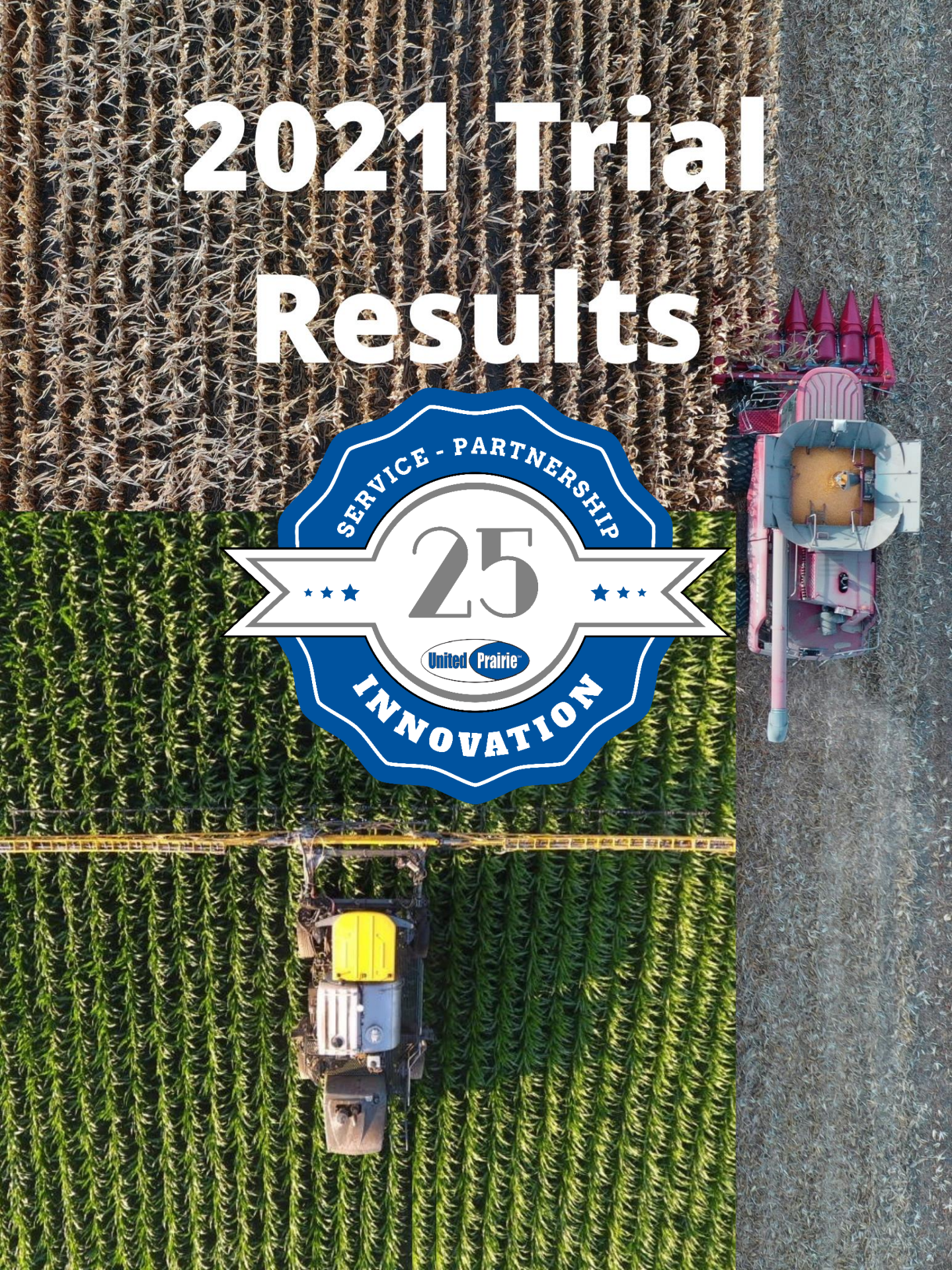
2021 Trial Results

SERVICE - PARTNERSHIP

25

United Prairie™

INNOVATION



At United Prairie the main-focus everyday is increasing our grower's success and that is why this company has grown so much over the last 25 years since it's inception. On behalf of all the dedicated employees we are proud to present the 2021 Innovation Farm and Grower Evaluation trial results.

Our Mission with the Innovation farm and side-by-side testing program is to provide independent, local agronomic results to make our growers more successful. Each year new products, technologies, and management practices are introduced to the marketplace. We feel it is our responsibility to make sure that our growers have all the information needed to exceed their goals and navigate through all the information they receive. We have been successfully doing this for a number of years now on this farm and continue to make changes to improve on what we have done in the past.

We continue to ensure that all the information you see from our research is strictly independent and not sponsored by anyone. We feel this is of the upmost importance in ensuring that the information we provide is pure and accurate in the aid of helping our growers make sound purchasing decisions. We are committed to only recommending products that show a Return on Investment, and not just increasing yield.

Thank you so much for taking the time to review this information. Your success continues to be our focus and that will never change. Thank you for your business and support of United Prairie. Thank you for making this a successful, growing company for the last 25 years.

Best Regards,

Curt Miller
General Manager

United Prairie's 2021 Trials Report!

On behalf of our whole team here at United Prairie and Miller Ag Service I would like to present you with our 2021 United Prairie Trial Results book. As in the past this book contains all the localized research and findings that were conducted during the 2021 growing season not only on our 60 acre Innovation Farm located east of Sadorus, but throughout our foot print with growers like you.

The 2021 growing season provided us with a number of hurdles to overcome once again throughout the geography that we cover as a company. From early season cool temps and frost advisories, to record breaking rainfalls received in a few days time in some areas, to finishing off with a buffet of challenges from crown rot, Armyworms, and TAR SPOT, the season didn't disappoint when it came to keeping all of us on our toes. One thing that I don't feel anyone can argue with though is that intense agronomic management practices paid huge dividends in the end.

As we come out of the 2021 growing season and shift our attention to 2022, it looks like we will be facing a whole new list of challenges, that many of us have never seen before in our careers. Although Covid 19 has brought with it a level of uncertainty, what I am certain is that working together as a team and putting together a solid plan of attack will help us overcome whatever barriers are thrown in front of us. Although input prices will be higher, lets not forget everything that we have learned from the past growing seasons that has gotten us here today in regards to agronomic practices and product placement. The research contained in this book will hopefully assist in being a road map for each of you as you're making decisions on what makes the most sense on your operation going forward in these unprecedented times.

Our major focus also going into 2022 is expanding our research offering in more geographies, and to insure this happens we have purchased a new to us research planter and small Hagie sprayer that we have goals to be able to load up and expand our trial protocols in some additional pre-identified areas. We feel the best information will be obtained by expanding our testing area outside of our Innovation Farm to some extent.

In conclusion I can't thank you our growers and our team at United Prairie and Miller Ag Service enough for the their time, dedication, and passion when it comes to implementing these studies and gathering the yield data in the end. I assure you as a company we will never loose sight of our goal in "Creating Partnerships to Enhance Productivity" and continue to bring you a level of information that we hope will assist you in achieving your goals as growers.

Thank you again and have a successful 2022 growing Season!!

Kyle Meece
Agronomy Manager
CCA & 4R NMS

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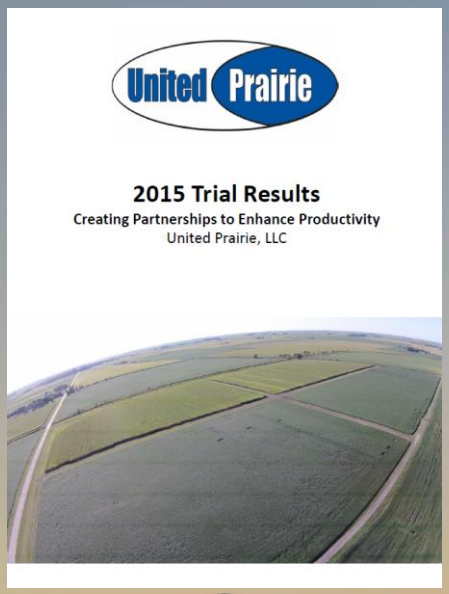
QR Codes Past Years Trial Results Books and Products

United Prairie's focus has always been to not only seek out and research the highest performing products for your operation but to insure that those products or practices bring yield as well as ROI. As we shift out of 2021 and focus in on the 2022 growing season it seems that we might be facing a few potential challenges that maybe we have not had to deal with in the past. As you sit down and put together plans for the 2022 growing season, please refer back to your past cropping seasons and make sure that drastic decisions aren't made that could cost you return in the end. Part of that process might involve looking back at United Prairie's past trial results books and studies, and to simplify that step the following pages include QR code links to our previous 6 years worth of trial guides, as well as links to products discussed in this years 2021 Trial Results Book. Please see instructions below on how to access those references.

