS 60LX-1SS	209.7
Channel 209-15VT2P	207.5
AgriGold 640-77STX	206.9
Pioneer 1017AMXT	204.2
DKC 60-87SS	203.3
Pioneer 1093AMXT	203.1
FS 57ZX-1SS	201.4
Pioneer 0707AMXT	193.1
Hefty 6612VT2P	192.5
Hefty 5812VT2P	188.3
Pioneer 0157AMXT	176.5

Planting Date: 5/5 *Hybrid: Multiple* *Population: 36K* *Row Width: 30”* *Rotation: CAB*

2018 PTI Results

Soybean Tillage Study

Objective: To evaluate the yield and economic impacts of various tillage programs in a soybean after corn rotation. Tillage programs include conventional tillage, strip-till, vertical till, and no-till.

Table 1. University of IL Machinery Cost Estimates

Conventional	Ripper	$	15.40
	Soil Finisher	$	10.10
	Plant	$	13.90
		$	39.40
Strip	Strip	$	23.20
	Plant	$	14.00
	Burndown	$	8.00
		$	45.20
Vertical	Vertical	$	12.10
	Burndown	$	8.00
	Plant	$	14.00
		$	34.10
NoTill	Burndown	$	8.00
	Plant	$	14.00
		$	22.00

Figure 1. Sunflower® 4630 Disc Ripper

Figure 2. Sunflower® 6833 Vertical Tillage Tool

Figure 4. Challenger® 1042 planting in No-Till

Figure 3. Case IH Steiger® Series with Strip-Till Bar

Soybean Tillage Study Continued:

Results: To understand both yield and economics, the University of Illinois Machinery Cost Estimate Summary is used to calculate individual cost of each tillage program (Table 1). For the three reduced tillage programs, an $8/A. burn-down is also included.

Table 2. illustrates overall yield for each tillage segment. Yields varied within 3.2 Bu/A. between all tillage programs with conventional till and strip-till offering highest yields at 56.4 and 56.3 Bu/A.

After applying all appropriate costs to each individual tillage segment, Table 3. depicts the economics of each system. Vertical tillage offered the lowest overall returns in the study, with reduced revenue of -$10.12/A. compared to strip till and -$18.70/A. to conventional till. No-Till performed very similar with lower returns of -$3.87/A. and -$10.12/A. respectively.

Table 2.

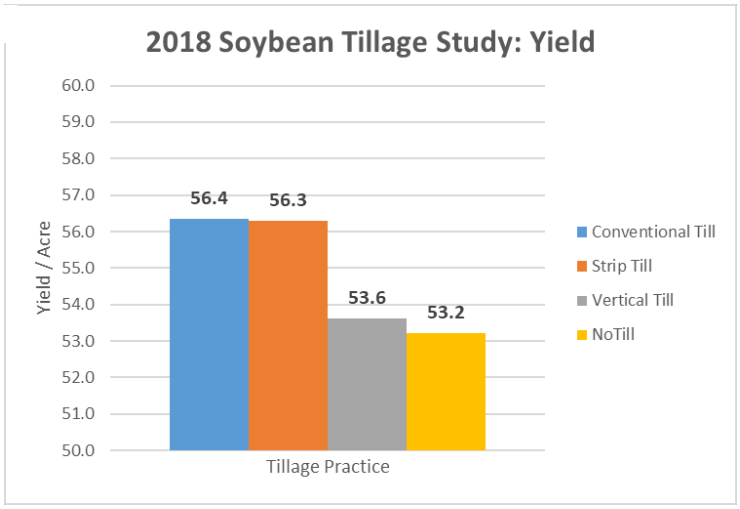
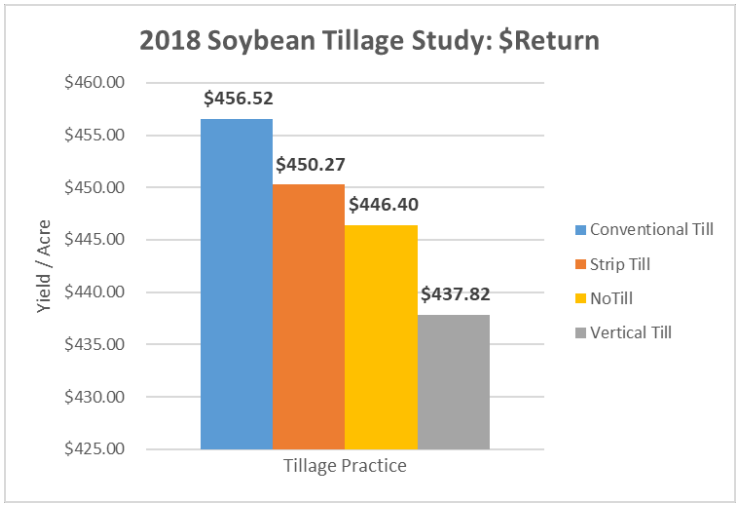


Table 3.



Planting Date: 5/10 *Variety: Pioneer 31A22X* *Population: 140K* *Row Width: 30"* *Rotation: BAC* *SB Price: $8.80*

2018 PTI Results

Soybean Closing Wheel Study:

Objective: To evaluate the performance of closing wheels in four different tillage systems. Closing wheels are designed to close the seed trench, eliminate sidewall compaction/smearing, remove air pockets, all at the same time achieving good seed-to-soil contact. This study evaluates four distinct types of closing wheel systems in a conventional, strip, vertical, and no-till soybean after corn rotation.

Dual Martin Dimple™ Spike Closing System:

Advantages: Pack and seal type system. Moisture saving.

Disadvantages: In wet soils, can't shatter side-wall smear

Hard to close trench in reduced till or wet soils

Dual Smooth Rubber Closing System:

Advantages: Lifts and fractures sidewall compaction/smear

Center ring acts as depth maintainer

Disadvantages: Potential plugging

Dual Poly Twister™ Spike Closing System:

Combination of above two systems for variable soils

Single Rubber/Yetter Poly Twister Spike Closing System:

Advantages: Lifts and fractures sidewall compaction/smear

Versatile heavy wheel, great for reduced tillage

Depth Maintaining

Disadvantages: Extra weight can be aggressive

2018 PTI Results

Conventional Tillage Results:

Conventional tillage consisted of a disc ripper in the fall, followed by a soil finisher in the spring directly before planting. Yields within this tillage system varied only 0.8 Bu/A. over all the four different closing systems (Table 1). In general, conventional tillage offers an easier environment for closing wheels to perform, making selections of closing systems more foregiving.

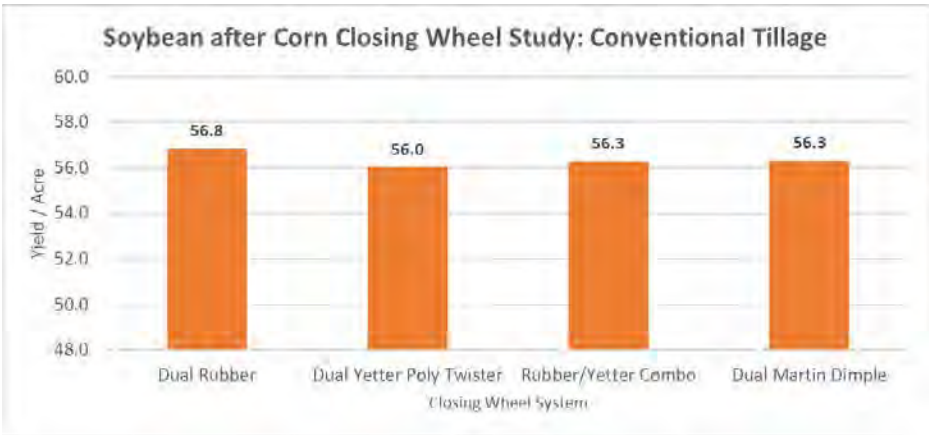


Table 1.