Accessing the QR Codes

- First go to settings > camera on your mobile device and turn on camera scan QR Codes setting
- To open the flow code on the following pages then, access the camera on your cell phone, and hold phone up to QR code once it is in camera mode
- Camera will automatically sense the QR code and ask you to select and open up the QR code link in the web browser by clicking link on your phone screen
- Click link and you will be taken to pdf copies of past trial results books or key products discussed in 2021 trial results book
- If above steps do not work download QR Code Reader app from the app store and follow instructions

Flow Code Examples


United Prairie
2015 Trial Results
Creating Partnerships to Enhance Productivity
United Prairie, LLC


Innovation
Farm Guide
2016 TRIALS
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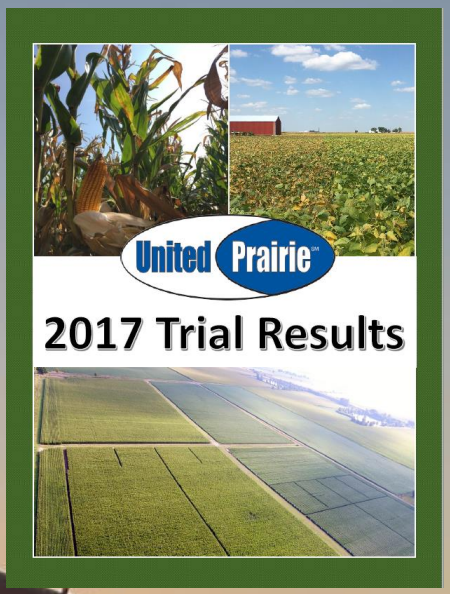
INNOVATION FARM


United Prairie
2017 Trial Results


2018 Trial Results
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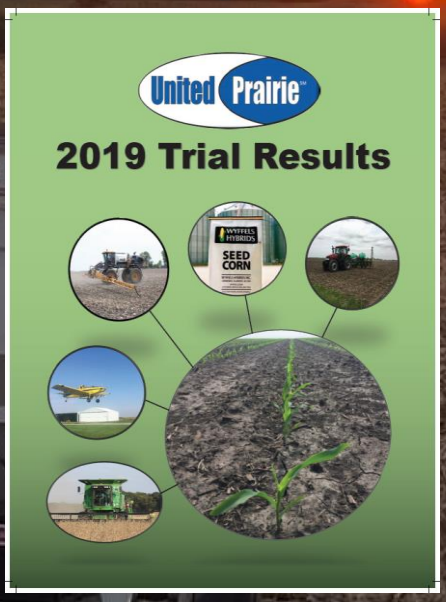

United Prairie
2019 Trial Results
SEED CORN


United Prairie
2020 Trial Results

microSyncPRO™

SEED+GRAPHITE

TAKE OFF® LS

MicroPlus

Hydri-Gro Vigor 802

InGrained

Thio 25-17™ Soybean

AMMONIUM THIOSULFATE

SRN25B

Utrisha™ N

NUTRIENT EFFICIENCY OPTIMIZER

PIVOT BIO PROVEN 40

Corn

Soybeans


START RIGHT 2.0
XYWAY LFR FUNGICIDE
Obvius® Plus
Seed Treatment
CYGIN™ · PRO
Ascend® SL
Voyagro™
biotrinsic™ by indigo
Kriss™
MARCO QuickGrow
M33 & M34
W10
CENTURO™
TRIDENT™ N
A VERDESIAN NUE SOLUTION™
NH3
UAN

United Prairie Innovation Farm
2021 Overview Corn

Quadrants: North West & South West

Planting Date: May 1, 2021

Hybrid: Wyffels 7888

Population: 36,000 ppa

Harvest Date: September 16-17, 2021

Soil Testing Averages:

- North West Quadrant- pH: 6.8, P:77, K: 306, CEC: 20.8
- South West Quadrant- pH: 6.5, P: 80, K: 308, CEC: 21

Fall 2020 Fertilizer Application: VRT applied Lime, Phosphorus, and Potassium based off United Prairie CEC based recs

Fall Tillage: Chisel Plowed bean stubble with exception of cover crop or minimum tillage studies

Drainage: Pattern tiled research farm November 2020

Spring Tillage: Soil Finisher

Fall Nitrogen: Fall ammonia with N-Serve applied in N rate and timing study on November 10, 2020

Spring Nitrogen: N rate and timing study received protocoled treatments, remainder of farm received 100 lbs/ac N Spring NH3 w/ N-Serve on April 3, 2021

Planter Nitrogen: Besides protocoled studies, farm received 10.5 gal/ac 32% & 4.5 gal/ac ATS applied through Yield 360 Bandits at planting (43 lbs N & 12.87 lbs S)

Sidedress Nitrogen: Besides protocoled studies, farm received 20.2 gal/ac 32% & 4.5 gal/ac ATS applied on May 24, 2021 (77 lbs N & 12.87 lbs S)

Herbicide Program:

- Pre-Emerge Application: 1.5 qts/ac Resicore & 1 qt/ac Aatrex
- Post Application: 24 oz/ac Callisto Xtra, 32 oz/ac Roundup Powermax, .375 gal/ac AmSurf Xtra

Corn Marketing Price Used: $5.15/bushel

Innovation Farm Growing Season Rainfall Amounts (in.)						
Year	**April**	**May**	**June**	**July**	**August**	**Total Rain**
2021	1.64	3.6	6.43	4.83	2.55	19.05

United Prairie Innovation Farm
2021 Overview Soybeans

Quadrants: North East & South East

Early Planting Date & Population Study: April 14, 2021

Standard Planting Date: April 27, 2021

Population: Target 140,000 ppa, beside protocol study's

Variety: Stine 36EB32 Enlist

Harvest Date: October 21, 2021

Soil Testing Averages:

- North East Quadrant- pH: 6.6, P: 135, K: 416, CEC: 21.2
- South East Quadrant- pH: 6.5, P: 120, K: 389, CEC: 20.3

Fall 2020 Fertilizer Application: VRT applied Lime, Phosphorus, and Potassium based off United Prairie CEC based recs

Fall Tillage: Chisel Plowed corn stalks with exception of cover crop or no-till studies

Drainage: Pattern tiled research farm November 2020

Spring Tillage: Soil Finisher

Herbicide Program:

- Cover Crops: 1 qt/ac Roundup Powermax, .375 gal/ac Amsol Plus, & 15 gal/ac H20
- Pre-Emerge Application: 3.25 oz/ac Zidua SC, 2 pts/ac Enlist One, 24 oz/ac Glyphosate, .375 gal/ac Amsol Plus, & 15 gal/ac H2O
- Post Application: 10 oz/ac Outlook, 2 pts/ac Enlist One, 32 oz/ac Liberty, 9 oz/ac Clethodim, .375 gal/ac Amsol Plus, 15 gal/ac H2O

Soybean Marketing Price Used: $12.85/bushel

2021 Drainage Makeover

Major focus of mine when taking over the United Prairie Agronomy Manager role was to address as many limiting factors as we could at the research farm, with drainage being number one on the list. With the blessing of Don Berbaum the landowner and the help from local growers and United Prairie customers Klein Farms, we made this project happen in the Fall of 2020. Anyone who has ever listened to Dr. Fred Below go through his 7 Wonders presentation is well aware that number 1 on his list for major factors that contribute to yield is weather. That factor of weather when to much of it is thrown at us can cause some massive limiting factors when it comes to ponding and just the soils natural water holding capacity. We want to make sure to alleviate these potential issues the best we can by removing that water as timely as possible, which in turn allows more oxygen to be introduced into the soil profile to keep our roots and bacteria thriving. We had a number of water holding areas on the farm we were more than aware of, which forced us to omit trial results and reduce trial area size each and every year, because of the fear of inconsistent studies and results. Well as you can see from the below pictures we hope those concerns are more than addressed as the farm is fully pattern tiled now! We can't thank Don and Klein Farms enough for getting this project completed for us and we look forward to what this is going to allow us to do for future research, as we remove one of the largest limiting factors that I feel like many of us deal with on an every year basis.

Tillage vs No Till vs Cover Crops

Trial Description

In 2021 we wanted to not only look at the differences in different tillage practices in both corn and soybeans, but also wanted to introduce a concept that continues to be a hot but misunderstood topic in the industry with cover crops. To line out this study we applied cover crops in the fall for corn following soybeans and soybeans following corn. We implemented basic mixes to start this multi-year study with broadcasting oats on the beanstubble and then cereal rye on the corn. Next to each of these cover crop passes, we then left either an area of untouched corn stalks, that we no-tilled soybeans into, or left untouched beanstubble that was worked once with the soil finisher and then corn was planted. The final evaluation was chisel plowing areas right next to these untouched zones and then would work these chiseled areas once in the spring ahead of planting. Goal was to not only observe final yields within each segmented trial, but also get a better understanding of root development of the growing crop, initial emergence, and then water and nutrient holding capacity within the soil profile.

Corn Cover Crop vs Min. Till vs Conv. Till

Treatment	Final Population	Bu/Acre @ 15.5%	Harvested Moisture	Avg Bu/Ac	Cost Per Acre Additional Trips or Products	Gross Profit/Acre
Chisel Fall, Soil Finisher Spring, & Plant	34,000 ppa	264.87	23.7%	**265.80**	$44.30/Ac Chisel Plow & Soil Finisher	**$1,324.54**
Chisel Fall, Soil Finisher Spring, & Plant	35,500 ppa	266.72	23.3%			
Soil Finisher Spring & Plant	35,500 ppa	251.31	24.0%	**254.59**	$16.60/Ac Soil Finisher	**$1,294.54**
Soil Finisher Spring & Plant	34,000 ppa	257.87	23.6%			
35 lbs/ac Oat Cover Crop Fall & No Till Plant	28,500 ppa	240.53	24.0%	**240.85**	$19.01/Acre for Oats & Burndown Herbicides	**$1,221.34**
35 lbs/ac Oat Cover Crop Fall & No Till Plant	31,500 ppa	241.16	24.2%			

Soybean Cover Crop vs No-Till vs Conventional Till

Treatment	Final Population	Bu/Acre @ 13%	Harvested Moisture	Cost Per Acre Additional Trips or Products	Gross Profit/Acre
No-Till Plant	103,500 ppa	75.17	13.2%	$7.46/Ac for Burndown Herbicides	**$958.47**
50 lbs/ac Cereal Rye Fall & No Till Plant	105,000 ppa	75.97	13.3%	$22.46/Acre for Rye and Burndown Herbicides	**$953.75**
Chisel Fall, Soil Finisher Spring, & Plant	95,000 ppa	75.33	13.4%	$44.30/Ac Chisel Plow & Soil Finisher	**$923.69**