Strip-Till Results:

Strips were created after harvest with a shank/knife type system directly between the existing corn rows. Each of the other closing systems realized significant yield gains over standard dual rubbers, however Martin dual dimples offered the highest gains by +4.7 Bu/A. (Table 2)

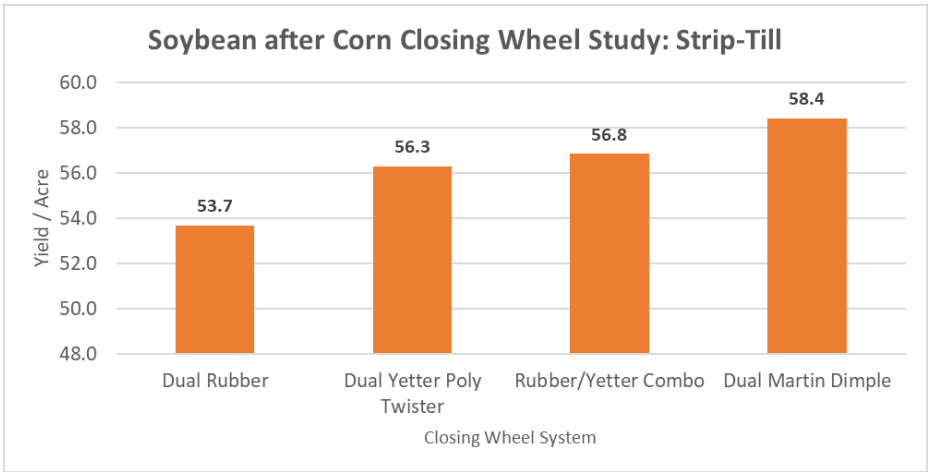


Table 2.

Vertical Tillage Results:

Vertical tillage in the fall after harvest was designed to lightly till, size residue, and anchor a portion of the residue into the upper few inches of soil. Smaller yield gains were noticed in this tillage segment, however "Spike" type systems such as the dual Yetter Twisters and the Martin dual dimples did offer yield gains of 2.6 and 2.3 Bu/A. respectively.

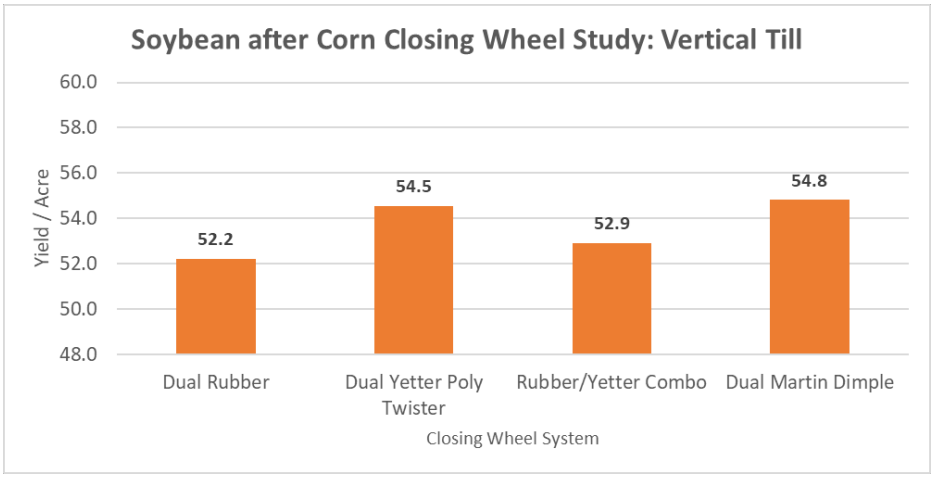


Table 3.

2018 PTI Results

No- Till Results:

Planting directly into the center between last year's corn rows in a no-till environment showed the biggest differences in closing wheel system performance in this study. Table 4. shows that Dual rubber closers suffered losses of **-3.7 to -5.1 Bu/A.** compared to the other systems. Not surprisingly in a no-till system, the more aggressive "spike" type closers such as the dual Yetter Twisters and Martin dual dimples showed the highest yield gains of +4.2 and +5.1 respectively. At $8.80 soybeans, these yield gains would equate to additional revenue of $37 to $44/A.

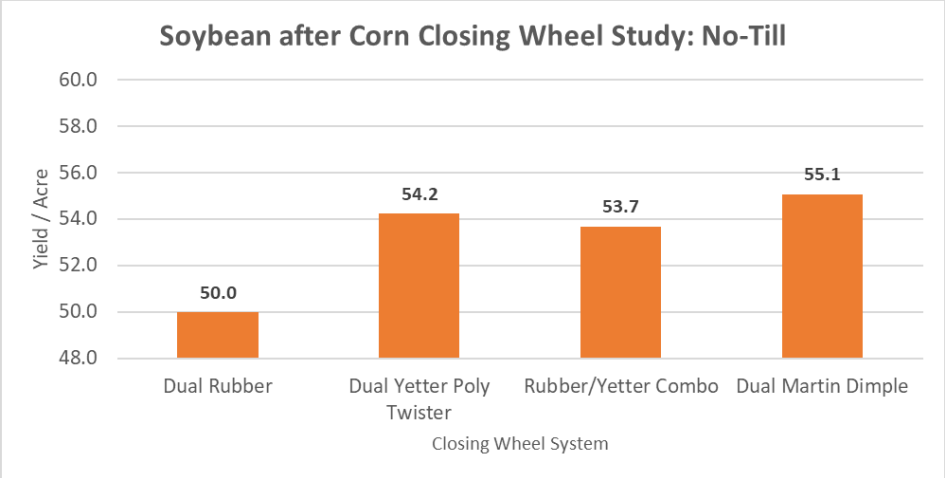


Table 4.

Table 5. illustrates the average soybean yields of closing wheel systems over all four tillage environments. Traditional dual rubber closers lost an average of **-1.7 to -3.0 Bu/A.** compared to all three of the other systems. These average losses tally from **-$15.41 to -$26.24/A.**, which helps clarify the significance of having and implementing the correct closing wheel system on the planter.

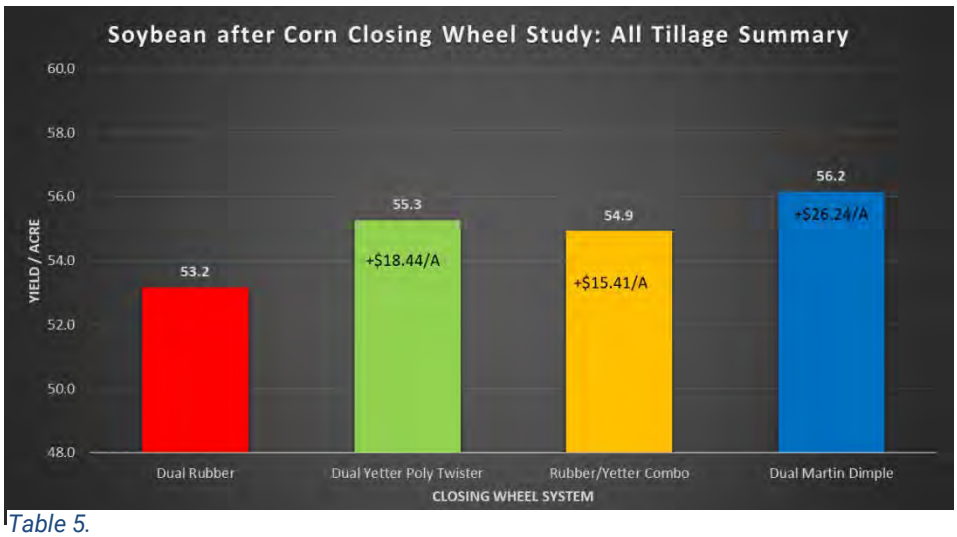


Table 5.

Planting Date: 5/10 *Variety: Pioneer 31A22X* *Population: 140K* *Row Width: 30"* *Rotation: BAC* *SB Price: $8.80*

2018 PTI Results

Soybean Fertility Study

Objective: To evaluate yield and economic net return of four multi-year long-term fertilizer programs in soybeans. Programs, products, and costs consist of the following:

1. 100% Dry Fertilizer:

18-46-0 Cost = $39.78/A. 0-0-60 Cost = $21.53/A.