***$5.15/bu Corn Price, $12.85/bu Soybean Price, Oats: $.33/lb, Cereal Rye: $.30/lb, 1 qt/ac Glyphosate: $5.18/Ac, .375 gal/ac Amsol Plus: $2.27/Ac, Chisel Plow: $27.70/Ac, Soil Finisher: $16.60/Ac**

***All Custom Field Operations sourced from University of Illinois 2021 Farm Doc on Field Operation Estimates**

Summary

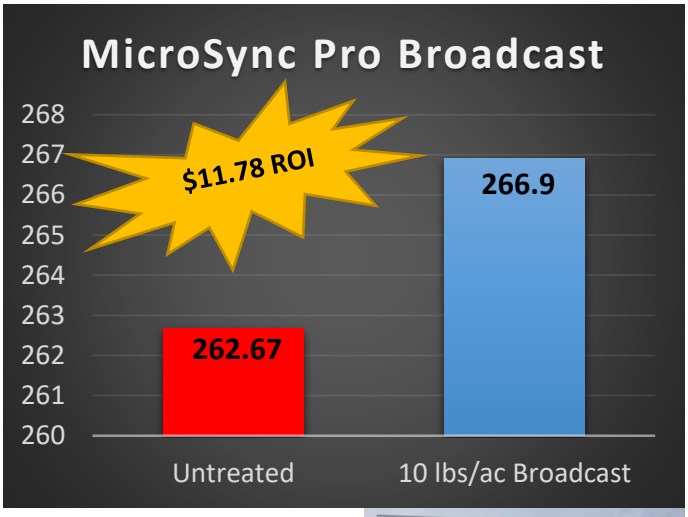
Great start to what will be a continued study on cover crops in the future. Downfall when it comes to planting into cover crops or minimum tillage scenarios seems to be the population decline. Much of this caused by potentially cool and wet conditions, as well as the penalty you face with fighting residue, not only from emerging through it but immobilization and disease pressure later in the season. Even with the reduction of populations the soybeans still seemed to handle this and thrived to produce solid yields, which we have observed this multiple times the last number of years and this provides additional confidence and support that we can be comfortable lowering our soybean populations from the start. Be careful though to not get too low, and face emergence issues that take final stands down to a level that could be yield limiting. When it comes to corn there is still some work to do here with the combination of covers and corn. Population and emergence is crucial when planting corn as every plant, ear, and kernel is necessary to maximize yield. The covers caused some significant stand reductions and immobilization of nitrogen that resulted in lower yields come harvest. We will continue to study this in 2022 and expand our cover crop plant selection, and better understand if we can overcome these potential yield obstacles.

MicroSync Pro for Corn

Planted: May 1, 2021
Harvested: September 16, 2021
Hybrid/Population: Wyffels W7888; 36,000 PPA
Rows: 8 row entries (30")
Tillage/Rotation: Conventional; corn/soybean rotation
Soil Type(s): Drummer SCL, Flanagan SL; well drained

Trial Overview

Replicating a study for year number 2 that we conducted in 2020 with a new macro and micronutrient product called MicroSync Pro. Initially looked at this product in 2020 based on a number of positive results that our Miller Ag location had seen in the past and were implementing this product on a regular basis in their fertilizer applications. When evaluating a vast summary of tissue tests that we had put together as a company as well as some of the partners we work with had conducted over the years, we continued to see a lack of key nutrients in corn that we felt needed to be addressed. Sulfur we continue to supplement each year with incorporating applications of either ATS or Dry AMS into our programs, but when it came to Zinc and Boron, or some other micronutrients our main method of application was foliar sprayed on plants. Although this has shown tremendous benefit and ROI spraying foliar nutritionals, we couldn't get enough applied in a foliar application to offset the plants demands. This is why we wanted to look at putting MicroSync Pro into our bulk dry fertilizer applications. The product is applied at 10 lbs/ac broadcast, as well as we are starting initial studies with an insecticide box application method of the MicroSync Pro Mini. The analysis of both products is 5% Ca, 9.5% S, 1.25% B, 5% Mn, and 7.5% Zn.



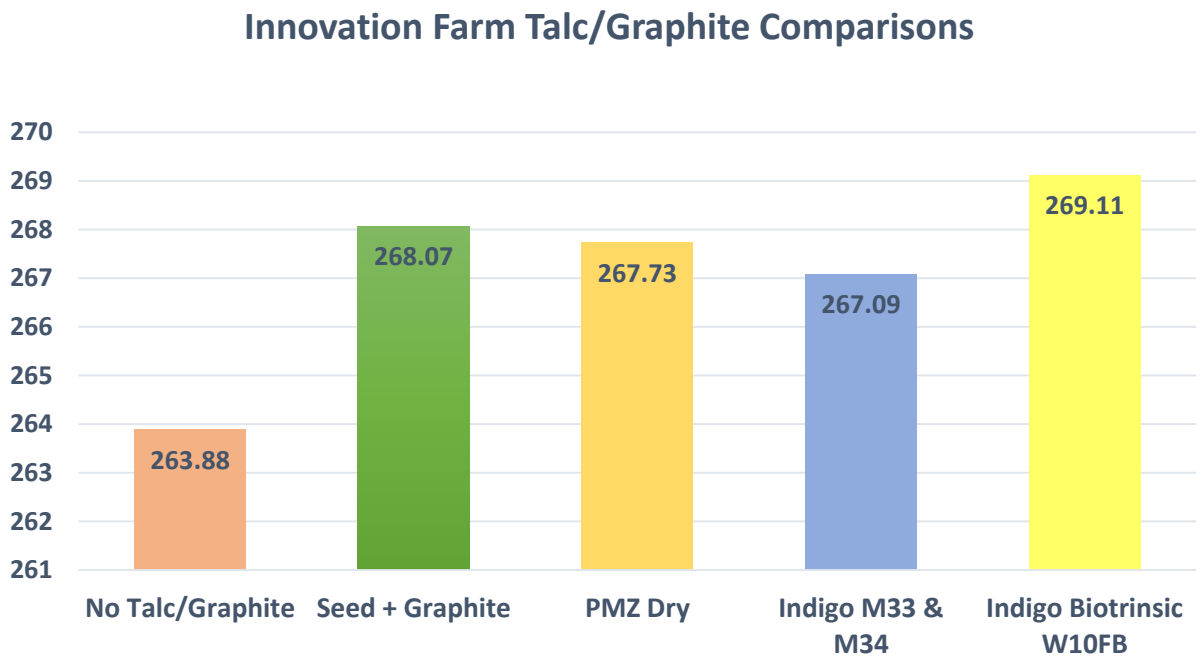
Summary

After another year of positive results being seen out of the broadcast application standpoint we decided to move forward with the installation of a micro-bin out of our Apex location, which is shown in the picture to the right. When it came to the MicroSync Pro Mini on the research farm we had a mix-up with products and didn't catch the mix-up until after the seed was planted, so we had to omit this side of the study. Understanding our crops limiting factors is crucial to being able to achieve maximum yields. Another factor that must be looked at is what products are mobile and non-mobile in the soil profile, and how that correlates with when a corn plant takes up that nutrition and if it will be there at that point in time. Those elements that are mobile in the profile, such as Boron, may need to be applied at multiple times within the growing season, and this is something we will expand on in 2022. The major key benefit with a product like MicroSync Pro though is knowing that each granual contains the exact nutrient analysis that is being applied, and after visiting there production facility in Cape Girardeau and seeing there quality control measures implemented first hand, we can assure you that what is being broadcasted is a consistent, homogenous product, that will provide plants with those key elements it is demanding.

Talc/Graphite S x S's Corn

Trial Overview

This season marks our 3rd year of working with talc/graphite products that can be applied on the corn seed ahead of planting. When these types of products first came out for many of us, myself included, it was a moment where you felt like "why didn't we think of this sooner"! None the less we wanted to validate there performance and if they could bring profit to the farm. This year we decided to implement a few other companies product offerings so that we could get some additional comparisons, especially as this market is becoming more saturated with players. Some products were providing a nutritional and bio-stimulant package, others were also looking at assisting that plant in defending itself against plant stresses, such as heat/drought, as well as increasing yield potential in the end. The common function of all the products though was still to help flowability of that seed through the planter and into the furrow, however as we have all discovered some planters prefer talc, some graphite, and many prefer a mixed ratio of both.



Summary

Although we waited for a little better soil conditions to plant our corn this growing season on the farm, we still dealt with some stresses and environmental issues once the seed was placed in the soil. One thing that could consistently be seen out of this lineup of products compared in 2021, was that there was consistent emergence and assistance in helping that young seedling defend itself against early season stresses. Throughout the growing season though I can't necessarily say that much was observed in differences between the treatments until final yields came in. We decided to compare these studies against no talc/graphite on the seed, just to get a better idea of what those applications of the basic products are bringing from a seed placement standpoint, and it shows that there is importance with following planter and seed company guidelines. When it comes to the higher value products we saw some subtle differences between each of the products, but quite a yield separation when using no product on the seed. Unfortunately this year we didn't do a study with a standard product applied, but our past trials showed a 3-5 bushel difference between regular talc/graphite products and our higher value products. Consensus is that these applications continue to make sense and is an easy way to maximize a trip and investment that is already being made at planting. One concern though is the method of application of some of these products as some are as easy as putting through a dispenser at planting, while others may need to be overtreated on the seed, which puts a risk if seed must be pre-treated and if hybrids need to be changed for some reason in season and treatment is already applied. I do feel these overtreatment risks will be overcome with time, as the value they could bring to the table may force some companies into providing some sort of exchange of seed guarantee if we run into adverse or delayed planting conditions where alternative maturity decisions may need to be made.

New Look into In-Furrow Options

Planted: May 1, 2021
Harvested: September 16, 2021
Hybrid/Population: Wyffels W7888; 36,000 PPA
Rows: 8 row entries (30")
In Furrow: All products applied through center of Furrow Jet
Tillage/Rotation: Conventional; corn/soybean rotation
Soil Type(s): Drummer SCL, Flanagan SL; well drained

Trial Overview

Applications of in furrow starter fertilizer based products has not always shown the most consistent results year in and year out on our research farm. As with any growing season the conditions you may not want to see, sometimes are the ones that show the strongest visual differences in starter applications, such as cool and wet soils. In 2021 we not only wanted to look at starters again, but take it up a notch and look outside the box on not only some other starter fertilizer offerings, but additional components that could we added in with this blend and trigger the plant or soils to do more for us. All products were applied at 3 gal/ac through the Furrow Jet center orifices on the plot planter. The study includes a wide variety of add ins that fall into multiple categories such as: PGR's, stress mitigators, fertilizer catalyst, biologicals, and etc.

Corn In Furrow Evaluation Innovation Farm 2021

Yield Rank	Corn In-Furrow Study	Rate per Acre	Bu/Acre	Bu/Acre Diff. from UTC	Net $ Return/A	ROI Rank
1	Quickgrow Complete Corn	3 gal/ac	270.7	16.15	$49.03	1
2	Optistart Plus & Ascend Pro	3 gal/ac & 6 oz/ac	264.37	9.82	$27.01	3
3	Optistart Plus	3 gal/ac	262.88	8.33	$29.97	2
4	Optistart Plus & Cygin	3 gal/ac & 2 oz/ac	261.42	6.87	$14.58	4
5	Quickgrow LTE & MicroPak	3 gal/ac & 1 qt/ac	261.03	6.48	$8.22	5
6	Optistart Plus & Start Right 2.0	3 gal/ac & 1 qt/ac	259.59	5.04	$2.40	6
7	Optistart Plus & Invigorate	3 gal/ac & 1 qt/ac	256.85	2.3	-$10.58	7
8	Optistart Plus & LCBF Boost	3 gal/ac & 1 gal/ac	255.04	0.49	-$13.91	8
9	UTC	No Starter	254.55	-	-	
10	Optistart Plus & Foster FC	3 gal/ac & 4 oz/ac	254.21	-0.34	-$22.60	9

- **$5.15/bu Corn, QuickGrow Complete Corn: $11.38/gal, Optistart Plus: $4.31/gal, Ascend Pro: $226.94/gal, Cygin: $252.00/gal, Marco MicroPak: $22.50/gal, Start Right 2.0: $42.50/gal, LCBF Boost: $3.50/gal, Invigorate: $38.00/gal, Foster FC: $1.98/gram, QuickGrow LTE: $6.51/gal**

Summary

Although we held off planting a little bit this year to try to ensure that we had ideal emergence conditions, mother nature still threw us some curveballs. However those obstacles also provided some additional benefit when incorporating starter fertilizer and additional add in's into the mix. Overall basic starter fertilizers alone showed some nice ROI, and much of that was attributed to consistent emergence and final stand counts we felt. Always great to see consistency out of products such as Ascend Pro, Cygin, and Start Right 2.0 that we have been looking at and evaluating for many years now. Have confidence in implementing those components in your mix moving forward. However as we started looking outside the box this year we found some new options that really took things to the next level, such as Marco's QuickGrow Complete Corn package. There will be more to come from this in 2022, as we start segmenting out the components of packages such as this, and trying to understand if we can take this product offering, and add additional proven studies to it, to advance yields even more. The key to success of products like the QuickGrow Complete, is to insure you don't only have the right recipe in the mix your implementing, but you have your foundation and basics in order to offset the demands you will inevitably create on that growing corn plant.

Yield 360 Bandits First Look

Planted: May 1, 2021
Harvested: September 16, 2021
Hybrid/Population: Wyffels W7888; 36,000 PPA
Rows: 8 row entries (30")
Nitrogen: Study received 100 lbs/ac N NH3 w/ N-Serve in spring fb baseline amount listed in chart with 360 Bandits. Followed up sidedress with 20.2 gal/ac 32% & 4.5 gal/ac ATS
Tillage/Rotation: Conventional; corn/soybean rotation
Soil Type(s): Drummer SCL, Flanagan SL; well drained

Trial Overview

The 2021 growing season was the first year adding an off to the side of the row application method when planting. We decided on the Yield 360 Bandits based on there cost per row, as well as the ability to not only apply product off to one side of the seed, but on both sides of the seed. This system was fairly easy to install and maintain throughout the growing season, once we got pumps dialed in to apply product both in-furrow and off to the side. Our goal in this particular study was to have an initial look at some products that could be added within this placement method. The baseline across the whole research farm was to utilize the 360 bandits to provide our initial source of nitrogen and sulfur to get these plants up and going. Since both N and S in these forms can be mobile in the soil profile, insuring that they were readily available for the corn plants root system to start pulling in that early season nutrition before it's potentially lost, we felt was crucial. This also helps offset a potential carbon penalty being faced with the additional residue that we are having to deal with in fields where the previous years yields were high. Higher yields typically attribute to larger amounts of fodder and a need for microbial activity to break this fodder down all season long. For that process to take place energy is needed for the microbes, and much of that energy comes from nutrients such as nitrogen.

Yield 360 Bandit Studies

Treatment	Bu/Acre @ 15.5%	Treatments	Cost Per Acre Additional Treatments	Bu/Ac Diff. over Standard	ROI
Standard Rate Nitrogen	254.68	10.5 gal/ac 32% & 4.5 gal/ac ATS	-	-	-
10% Inclusion LCBF Boost	253.69	9 gal/ac 32%, 4.5 gal/ac ATS, & 1.5 gal/ac LCBF Boost	$2.32	-0.99	($7.42)
LCBF Boost	255.23	10.5 gal/ac 32%, 4.5 gal/ac ATS, & 1.5 gal/ac LCBF Boost	$5.25	0.55	($2.42)
10% Liquid Boron	256.29	10.5 gal/ac 32%, 4.5 gal/ac ATS, & 1 qt/ac 10% Boron	$4.32	1.61	$3.97

Summary

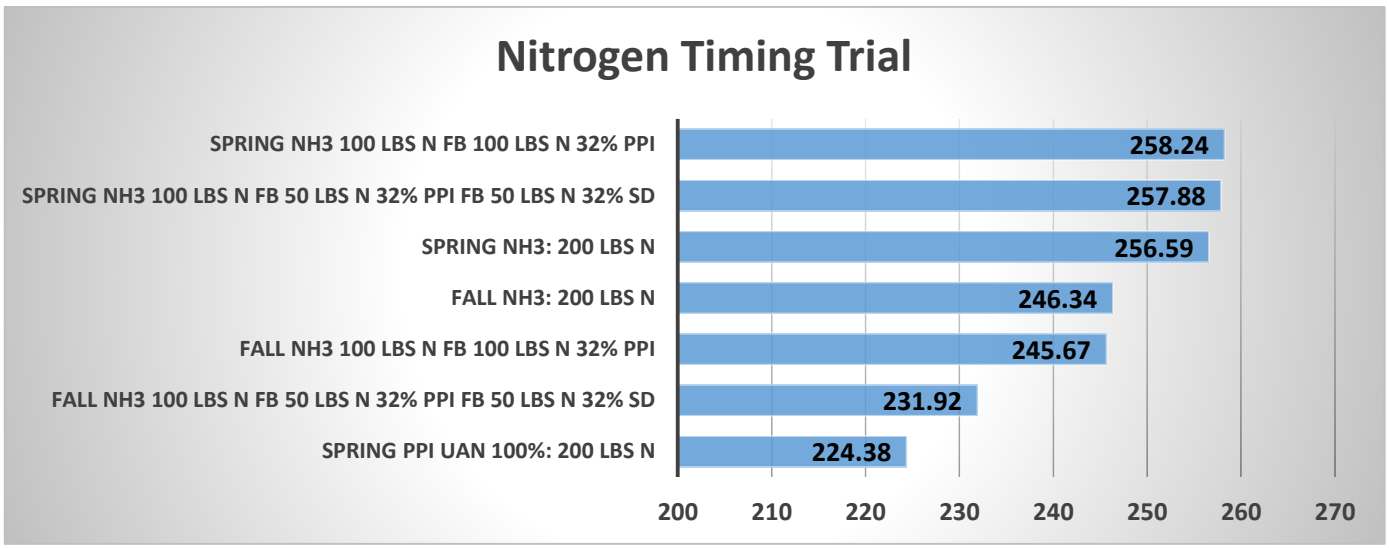
When looking at the few studies we implemented this year with the Yield 360 Bandits, we didn't see a tremendous amount of differences with the addition of the products tested. As seen in the above chart the one product that stood out the most was supplementing some additional Boron into that delivery point. Boron is not something that can be added from an in-furrow standpoint because of its toxicity potential to the corn plant, but plays a key role in flowering, pollen development and viability, and sugar translocation and carbohydrate metabolism. This nutrient has been shown in multiple years of tissue testing to be deficient in the corn plants here in Central IL, and we have a major focus going forward to better understanding its potential benefits. The foundation of this started with our MicroSync Pro applications, but because of its mobility in the soil profile, multiple applications throughout the season maybe needed to achieve the highest success rate. Although we had mixed results this year in our first year of testing add-in products, we hope to expand on this study in 2022 and explore what other options might need to be evaluated.