Build-up and Maintenance Program

.75#P/Bu at Yield Goal 70	= 115# /A	
Soil Test P=36#/A, Build to 50	= 70#/A	
Total	***185#/A***	***18-46-0***
1.17#K/Bu at Yield Goal 70	= 135#/A	
Soil Test K=260#/A, Build to 300	= 70#/A	
Total	***205#/A***	***0-0-60***

2. 0% Fertilizer: No Fertilizer Applied

3. 100% Liquid Fertilizer: Agro-Liquid Build-up and Maintainence Program

Cost/A.	Product	Application
$ 11.60	2 Gal Pro-Germinator® 9-24-3	FurrowJet
$ 22.80	4 Gal Sure-K® 2-1-6	FurrowJet
$ 4.13	1 Qt Micro 500™ .02B-.25Cu-.37Fe-1.2Mn-1.8Zn	FurrowJet
$ 6.00	1 Qt C-Tech® Hydrophobic Fulvic Acid	FurrowJet
$ 8.80	2 Gal AccesS® 7-0-0-17S-.25Fe-.05Mn-.05Zn	Conceal
$ 6.30	1 Gal Ferti-Rain® 12-3-3-1.5S-.1Fe-.05Mn-.1Zn	R1 Foliar
$ 8.80	2 Gal Sure-K® 2-1-6	R1 Foliar
$ 2.16	1pt Boron 5% Boron	R1 Foliar
$ 4.50	1 Qt Manganese 4% Manganese	R1 Foliar
$75.08/A		

4. Dry Fertilizer Soil Test Build-up + Liquid Fertilizer Yield Maintainence

Soil Test P=36#/A, Build to 50= 70#/A 18-46-0
Soil Test K=260#/A, Build to 300= 70#/A 0-0-60
Agro-Liquid Maintainence Program

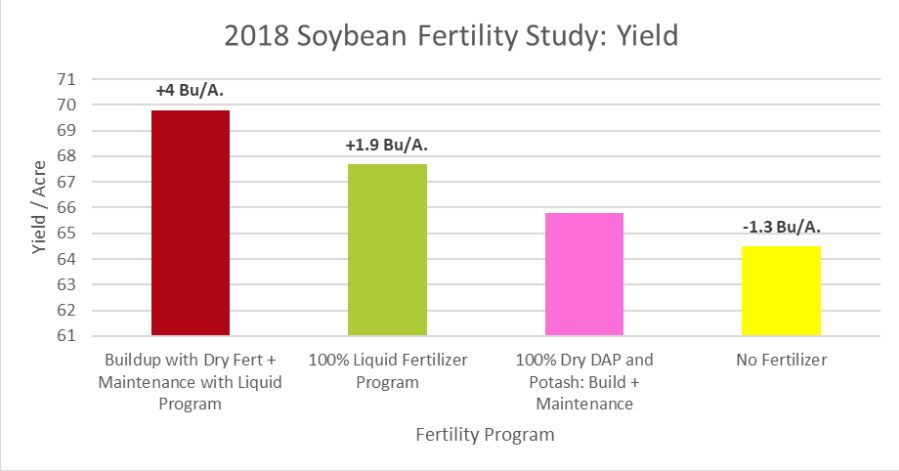
Cost/A.	Product	Application
$ 8.70	1.5 Gal Pro-Germinator 9-24-3	FurrowJet
$ 8.80	2 Gal Sure-K 2-1-6	FurrowJet
$ 4.13	1 Qt Micro 500 .02B-.25Cu-.37Fe-1.2Mn-1.8Zn	FurrowJet
$ 6.00	1 Qt C-Tech Hydrophobic Fulvic Acid	FurrowJet
$ 8.80	2 Gal accesS 7-0-0-17S-.25Fe-.05Mn-.05Zn	Conceal
$ 6.30	1 Gal Ferti-Rain 12-3-3-1.5S-.1Fe-.05Mn-.1Zn	R1 Foliar
$ 8.80	2 Gal Sure-K 2-1-6	R1 Foliar
$ 2.16	1pt Boron 5% Boron	R1 Foliar
$ 4.50	1 Qt Manganese 4% Manganese	R1 Foliar
$58.19/A		

2018 PTI Results

Soybean Fertility Study Continued:

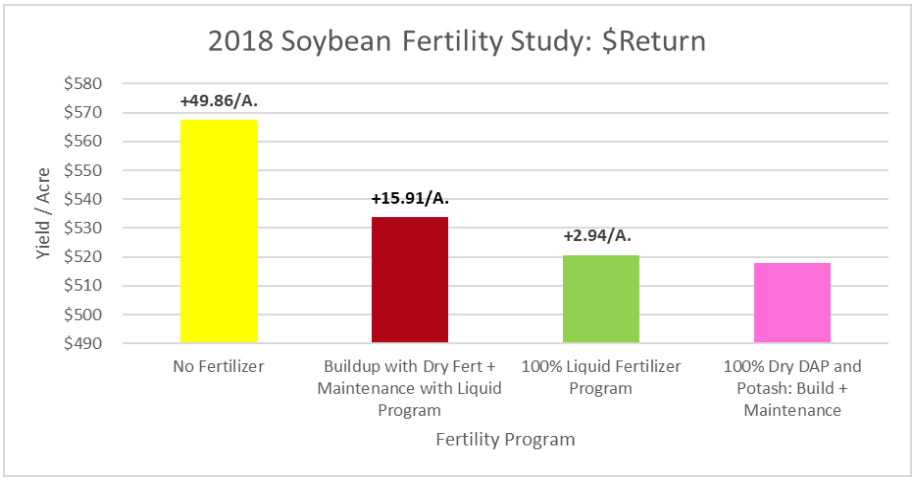
Results: Year one results were quite surprising as highest soybean yields occurred at 69.8 Bu/A. with the Buildup with Dry+Maintenance with Liquid program (Table 1). However, there was only a 1.3 to 4.0 Bu/A. yield variance between all the four fertility programs.

Table 1.



Applying no fertilizer at all only incurred yield losses of **-1.3 Bu/A.** compared to the 100% Dry Fertilizer program with DAP and Potash. Therefore, having no real fertility cost, it incurred the highest net return at +$49.86/A. (Table 2). It is doubtful that over time, this fertility program could be sustainable, but it will be interesting to monitor this continuous zero fertilizer treatment over the next few years, watching soil fertility levels decrease, while still analyzing overall yield performance and economic trends from year to year.

Table 2.



Challenging the status quo allows us to benchmark our current programs and compare it to potential other programs to evaluate yield performance, efficiencies, and economics. The 100% Dry Fertilizer program for soil test build-up and yield maintenance with DAP and 0-0-60 is traditionally one of the most common programs in the Corn Belt by ag retailers and producers. Using this as our control, allows us to compare other programs to address fertility and compare to typical standards.

All fertilizer applications are intended to be applied each year as part of a multi-year long-term study, with each program spatially being constant in a corn and soybean rotation.

Planting Date: 5/6 Variety: Asgrow 36X6 Population: 140K Row Width: 20" Rotation: BAC SB Price: $8.80

DAP: $430/T 0-0-60: $210/T

2018 PTI Results

pH Acidity Study:

Objective: To evaluate the long-term yield and economic impact of acidic soil pH in soybeans.

When the PTI farm was acquired in the fall of 2017, a soil test revealed some major issues with soil pH on a particular area of the east side of the farm. Soil test results indicated average pH values of 5.1, with lows of 4.7 pH. This acidic area offered an opportunity to evaluate the yield response of acidic soils compared to corrected basic or neutral pH soils. Lime was applied in 2017, however plots were left un-limed to represent long-term pH testing.

What is soil pH? The term pH stands for the potential (p) of hydrogen ions (H+) in water, and indicates a measure of the relative acidity or alkalinity of the soil solution. Soil pH is calculated on a 14-point scale, where a value of 7.0 is considered neutral or basic (Figure 2). Lower values on the pH scale denote increasing H+ ions and acidity, while higher values represent increasing hydroxyl (OH-) ions and alkalinity. Because pH is expressed on a logarithmic scale, each change of 1 pH unit actually represents a 10-fold increase in soil acidity or alkalinity.

Figure 3. indicated the influence of soil pH on nutrient availability of various macro and micronutrients.