Nitrogen Product and Timing Trial

Fall Ammonia Applied: November 10, 2020
Spring Ammonia Applied: April 3, 2021
UAN Applied: May 1, 2021
Planted: May 1, 2021
Harvested: September 16, 2021
Hybrid/Population: Wyffels W7888; 36,000 PPA
Rows: 8 row entries (30")
Tillage/Rotation: Conventional; corn/soybean rotation
Soil Type(s): Drummer SCL, Flanagan SL; well drained

Trial Overview

Goal within this study was to look at not only different sources of nitrogen applied for the corn plant, but also the timing at which we make those applications. Each year there are multiple conversations surrounding just how and when we should get our sources of N put on the farms. These conversations seem to many times be driven around the economics of the application in regards to price per unit of N. However understanding the timing of Nitrogen uptake within the plant, the form of Nitrogen that is being used, and just what makes both economic as well as agronomic sense should also be at the forefront of our decision. Within this study all pre-plant Fall or Spring NH3 was applied with a 1 qt/ac rate of N-Serve, and the 100% Spring UAN application included a full rate of a nitrification inhibitor. Once applications were all made the soil was worked with a soil finisher and the corn crop was planted. Sidedress applications were applied at V4, and were put on as 32% with a coulter/knife toolbar.



Summary

Timing of nitrogen applications was crucial this year with the heavy amounts of rain received (19" at Innovation Farm) at certain timings throughout the season. Note that from the above yield data all N that was applied in the Spring of the year with the exception of 100% UAN PPI was higher yielding versus those that involved some form of a Fall application. This hasn't always shown to be the case, some years we have seen fall applications of nitrogen providing just as high if not higher yield response. Understanding that a corn plant doesn't just take up nitrogen one time during the growing season always needs to be realized, and in years with heavy amounts of rain like we saw in 2021, split applying that nitrogen at different intervals throughout the corn plants lifecycle could be the difference of 30-40 bushel in some situations. Focused N management will be even more important in '22 with N pricing reaching over $1 dollar per unit of nitrogen.

Protecting your Nvestment

Planted: May 1, 2021
Harvested: September 16, 2021
Hybrid/Population: Wyffels W7888; 36,000 PPA
Rows: 8 row entries (30")
Nitrogen: 100 lbs/ac N Spring NH3 w/ N-Serve fb 50 lbs/ac 32% applied PPI w or w/o inhibitors
Tillage/Rotation: Conventional; corn/soybean rotation
Soil Type(s): Drummer SCL, Flanagan SL; well drained, lower CEC zone

TRIDENT N
A VERDESIAN NUE SOLUTION™

CENTURO®

Instinct NXTGEN®

Trial Overview

For many of us when we think of nitrification inhibitors our minds go straight to a product like N-Serve that has been on the market now for a number of years. The focus of products like this are to keep our positive ammonium forms of nitrogen in that stable form, before nitrification takes place and converts these positives to negatives. One must remember our soil colloids are negative so if the nitrogen and soils are both negative, like items don't attract to each other, and we are at a higher risk of loss. This treatment was placed within a lower CEC and organic matter zone of the research farm intentionally. We wanted to not only reduce the potential for mineralization to occur by putting this study in a poorer area, but also wanted to cap out the total applied nitrogen at 150 lbs/ac. By doing this we hoped to show the differences between products that not only protect below ground, but also above ground, and see if these multiple protection avenues could help carry this reduced N supply out longer in the season, and separate the multiple products being evaluated from each other.

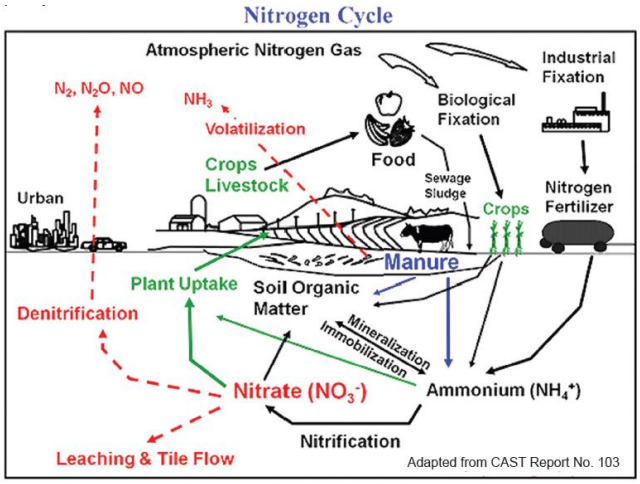
Protecting your Nvestment

Nitrogen Inhibitor	Rate per Acre	Bu/Acre	Bu/Acre Diff. from CHK	Yield Rank
Instinct NXTGEN	24 oz/ac	260.75	8.66	1
Trident N	1.5 qt per Ton	260.47	8.38	2
Centuro & Anvol	1.5 gal per Ton & .75 qt per Ton	259.62	7.53	3
Agrotain Plus SC	3 gal per Ton	258.47	6.38	4
Hi Test	1.5 qt per Ton	254.74	2.65	5
UTC	-	252.09		6

***100 lbs/ac N applied w/ N-Serve Spring 2021 fb 50 lbs/ac N 32% with inhibitor products**

Summary

Saw some really nice separation between products in this first round study at the research farm. Instinct and Trident N lead the way in regards to yield gain versus no inhibitors used, but Centuro/Anvol was right there as well. With Instinct being a below ground only protection, and Centuro/Anvol and Trident N providing above and below ground protection, I would say our fear of volatilization loss was very minimal, but it was crucial to protect that nitrogen below ground from being lost due to leaching or denitrification. In the past when allocating dollars much of our focus has been on whether to apply ATS or an N Inhibitor, but never both., with many of us leaning towards the ATS only with our 32%, and attribute that it has some inhibiting characteristics. As nitrogen pricing continues to ramp up it might be time to not only look at N & S applications for our corn, but also look at protecting that Nvestment by utilizing an insurance policy such as inhibitors. Most N inhibitors have a rate structure and price based on the total units of N applied, so you would have to evaluate total ROI on a product by product basis, but 2-3 bushel return will more than offset that cost typically. More testing to come with 32%, ATS, and Inhibitors combined in '22.



Pivot Bio ProveN Comparison

Planted: May 1, 2021
Harvested: September 16, 2021
Hybrid/Population: Wyffels W7888; 36,000 PPA
Rows: 8 row entries (30")
Pre-Plant Nitrogen: 100 lbs/ac N NH3 Spring w/ 1 qt/ac N-Serve
Planter Nitrogen: 10.5 gal/ac 32% & 4.5 gal/ac ATS thru Bandits, 3 gal/ac Water & Pivot Bio products applied In-Furrow
Sidedrees Nitrogen: Sidedressed 10.5 gal/ac 32% vs ProveN study, sidedressed 21.9 gal/ac 32% vs ProveN40 study
Tillage/Rotation: Conventional; corn/soybean rotation
Soil Type(s): Drummer SCL, Flanagan SL; well drained

PIVOT BIO PROVEN

PIVOT BIO PROVEN40

Trial Overview

This was year number 2 of evaluating the Pivot Bio ProveN products. The products provide a strain of bacteria that is applied in furrow and feeds off the root exudates of the growing corn plant, in return it assists the corn plant in fixating its own atmospheric nitrogen similar to a soybean plant. We were fortunate in 2021 to not only get another look at the Gen 1 ProveN product that has been said to provide the corn plant 25 lbs of N, but also looked at the next generation of products with the ProveN 40, which as the name states, claims to provide that corn plant at least 40 lbs of N. Both products were compared against full rates of N applied within growing season, with a total target nitrogen rate of 220 lbs/ac N being the goal. Nitrogen applied was managed throughout the season, and areas of the farm that were selected for this study were higher CEC and OM parts of the farm. This was intentional to try to understand the full potential of the Pivot Bio product lineup in soils that have a history of being able to mineralize heavy amounts of nitrogen late if conditions are favorable for this process to occur.

2021 Pivot Bio ProveN Study

Application Rate	Final Yield	Moisture	Rank	Cost Per Acre N Program	Gross Profit	ROI w/ProveN	
180 lbs N + ProveN 40 (220 lbs/ac Total N)	274.14	24.0%	1	$135.75	$1,276.07	$42.21	5.67 bu/ac Yield Gain w/ Pivot Bio Proven40 & $13.01/Acre Cheaper
220 lbs/ac Total N	268.47	23.0%	2	$148.76	$1,233.86		
195 lbs N + Proven Gen 1 (220 lbs/ac Total N)	262.08	24.7%	3	$137.15	$1,212.56	$49.72	7.4 bu/ac Yield Gain w/ Pivot Bio ProveN Gen 1 & $11.61/Acre Cheaper
220 lbs/ac Total N	254.68	24.1%	4	$148.76	$1,162.84		

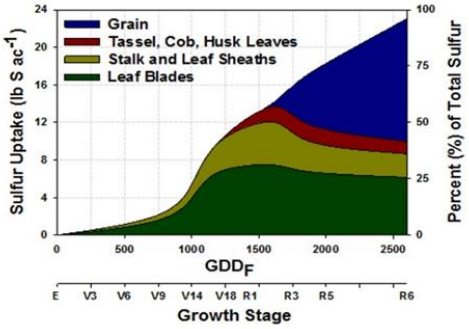
*** $5.15/bu Corn, 32%: $355/Ton or $.555 per lb N, NH3: $715/Ton or $.436 per lb N, ATS: $335/Ton or $1.85/gal, ProveN: $13/Ac, ProveN 40: $20.00/Ac, N-Serve: $13.07/Ac, NH3 Application: $9.75/Ac, SD Application: $10.75/Ac**

Summary

The 2021 growing season like other growing seasons still dealt us some challenges, but waiting a little later to plant and allowing the soil to warm up I feel is key to emergence success and keeping bacteria alive and thriving. This year we saw some great performance out of both Pivot Bio products, and increased our confidence in the potential return that can be received when implementing these products into an in furrow program. We must never forget that we are working with live bacteria in these applications, and have to be cognoscente of the fact that they must be applied into the soil profile within a set period of time once opened, and that our sources of fertilizers or water must be free of chlorine or high salts that could impede the life of these bacteria. With Nitrogen prices continuing to shift higher for the 2022 growing season, the ProveN 40 product looks to be a potential fit to implement and count on for part of your total corn crop Nitrogen demands. There is more to come from Pivot Bio in 2022, and we look forward to continuing to evaluate what they bring to the table.

Another Look at Sulfur in Corn

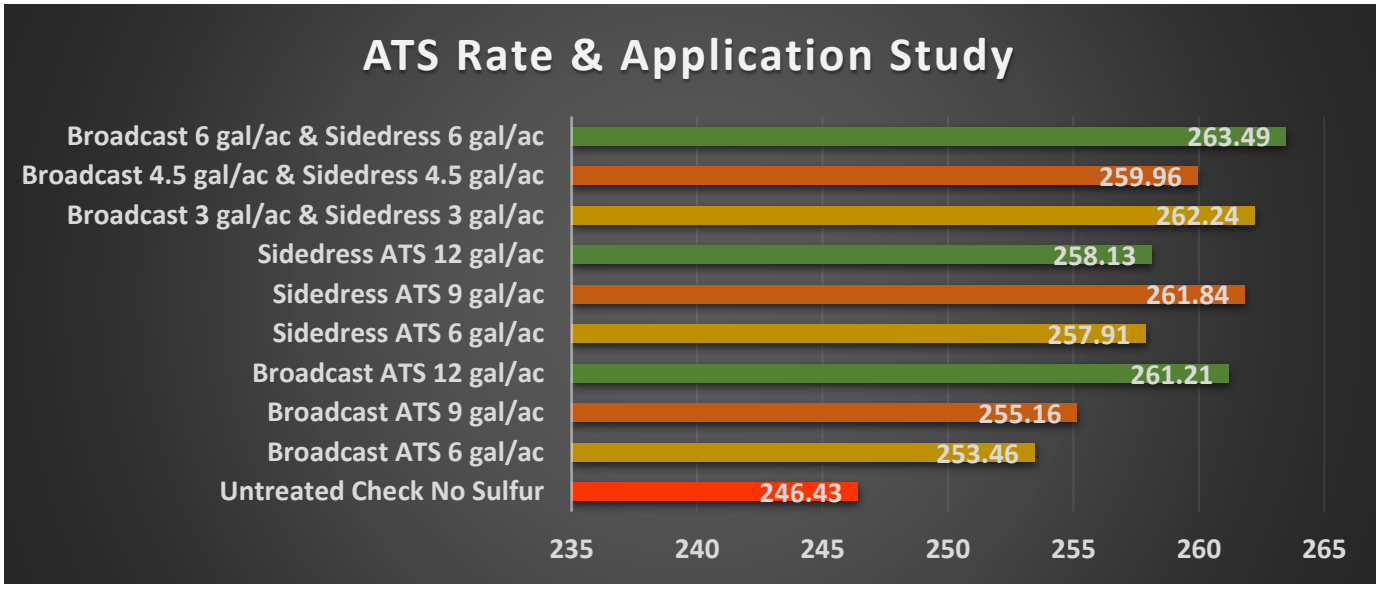
Planted: May 1, 2021
Harvested: September 16, 2021
Hybrid/Population: Wyffels W7888; 36,000 PPA
Rows: 8 row entries (30")
Tillage/Rotation: Conventional; corn/soybean rotation
Soil Type(s): Drummer SCL, Flanagan SL; well drained



Source: Bender, Haegele, Ruffo, Below. *Agron. J.* 2012.

Trial Overview

Sulfur continues to be a main nutrient to focus on when raising corn and usages of multiple S based products have increased drastically the last 5-7 years. Over the previous growing seasons we have been not only been trying to understand the right timing of application of Sulfur but also trying to dial in what the right rate is that the corn plant is demanding. This can be a moving target each year with the unknowns of what final yield will be and just how much our soil profile may release for us. The best rule of thumb is targeting a corn yield that makes sense per trend line yield history on your farm, and applying a rate of S that offsets what that yields total demands might be. In this study we looked at a single sulfur source with Ammonium ThioSulfate 12-0-0-26, and applying it at multiple timings and use rates. We explored broadcasting set rates 100% up front vs Sidedressing vs applying 50% of our target rates up front and supplementing the last 50% in a sidedress application with our remaining nitrogen needs. In the end all applications had equal amounts of N applied, as one benefit that ATS brings with it along with S is some N, but we took this into account and adjusted accordingly for that rate of N coming with multiple rates of the ATS.



Summary

Because the sulfate form of sulfur is negatively charged this puts this source of nutrition at the same risk of being lost as nitrates, therefore focusing on application closer to the plants uptake and needs is a very important part of your success. The chart in the top right hand corner of this page illustrates the timing and crop stages for highest uptake. This year once again we saw a nice increase in yield just from implementing even a basic 6 gal/ac rate of ATS into the mix. As we look at application timings and rates we see a little inconsistency, but as we break down overall averages from each application timing, the split applied had the highest yield and the 100% broad cast up front had the lowest, by 4-5- bushel. I feel a lot of this was just the potential loss of S through the soil profile from early season rains, but when we increased that total S rate higher we helped to offset that loss and helped that plant recover. Overall the application of sulfur somewhere within your management plan is a must, and if you're able to split up those amounts applied throughout the season we would highly encourage that as a risk management strategy.

Corn Foliar Treatments

Planted: May 1, 2021
Harvested: September 16, 2021
Hybrid/Population: Wyffels W7888; 36,000 PPA
Rows: 8 row entries (30")
Tillage/Rotation: Conventional; corn/soybean rotation
Soil Type(s): Drummer SCL, Flanagan SL; well drained

Trial Overview

One of the key items that we try to look at on a regular basis is if there are products that can be added in with our post herbicide applications to that help maximize yield. In corn, post applications are typically happening between V3-V5 right ahead of roundness of ear determination, heavy nitrogen uptake, and what could be a hotter part of the growing season where additional stress factors could come into play. This particular trial focuses in on a number of products that we have worked with in the past, as well as a few new players. We were not only wanting to look at potential foliar nutrition products for corn, but what other additions might be necessary based on past tissue testing demands, as well as trying to trigger that plant to do more in regards to bigger stalks, broader leaves, and larger root system with something like Ascend SL, as well as following that up with something like Takeoff LS to lift that nutrition into the plant, or Legend Elite that not only provided some supplemental nutritional needs but also helps to mitigate potential stresses.

Corn Standard Foliar Treatments Applied V4	Bu/Acre @ 15.5%	Bu/Acre Diff.	Net $ Return/A	ROI Rank
Hydrigro 802 (1 qt) & 10% Boron (1 qt)	265.12	11.98	**$53.70**	**1**
Hydrigro 802 (1 qt), Ascend SL (4 oz), & Takeoff LS (1 pt)	263.84	10.7	**$37.69**	**2**
10% Boron (1 qt)	259.04	5.9	**$26.07**	**3**
Ascend SL (4 oz) & Takeoff LS (1 pt)	258.81	5.67	**$18.17**	**4**
Legend Elite (1 qt)	258.48	5.34	**$18.08**	**5**
Hydrigro 802 (1 qt)	255.19	2.05	**$6.88**	**6**
UTC	253.14	-		**-**

*** $5.15/bu Corn, Hydrigro 802: $14.70/gal, 10% Boron: $17.27/gal, Ascend SL: $202.49/gal, Takeoff LS: $37.68/gal, Legend Elite: $28.99/gal**

Summary

Harvesting this trial in 2021 provided some surprises to be 100% honest. Very rarely do we see as much positive return on so many products as we did in this study, but it falls in line with some of our findings in the 2021 growing season as well. Boron seems to be a limiting factor to some extent on this research farm, and that falls in line with mutli-year tissue testing discoveries throughout the state. Thoughts going forward is to better understand how to apply this micronutrient and if multiple applications in a growing season are needed. One thing that we always must remember when spraying products like the above list, is when we are demanding the plant to do more, then we better insure that we have and are continuing to supply it with what it's going to be demanding. With pattern tile on this farm now, and a solid baseline fertility program, this helps to insure that we see some successes when making a few of the applications above. However I still feel there is work to be done to see consistency across multiple acres, and the first step to achieving that is a better understanding of your basic foundational needs.

Next Class of Corn Foliar Products

Planted: May 1, 2021
Harvested: September 16, 2021
Hybrid/Population: Wyffels W7888; 36,000 PPA
Rows: 8 row entries (30")
Tillage/Rotation: Conventional; corn/soybean rotation
Soil Type(s): Drummer SCL, Flanagan SL; well drained

Trial Overview

In combination with our basic evaluation of foliar treatments the goal with our Innovation Farm has always been to make sure that we take a look at that next generation of products on the market as well. Those products may not always be brand new to the market, as some of them may have existed for a number of years, but are new to United Prairie. The focus on this years study of products was to continue to expand our knowledge and understanding of stress mitigating based products, PGR's, and offerings that can help fuel other key functions within the corn plant or soil profile. There is continued discussions being had on how we can maximize, what I like to call our soil savings account. We have spent years working to create a strong foundation for our growing plants, but our great soils can be our worst enemy with nutrient tie up. Are there steps that can be taken to help better make that nutrition available through foliar applications, and if so where do we need to concentrate our efforts on to assist in this task?