Figure 1. 2017 Soil Test pH

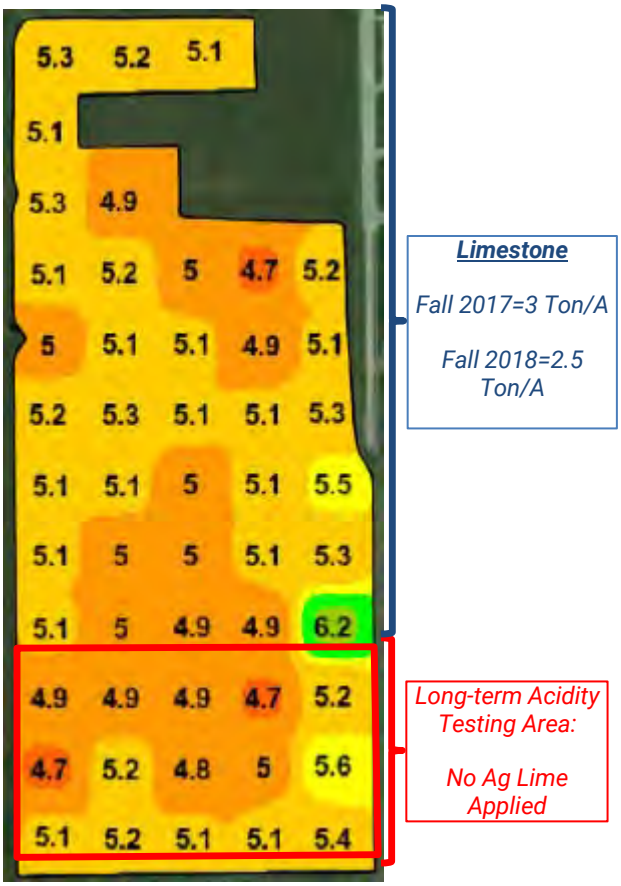


Figure 2. The pH Scale

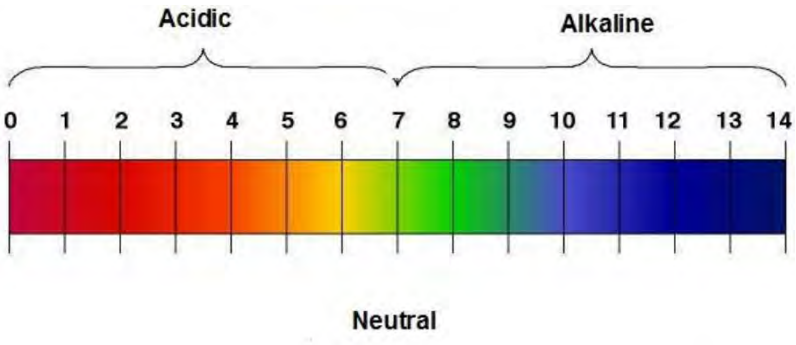
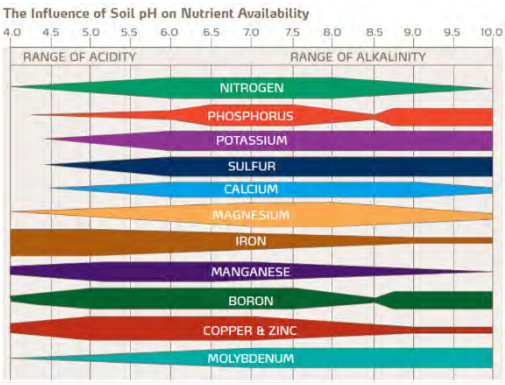


Figure 9. Application of Ag Lime Fall 2017



pH Acidity Study Continued:

Results: Table 1. illustrates that in our first year of this soil acidity study in soybeans, there was a significant yield loss in acidic soils near 5.1 pH. 2018 yield data revealed a **-7.5 Bu/A. yield loss** in soybeans. Ag limestone applications from 2017 proved a return on investment of $5.91/A., indicating that all the limestone was paid for in just year one of the study in soybeans.

Being designed as a long-term multi-year study, we will continue this trial over the years to come to monitor yield, nutrient deficiencies, or other stress factors.

Table 1. Ag Lime Year 1 Yield

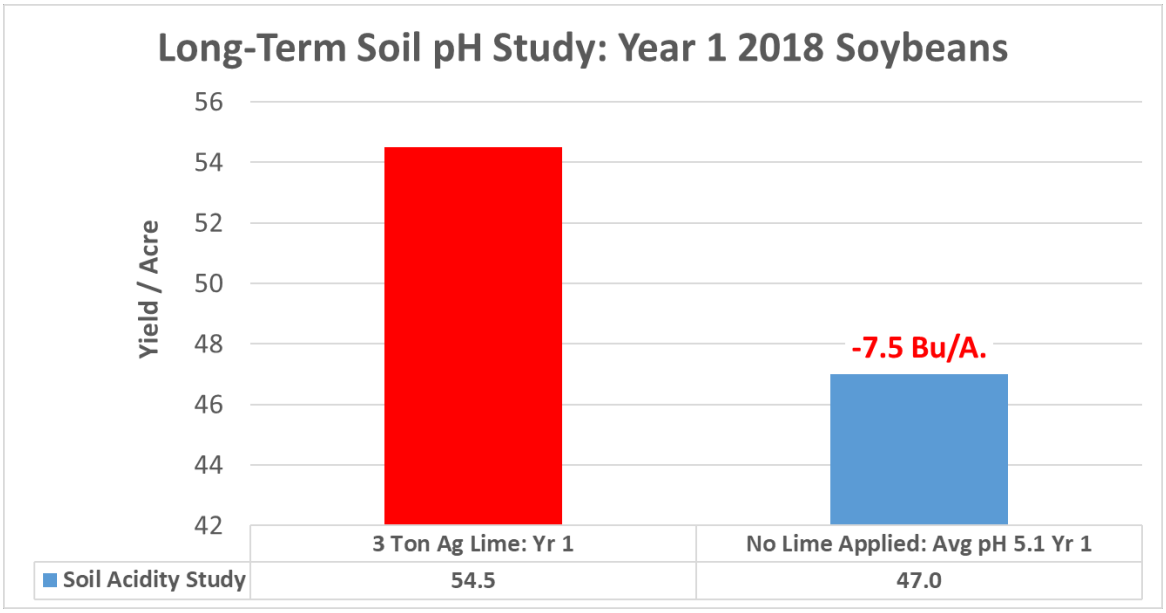
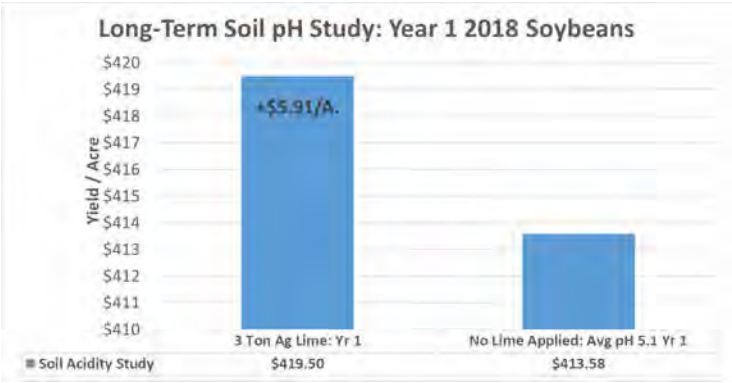


Figure 4. Fall 2017 3 Ton/A. Ag Lime Application

Table 2. Ag Lime Year 1 Economics



Planting Date: 5/8 *Variety: Pioneer 31A22XR* *Population: 140K* *Row Width: 30"* *Rotation: SAC* *Prices: Soybeans $8.80*

2018 PTI Results

Soybean Planting Date Study

Objective: To evaluate various soybean planting dates throughout the spring planting season to determine optimum planting date. Once optimum yield is discovered, data can then be analyzed to determine the deviation of yield at both early and late planting dates compared to traditional norms.

Figure 1. Soybean Planting Date Trial

Figure 2. Snowfall on March 23rd

Results: With the recent trend of earlier soybean planting dates achieving higher yields, it was our intention to plant as early as possible in this study. Due to abnormally warm and dry conditions in March, our first planting date entry was able to be planted on March 22nd. Ironically, 24hrs after planting, 13" of snow fell at the PTI farm (Figure 2). However, this planting date offered the highest soybean yields at the Precision Technology Institue at 83.8 Bu/A. Table 1. illustrates that as additional planting dates were placed within the study, yields fell at every weekly planting date.