Corn Foliar Treatments Next Generation Products applied V4	Bu/Acre @ 15.5%	Bu/Acre Diff.	Net $ Return/A	ROI Rank
Voyagro (1 pt)	265.91	5.61	**$20.44**	**1**
Optum (4 oz)	264.86	4.56	**$17.52**	**2**
Ingrained (1 pt)	264.54	4.24	**$15.59**	**3**
B-Sure (1 pt)	263.74	3.44	**$14.22**	**4**
Source (.7 oz)	262.81	2.51	**$7.46**	**5**
Cygin Pro (4 oz)	262.47	2.17	**$1.65**	**6**
UTC	260.3	-		**-**

*** $5.15/bu Corn, Voyagro: $67.60/gal, Optum: $190.89/gal, $50.00/gal, B-Sure: $28.00/gal, Source: $1,000/gal, Cygin Pro: $304.92/gal**

Summary

Lots of positive response being seen on this next level study of foliar based applications. Understanding the contents and direct function of each of the products provided in the table is just as important as the final return that can be seen with there applications. Although personally I didn't feel like there was an overwhelming amount of stresses thrown at the research farm in 2021, after evaluating results from not only this study but everything across the farm I feel like there are always stresses that are unforeseen to each of us, and a key function to increased yields is addressing those potential unforeseen yield limiting factors. There is one key that has really been noticed and will be a major focal point going forward and that is a better understanding of products that are the building blocks of proteins in plants. Many of the products in the above table contain actives that are geared towards that function, which turns into a domino affect of potential positive benefits for the corn plant throughout the season. As we continue evaluating these types of products and their recommended application timings, a change that will be made for 2022 is finishing the crop out with proven management techniques that we know can maximize yield. Understanding the differences in products like these from a single application is just one part of the puzzle, but maximizing the full systems approach to crop management, might be able to take us to the next level we are striving for. We are excited to tackle this next level of understanding in the 2022 growing season and to share our findings.

V14 Fungicide Applications

Planted: May 1, 2021
Harvested: September 17, 2021
Hybrid/Population: Wyffels W7888; 36,000 PPA
Rows: 8 row entries (30")
Tillage/Rotation: Conventional; corn/soybean rotation
Soil Type(s): Drummer SCL, Flanagan SL; well drained
Fungicide Application: Applied at V14 with Hagie @ 20 gpa w/ 4 oz/ac MasterLock

Trial Overview

The focus on earlier applications of fungicides started to ramp up in the 2020 growing season as newer fungicides in the marketplace with multiple modes of action and higher active ingredient rates were claiming to offer longer residual activity and allow growers and retailers to potentially use there own lower clearance sprayers to spray fungicides to attempt to offset aerial expense. Our first look at this as a company with a few products in 2020 showed some very positive results, so we wanted to expand this trial in 2021 with a few more product offerings. The goal was to push spraying back a little later than the initial V10 that was being discussed in 2020, and try to target V12-14 so that this would hopefully stretch our length of residual out longer and help protect during pollination. This trial was conducted with 3 separate fungicides, all applied at recommended manufacturer rates, along with 4 oz/ac of a deposition aid. We sprayed the solution at 20 gal/ac with a small Hagie research sprayer.

Corn Fungicide Study V14 Application	Rate per Acre	Bu/Acre	Bu/Acre Diff.	Net $ Return/A	ROI Rank
Miravis Neo	13.7 oz/ac	271.89	**23.01**	**$84.31**	**1**
Veltyma	7 oz/ac	268.91	**20.03**	**$81.14**	**2**
Delaro Complete	8 oz/ac	266.11	**17.23**	**$57.19**	**3**
UTC	**-**	**248.88**			**4**

*** $5.15/bu Corn, Veltyma: $402.59/gal, Miravis Neo: $221.31/gal, Delaro Complete: $504.68/gal, Hi Clearance Fungicide Application: $10.50/Ac, NO REBATE OFFERS WERE FACTORED INTO FINAL PRICING OF INDIVIDUAL PRODUCTS**

Summary

The early application timing of fungicides moving forward we feel could continue to be something that needs to be looked at and potentially implemented on a regular basis. As Tar Spot has now entered into our growing area in full scale there are a number of questions about this disease and how it should be managed. Observations this year showed detrimental yield loss being seen in areas where the Tar Spot was the heaviest, but the onset of this disease came along with a number of other limiting factors throughout the season, such as N loss, crown rot, reduced nutrient levels, and etc. Unfortunately we have no idea what the 2022 growing season will entail, but what we do know is that the spores and disease are here, and could show it's ugly face again if the right conditions present themselves. Always remember that it takes a PEST for this to occur: Pathogen, Host, Environment, & Time. The other key to these applications is implementing the right rates of these fungicides and we feel using a product that offers as many modes of action of protection that are available currently is also crucial. Again this hopefully helps to overcome not only future resistance, but lengthens that residual activity out.

VT Fungicide Applications

Planted: May 1, 2021
Harvested: September 17, 2021
Hybrid/Population: Wyffels W7888; 36,000 PPA
Rows: 8 row entries (30")
Tillage/Rotation: Conventional; corn/soybean rotation
Soil Type(s): Drummer SCL, Flanagan SL; well drained
Fungicide Application: Applied at V14 with Hagie @ 20 gpa w/ 4 oz/ac MasterLock

Untreated **Treated**

Trial Overview

Over 5 growing seasons now we have continued to look at multiple fungicide options on the market and comparing them side by side at a VT application. As this study has developed over time there have been new products introduced into the market place, that are offering higher rates of active ingredient loads and multiple modes of action, which we feel is crucial as new diseases are beginning to attack are corn crop. The newest product and application process brought to us to evaluate in the 2021 growing season was an In-Furrow fungicide from FMC called Xyway. We therefore implemented this product into our trial protocol at the research farm and evaluated it by itself applied at planting time versus all other product offerings applied at VT-R1 timing. The Xyway was applied with our furrow jet equipment in the middle of the furrow with 5 gal/ac water as the carrier per companies suggestions. The foliar products were all applied with the Hagie research sprayer at 20 gal/ac carrier and 4 oz/ac MasterLock deposition aid.

Corn Fungicide Study VT Application	Rate per Acre	Bu/Acre	Bu/Acre Diff.	Net $ Return/A	ROI Rank
Xyway In Furrow	15.2 oz/ac	269.88	18.16	$71.32	1
Veltyma	7 oz/ac	264.91	13.19	$35.41	2
Delaro Complete	8 oz/ac	265.91	14.19	$31.04	3
Aproach Prima	6.8 oz/ac	260.57	8.85	$20.10	4
Miravis Neo	13.7 oz/ac	261.28	9.56	$15.05	5
Headline Amp	14.4 oz/ac	260.31	8.59	$11.06	6
UTC	-	251.72			
Generic Quilt Xcel	14 oz/ac	254.04	2.32	($11.64)	7
Lucento	5 oz/ac	250.04	-1.68	($38.45)	8

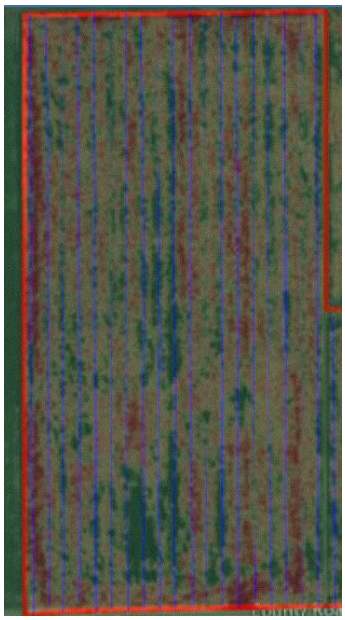
*** $5.15/bu Corn, Veltyma: $402.59/gal, Miravis Neo: $221.31/gal, Delaro Complete: $504.68/gal, Xyway: $187.00/gal, Aproach Prima: $282.00/gal, Headline Amp: $201.60/gal, Generic Quilt Xcel: $119.70/gal, Luento: $493.98/gal, Hi Clearance Fungicide Application: $10.50/Ac, NO REBATE OFFERS WERE FACTORED INTO FINAL PRICING OF INDIVIDUAL PRODUCTS**

Summary

I don't believe that there are many that will argue the fact that the 2021 growing season when it came to late season fungicide applications didn't provide some large returns. In some areas the amount of limiting factors that stacked up throughout the growing season caused that corn plant to have a lower ability to fight off diseases internally, and infection such as Tar Spot took over and caused huge yield reductions. Although our research farm shows great ROI throughout the product lineup, there were areas that we were seeing 20-40 bu/ac yield gains from treated versus untreated, and I feel that ties back to the extensive pressure some faced. Tar Spot although present was minimal at our research farm, but we are preparing for heavier infestations in 2022, with the amount of spores laying in fields. The in furrow applications of Xyway really separated itself from the pack in this study. Although the product potentially brings some baggage with it, in regards to stand reductions being seen when used in less than ideal planting and growing conditions, the fact of getting a product introduced early in the season within the plant, and allowing it to translocate and protect the growing tissue, could be a piece of the puzzle we are missing for staying proactive in managing disease. We aren't sure that it's a season long protectional product, as claimed, but plan to look at this much harder in 2022 and bundle it together with mid and late season applications of key fungicide products.