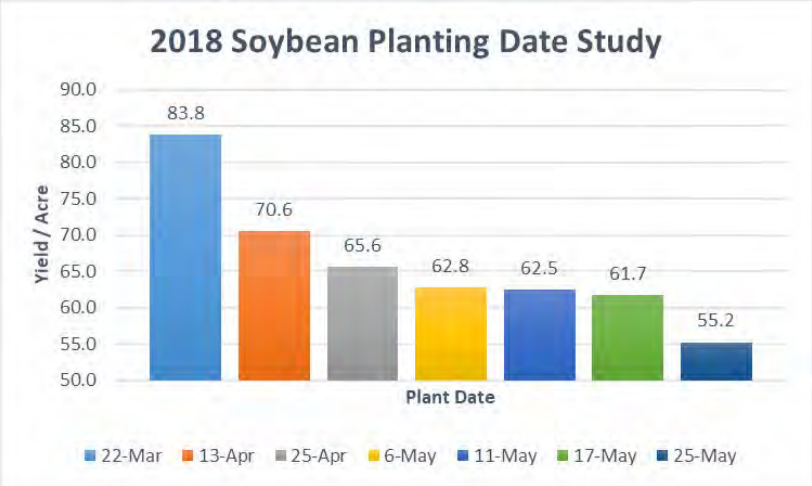


Table 1.

Table 2. reveals the percentage of yield gain or loss from planting dates that deviate from a traditional planting date of May 6th. March 22 yields resulted in highest deviations at +34%, while April dates of 13th and 25th at tallied gains of +12% and +5%.

May 11th, 17th, offered stable deviations of **-1% to -2%,** while late May 25th plantings netted **-12%** yield losses.

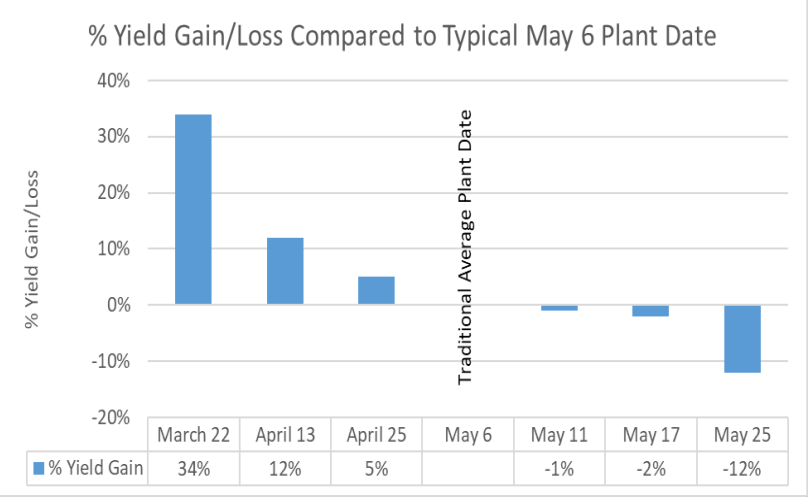


Table 2.

Planting Date: Varied *Variety: Pioneer 31A22X* *Population: 140K* *Row Width: 30"* *Rotation: BAC* *SB Price: $8.80*

2018 PTI Results

At-Plant Film Study

Objective: This study evaluates the use of an at-plant 90-day biodegradable film that is designed to create a greenhouse effect to warm soils and preserve moisture. Film was laid directly over top of a planted row and has slits at 3-inch intervals directly above the seed placement. This film traps heat from the sun, raises soil temperatures, thus increasing heat units. At the same time, the film locks moisture underneath it, preserving that water for plant uptake throughout the growing season.

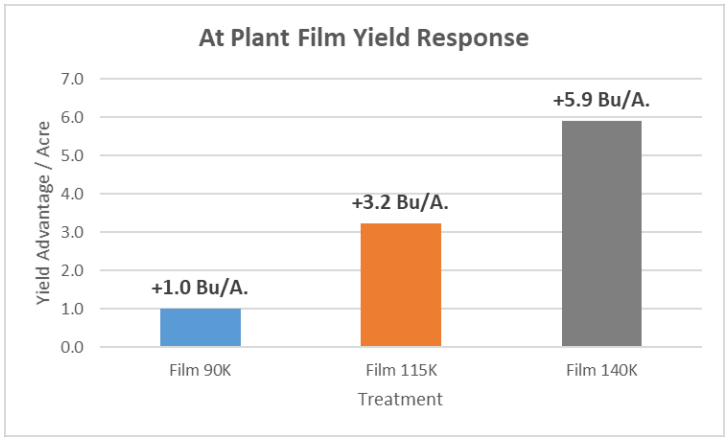
Figure 1. Norseman Techni-Plant FL Precision Planter

Figure 2. Close-Up View of Film After Planting

Results: The at-plant biodegradable film worked excellent on our early April 13th planting dates. Still having cold soil temperatures below 50 degrees, the film was utilized to help insulate and warm the soil surface. In fact, after only two hours after planting it was common to see soil temperatures near 7 degrees warmer due to the film's warming effect.

As for yield, the at-plant film increased yield by an average of 3.4 Bu/A., however there was a stark contrast in response to seeding rate. Three seeding rates were replicated and evaluated at 90K, 115K, and 140K populations. The results proved that the higher the seeding rate, the higher the yield response from the at-plant film due to 7 weeks of drought conditions in July and August. The highest seeding rate of 140K offered the highest yield gains of +5.9 Bu/A. with additional gross revenue of +$51.92/A. As seeding rates decreased to 90K and 115K, yield response also decreased to +3.2 and +1.0 Bu/A. respectively, with additional gross returns of +$28.16 and +$8.80/A.

Table 1.



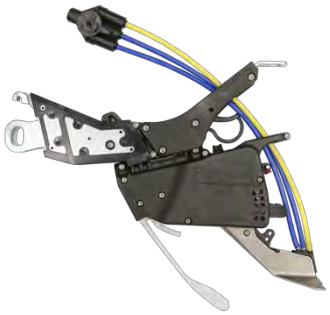
Concerning return on investment, Norseman Techni-Plant FL states that the cost for the 90 day biodegradable film is estimated at $100/A. With this cost, break-even yield would occur at 11.4 Bu/A., indicating that all treatments fell short of profitability.

We look forward to testing this interesting technology and finding ways to protect and improve corn yields in the future. Special thanks to Michael Freeman for supplying the use of the film planter for Precision Planting agronomic research.

Planting Date:Varied Hybrid:Pioneer 31A22X Population: 130K Row Width: 20" Rotation:BAC SB Price: $8.80

2018 PTI Results

Starter Fertilizer Response by Planting Date:



Objective: To monitor the performance of starter fertilizer at various planting dates. Does starter fertilizer pay in soybeans? If so, when does starter fertilizer give the highest returns? Does starter fertilizer respond differently at earlier planted dates versus later? In this study we evaluate five planting dates consisting of April 13th, April 25th, May 6th, May 11th, and May 17th and how a Marco fertilizer 6-20-4-.25Z-2.7S applied via FurrowJet wings at 5 Gal/A. responds throughout the planting season window.

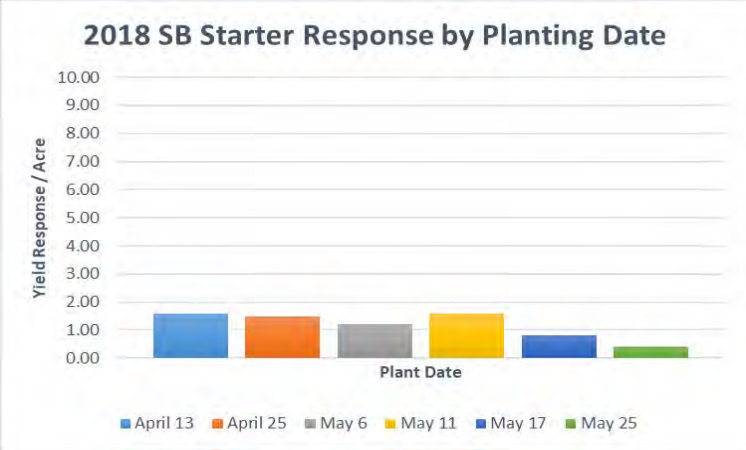


Table 1.

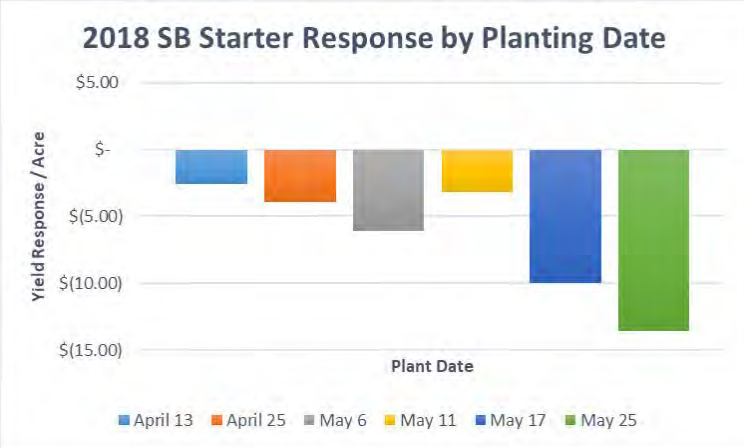


Table 2.

Conclusion: Starter fertilizer did not impact soybean yields, in fact response in yield was less than 2 Bu/A. in every planting date treatment (Table 2). Consequently, starter fertilizer treatment resulted in net losses of **-$2.56 to -$13.56/A.**

More research needs to be done to fully analyze the benefits of starter fertilizers in soybean and the response by soybean planting date.

Planting Date:Varied *Hybrid:Pioneer 31A22X* *Population: 130K* *Row Width: 20”* *Rotation:BAC* *SB Price: $8.80*

Fertilizer Pricing: Marco LTE 6-20-4-.25Zn-2.7S $3.40/Gal

2018 PTI Results

SoyShot™ FurrowJet® Trial

Objective: This FurrowJet application trial evaluates the yield and net return of in-furrow treatments of SoyShot. This liquid fertilizer is a 0-10-10-0.1Zn that contains an ortho EDDHA chelating agent Levesol, which aids to increase the availability of phosphorus and micronutrients in the soil.

Grade 0-10-10
GUARANTEED ANALYSIS

Available Phosphate (P_2O_5)	10%
Soluble Potash (K_2O)	10%
Zinc (Zn)	0.1%
0.1% Chelated Zinc (Zn)	

Derived from: Phosphoric acid, potassium hydroxide, zinc ortho-ortho EDDHA and zinc EDTA.

Results: SoyShot treatments were applied at 1-2 Gal/A. as a FurrowJet center in-furrow treatment and resulted in average gains of 2.6 Bu/A. over the untreated control (Table 1). These gains translated to average net returns of +$11.92/A. (Table 2).

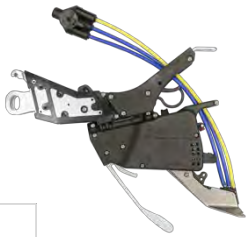


Table 1.

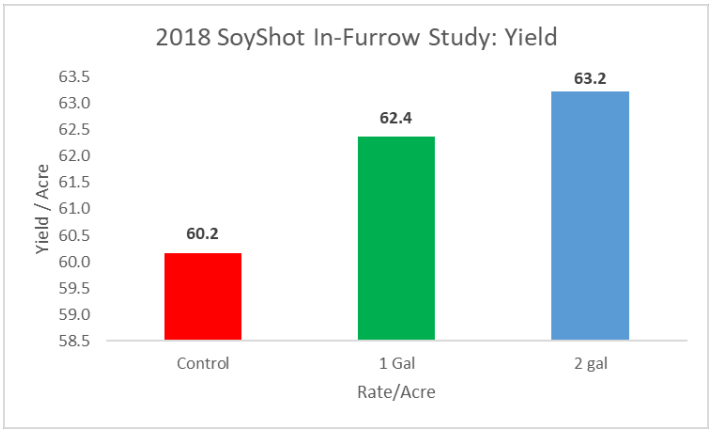
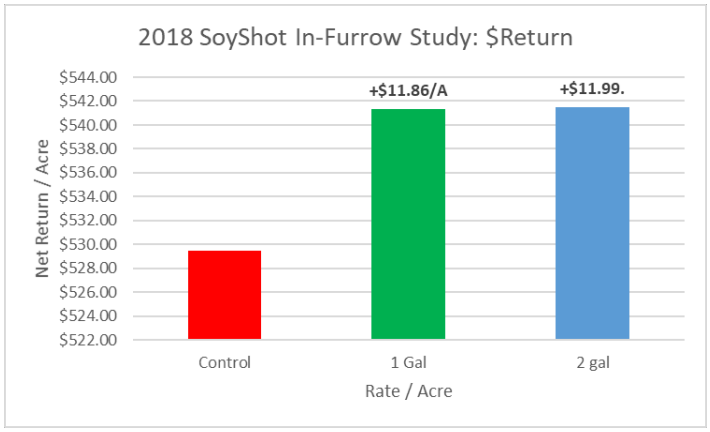


Table 2.



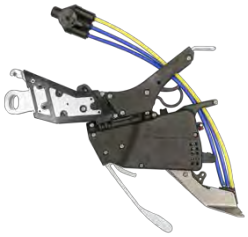
Planting Date:May 6 *Hybrid:Asgrow 36X6* *Population: 130K* *Row Width: 30"* *Rotation:BAC* *SB Price: $8.80*

SoyShot: $7.50/Gal

2018 PTI Results

NutriStart™ 7-22-5-.25Zn FurrowJet® Trial

Objective: This soybean FurrowJet application trial evaluates the yield and net return of in-furrow treatments of Marco Fertilizer Nutristart 7-22-5-.25Zn. This liquid fertilizer is a 70% polyphosphate and 30% orthophosphate formulation.



Results: 7-22-5-.25Zn treatments were applied at 5 and 8 Gal/A. as a FurrowJet wing treatments only. 8 Gal/A. treatments proved yield advantages of +5.5 Bu/A. with a return on investment of +$26.18/A. (Table 1-2)

5 Gal/A. rates reduced yield gains by 3 Bu/A. compared to the higher 8 Gal/A. rate, however still offered a net return on investment of +$8.18/A.

Table 1.

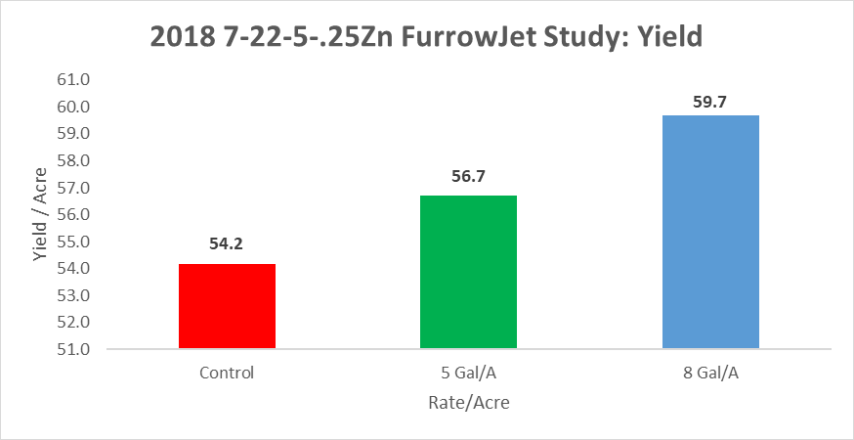
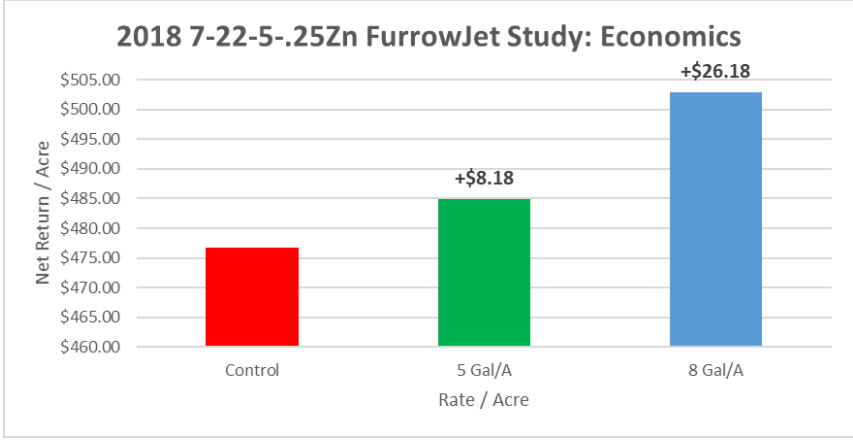


Table 2.



Planting Date:May 8 Hybrid:Asgrow 36X6 Population: 130K Row Width: 30" Rotation:BAC SB Price: $8.80

7-22-5-.25Zn: $2.80/Gal

2018 PTI Results

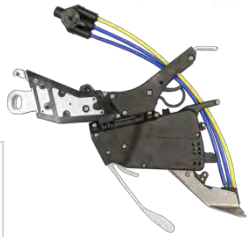
3-18-18 FurrowJet® Trial

Figure 1.

3-18-18 Liquid Fertilizer

Nutrients Supplied
(pounds per gallon)

Total Nitrogen (N)	0.35
Available Phosphate (P_2O_5)	2.11
Soluble Potash (K_2O)	2.11



Objective: This soybean FurrowJet application trial evaluates the yield and net return of in-furrow treatments of 3-18-18 at 5, 8, and 10 Gal/A. This liquid fertilizer is a 100% orthophosphate formulation that is immediately available for plant absorption and metabolism.

Results: 10 Gal/A. rates offered the highest yield at 56.0 Bu/A., however none of the individual treatments of 3-18-18 achieved positive net return on investment over and above the untreated control.

Table 1.

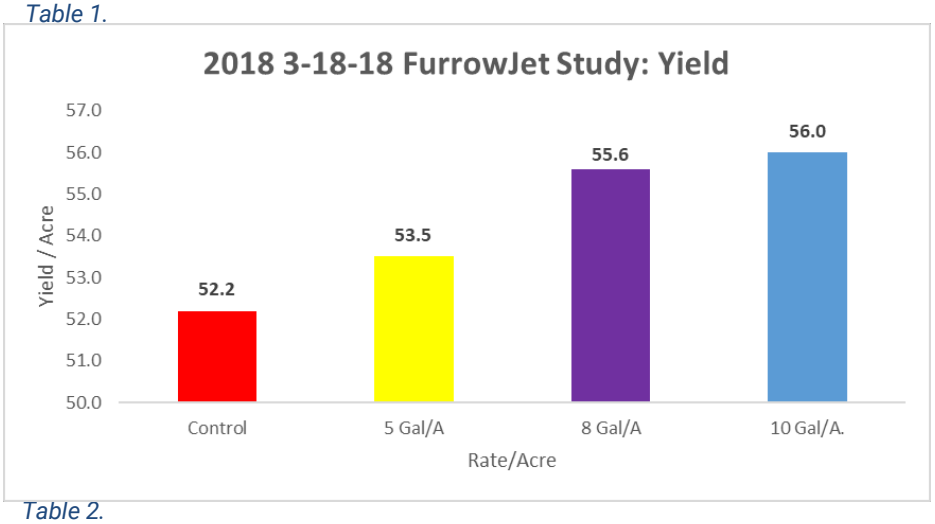
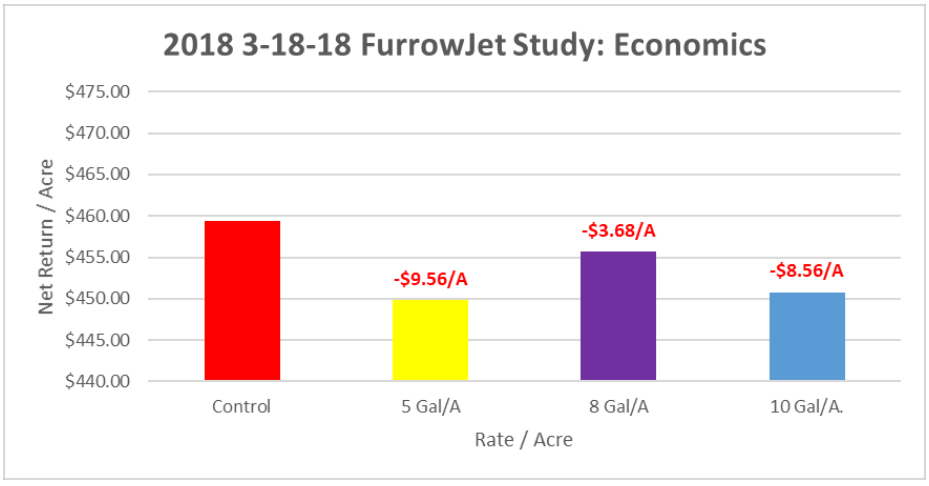


Table 2.



Planting Date:May 14 Hybrid:Asgrow 36X6 Population: 130K Row Width: 30" Rotation:BAC SB Price: $8.80

3-18-18: $4.20/Gal

2018 PTI Results

Nachurs Soybean Fertilizer Study

Objective: To evaluate the yield and net return of Nachur's at-plant and foliar liquid fertilizer and micronutrient products in soybeans.

The products used, rates, and application timings are as follows:

Product	Timing	Rate/A.
playmaKer® 2-6-16	At-Plant FurrowJet	2 Gal/A.
CropMax®	At-Plant FurrowJet	1 Qt/A.
Triple Option® 4-13-17-1S	Foliar V3	1 Gal/A.
Rhizo-Link® 3-10-13-.1Z	Foliar V3	1 Qt/A.

Results: Table 1. illustrates that in-furrow and foliar treatments increased soybean yield by +6.2 Bu/A. on average across all replications. At prices listed below, this yield increase translates into a positive return on investment of $33.76/A..

Table 1.

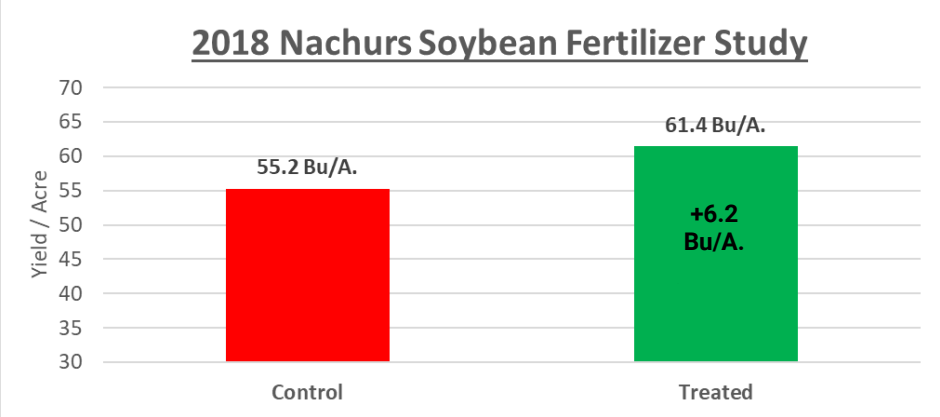


Figure 1. playmaKer

2-6-16 Liquid Fertilizer

Nutrients Supplied (pounds per gallon)	
Total Nitrogen (N)	0.21
Available Phosphate (P_2O_5)	0.62
Soluble Potash (K_2O)	1.68

Figure 2. Cropmax

2-0-2-.1B-.15Cu-.3Fe-1.5Mn-.0005Mo-4Zn Liquid Fertilizer

Nutrients Supplied (pounds per gallon)	
Total Nitrogen (N)	0.204
Soluble Potash (K20)	0.204
Boron (B)	0.010
Copper (Cu) EDTA	0.015
Iron (Fe) EDTA	0.031
Manganese (Mn) EDTA	0.153
Molybdenum (Mo)	0.00005
Zinc (Zn) EDTA	0.409

Figure 3. Triple Option

4-13-17-1S Liquid Fertilizer

Nutrients Supplied (pounds per gallon)	
Total Nitrogen (N)	0.45
Available Phosphate (P_2O_5)	1.46
Soluble Potash (K_2O)	1.91
Sulfur(S)	0.11

Figure 4. Rhyzo-Link

3-10-13-1S-.1Zn Liquid Fertilizer

Nutrients Supplied (pounds per gallon)	
Total Nitrogen (N)	0.32
Available Phosphate (P_2O_5)	1.07
Soluble Potash (K_2O)	1.39
Sulfur (S)	0.107
Zinc (Zn)	0.011

Planting Date: 5/8 *Variety: Asgrow 36X6XR* *Population: 130K* *Row Width: 30"* *Rotation: BAC* *Soybean Price: $8.80*

Fertilizer Pricing: playmaKer $4.90/gal *CropMax: $14.55/gal* *Triple Option: $4.90/Gal* *Rhizo-Link: $9.95/Gal*

2018 PTI Results

Conceal™ 14-12-4-6S Study:

Objective: This soybean application trial evaluates the yield and net return of Conceal dual band treatments of 12-12-4-6S at 10, 15, 20, and 30 Gal/A. This liquid fertilizer is a 70% polyphosphate and 30% orthophosphate formulation designed for non-infurrow applications. Conceal is an ideal placement for this product as it's far enough away from the seed furrow to prevent seed injury, but yet close enough to enable access to seedling nutrition.

Results: Tables 1-2. illustrate that 10 gallon rates of 14-12-4-6S offered both agronomic and economic optimum rate per acre. This rate garnered +4.9 Bu/A. yield increases with a return on investment of +$25.20/A. Fifteen gallon rates responded similarly with yield gains of +4.6 Bu/A. and positive return on investment of +$13.33/A.

The higher 20 and 30 gallon rates all saw positive yield gains over the control, however a negative return on investment was observed at **-$15.08 to -$38.46/A.** respectively.

Table 1.

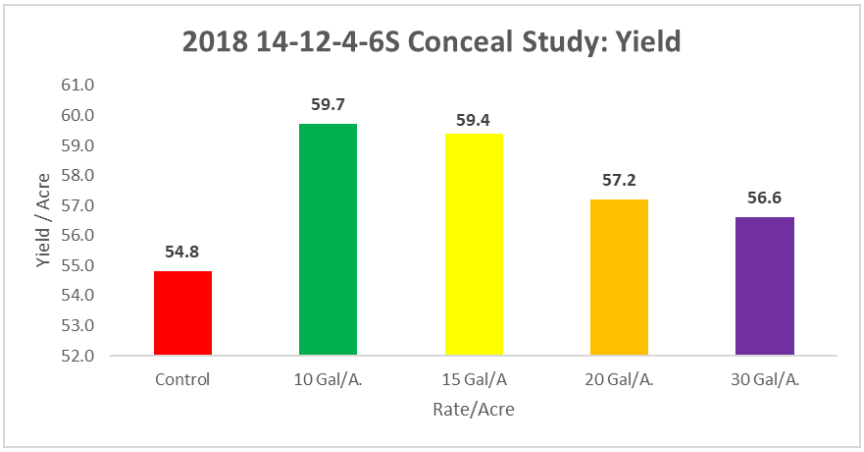
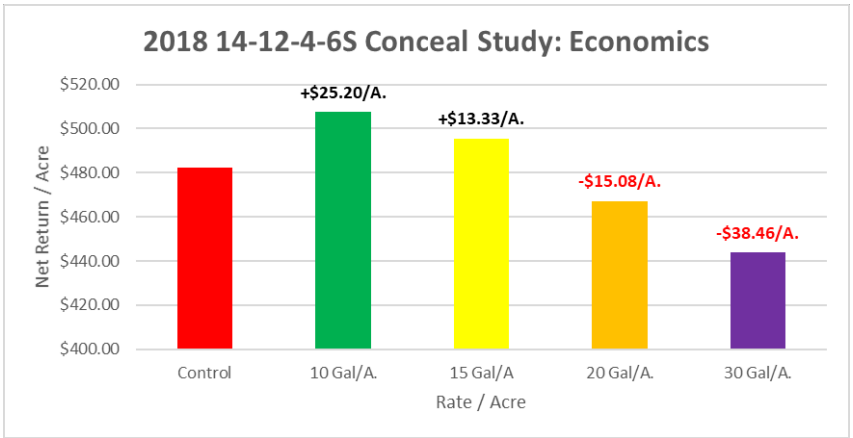


Figure 2. Conceal Dual Placement 3" from

Table 2.



Planting Date:May 14 Hybrid:Asgrow 36X6 Population: 130K Row Width: 30" Rotation:BAC SB Price: $8.80 14-12-4-6S: $1.81/Gal

2018 PTI Results

Chopping Head Study: Soybeans

Objective: To study the yield impact of utilizing a chopping corn head in no-till soybeans. A Capello Quasar™ chopping head (Figure 1-2) is used to create replicated strips of chop and non-chop residue management trials. The goal of this trial is evaluate sizing of residue (Figure 3) and allowing heavy stalks and residue to break down faster to advance the degradation process.

Results: Chopping corn residue improved soybean yields by 3.3 Bu/A. and increased gross revenue by $29.02/A. (Table 1). If this yield gain was sustainable each crop year, Table 2. illustrates the potential additional revenue generated annually based upon acreage size. This revenue could be appropriated to account for cost of equipment (purchase or maintenance) to properly size residue.

Figure 1.

Table 1. 2018 Yield Results

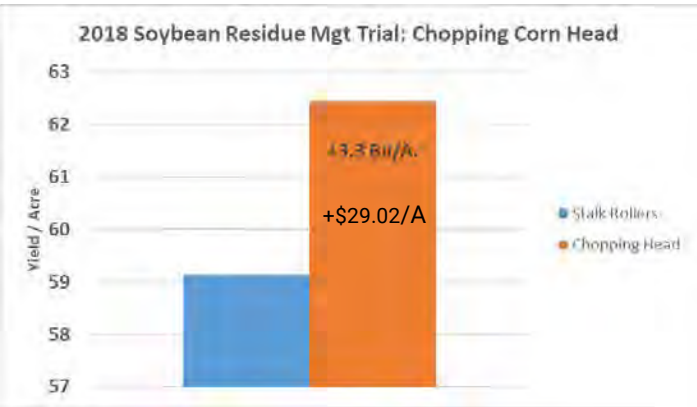


Figure 2.

Table 2. 2018 Summary of Revenue Based on Acre Size

Figure 3.

Planting Date: 5/7 *Variety: Asgrow 36X6XR* *Population: 140K* *Row Width: 30"* *Rotation: SAC* *Soybean Price: $8.80*

2018 PTI Results

Wrap Up:

Precision Planting is excited to share our inaugural PTI Pontiac research farm results and findings. We know the results will provide useful insights that help drive thoughtful consideration around future crop management. The PTI Pontiac research farm is working diligently to continue with long-term studies that provide multi-year data analysis for decision-making purposes. We will continue to work with our Precision Planting premier dealers to identify opportunities to find new research objectives, driving innovation and development of new solutions in the field. Precision Planting continues to find new ways to provide commitment to the development of innovations and insights that allow for the highest yield and ROI opportunities for your farm and family.

One of our goals at the PTI Farm is to continue to bring new, fresh, and unique ideas, so that when growers visit the farm they see and experience new technology. “Challenging the Status Quo” is important concept to us and we always want to offer the opportunity for growers to experience, compare, and challenge their traditional ways of farming to other means. We all know that change is inevitable, but knowing what and when to change is critical to a business. At the PTI farm, we are excited about all of the agronomic trials slated for 2019, but we are also proud to announce some major renovation, conservation, and state of the art agronomy implemented at the farm for this next summer. You will not want to miss our upcoming field days and we look forward to seeing you throughout July-September at the Precision Planting Precision Technology Institute at Pontiac, IL.

Precision Planting would like to extend our sincere gratitude to the support and dedication of our Precision Planting Premier Dealers. A Precision Planting Premier Dealer is a world-class certified precision agriculture expert, with rigorous training and knowledge of the industry and issues facing farmers today. Our Premier Dealers are experienced professionals helping you know and yield more

The ability to provide unbiased and objective insights into the agronomic research is important to us and we appreciate all Premier Dealers who scheduled and invited growers to the farm in 2018. If you are interested in visiting the PTI Farm in 2019, please contact a Precision Planting Premier Dealer to schedule your visit to the PTI Farm.

Find the Precision Planting Premier Dealer nearest you at planterexpert.com

Acknowledgements and Legal Statement:

The University of Illinois Machinery Cost Estimates provided by The University of Illinois Farm Business Management Handbook.

Benefits of Higher Levels of Organic Matter Table provided by Cornell University Department of Crop and Soil Sciences Agronomy Fact Sheet 41.