Aerial Height Above Canopy

Fungicide Application #1: Applied at VT Aerially w/ 6.8 oz/ac Aproach Prima, 3.8 oz/ac Lambda Cy, 1 qt/ac MicroPlus, 4 oz/ac Masterlock: 2 gal/ac Total Volume Applied
Fungicide Application #2 Height Study: Applied at R4 Aerially w/ 7 oz/ac Veltyma, 4 oz/ac MasterLock: 2 gal/ac Total Volume Applied
Wind Speed & Direction Application #2: South South West @ 13 mph Gusts



Trial Overview & Summary:
The goal of this particular study was to get a better understanding of deposition of product into the canopy when aerial applying at different heights. The plane conducting the study was set up with LIDAR to insure that we were the accurate heights wanting to target when applying: Wheels in Tassels, 10', 20', and 30' above the tassels of the corn plant. Each year there are multiple questions and observations brought up about aerial applications and height product is being applied above the canopy. In 2021 with heavy disease pressure such as tar spot this was potentially seen at a greater extent with what looked to be streaking or as some thought misapplications. Although this study wasn't focusing on the overall yield, but the deposition alone by implementing water soluble cards at different levels in the canopy of the growing crop, even at 30' above the canopy we were still seeing decent coverage on the cards. When looking at the concerns brought up in 2021 with streaking, many times what was found is those areas, was a double application or overlap of fungicide, more than a skip. So that tells us that there is a lot more that needs to be understood on timing of application, rate of products applying, and having confidence that we are getting consistent coverage on our corn crop, to protect that plant from stress, disease, and overall yield loss. Even though there was a VT application of fungicide applied on this farm, and minimal Tar Spot pressure, the 2nd application at R4-5 still gave us some additional yield benefit of 5-7 bu/ac, with 10'-20' being the target height for best performance.

2021 Aerial Height Trial

Card ID	Top of Tassel	1 ft from tassel	Ear Leaf	2 ft from soil
Wheels in Tassels	1.20%	1.60%	1.30%	1.10%
10' Above	1.70%	2.00%	2.10%	2.20%
20' Above	2.10%	1.50%	1.40%	1.50%
30' Above	1.10%	1.30%	1.60%	1.70%

Ivesdale "ALL IN" Study

Planted: May 7, 2021
Harvested: September 24, 2021 & October 23, 2021
Hybrids/Population: Brevant 09Z08, W6978, W7888, W7876, Brevant 14J04, Armor 1575, W8936, W7878
Rows: 16 row entries (30")
Tillage/Rotation: Conventional; corn/soybean rotation
Soil Type(s): Drummer SCL, Flanagan SL; well drained

Trial Overview

The 2021 growing season was our first attempt at really trying to push multiple corn hybrids to their limit on yields, by implementing a number of agronomic practices and products we have been focusing heavily on the past number of years. We decided to call this the "All In" concept as we wanted to do everything we could to attempt to maximize yield but most importantly wanted to evaluate what that true ROI was on everything that was implemented. Therefore we took 8 key hybrid offerings we have at United Prairie and planted them at target populations recommended by the company representative for each hybrid. From there we strategically incorporated multiple products and applications at key timings throughout the growing season at an attempt to mitigate stress and maximize yield. Those applications included starter fertilizers, sulfur, PGR's, Bio Stimulants, Fertilizer Catalysts, micronutrients, fungicide/insecticide applications, nitrogen fixating bacteria, and etc. Many of the trips made across the field were strategically timed not only based on growth stage of the corn crop, but also what our tissue test reports were telling us we might be lacking and needed to implement. Within all the standard program strips we had 197 lbs/ac total nitrogen, no sulfur, and a total investment on average of $297.67 per acre. On the "All In" portion of the study we had a total of 296 lbs/ac total nitrogen, 24 lbs/ac Sulfur, and a total investment on average of $489.56/acre. This gave us a difference in expense of $191.89 per acre and at $5.15 per bushel corn price, we needed 37.26 bushels to at least breakeven.

Ivesdale All In Corn Study						
Hybrid	Harvest Date	All In Program Yield	Moisture	Standard Program Yield	Moisture	Difference
Brevant 09Z08	9/24/2021	289.4	21.3%	276.5	21.1%	12.90
Wyffels 6978	9/24/2021	272.4	22.1%	248.5	23.0%	23.90
Wyffels 7888	9/24/2021	274.2	21.9%	273.9	22.4%	0.30
Wyffels 7876	9/24/2021	292.6	23.1%	287	23.8%	5.60
Brevant 14J04	9/24/2021	284.2	21.2%	266.5	22.1%	17.70
Armor 1575	9/24/2021	280.5	25.3%	272.4	27.0%	8.10
Wyffels 8936	9/24/2021	278	24.6%	275.2	25.1%	2.80
Wyffels 7878	10/23/2021	291.4	16.8%	280.2	16.0%	11.20

Summary

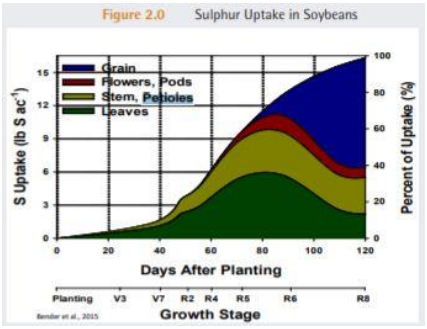
As much fun as it was to push these hybrids to the limits this year and see some great yield gains versus the standard practice we missed our mark on all hybrids on bushels needed to at least break even. Reflecting back on the study and evaluating all the parts of the equation that were implemented, there were some applications of products that overall I just don't think were necessary and provided no ROI. Although at times we feel like the "throwing the kitchen sink method at it" is a for sure win, it may be a win on yield gain, but profitability is what's the most important. One of the largest expenses overall on this project was the total nitrogen applied, and in growing seasons like 2021 on high OM farms the mineralization factor was a big influence it seemed, and therefore excess N or N fixating bacteria may have been an unnecessary expense. An additional evaluation is looking at what all was implemented in the In-Furrow and 2 x 2 applications. Some products I feel are necessary, however others I think could be omitted based on the planting date and soil temperature at that point in time, again potentially saving us more expense. The last big item I feel is really understanding your hybrids and what their true yield potential maybe in a 30" spaced setting. As we study the above chart we saw some tremendous yield separation on some hybrids, but definitely not all. Are some just much more efficient and able to maximize yield from the start if you put them in the right environment and have a foundation that sets them up for success? In many cases yes we believe so, but true feelings are there are still untapped yield drivers that we are on the cuff of discovering, and one must realize it might not just be one product or application, but a systems approach to hitting our final goals.

Time Lapse Camera's

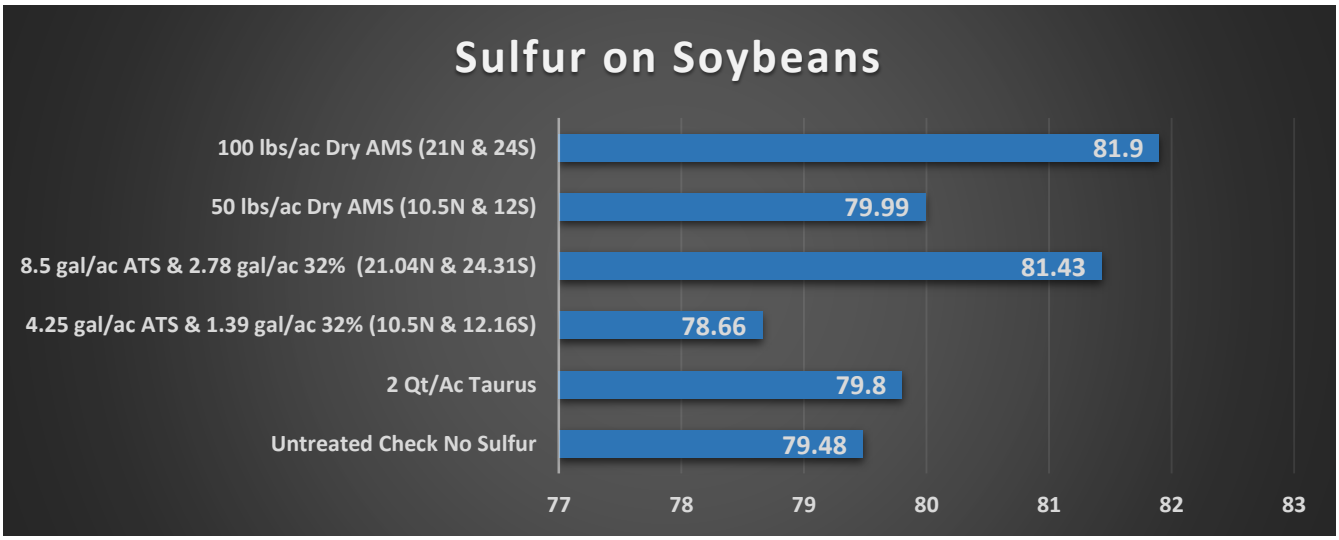
One of the most beneficial new tools that we implemented into our research this year were time lapse cameras. The cameras could be set up to capture images on the growing crop every so often over a long period of time. In most situations we focused on photo's being captured every 4-6 hours during the day, so that we could monitor the growing crop from emergence through tassel time. In the particular study below we were monitoring the emergence of W7888 with and without the application of Xyway fungicide applied In-Furrow with 5 gal/ac water as carrier. Growers in the southern part of the U.S. had claimed to be seeing stand reductions with the use of this product, so we wanted to monitor as closely as we could. The pictures below illustrate 1 months worth of images that can be viewed within a 20 second video. The clarity and consistency of the image quality is a real game changer I feel like, especially as we are looking at brand new products within the industry on our Innovation Farm. Going forward we will continue to implement this style of technology, to provide us with yet another resource and tool to assist in documenting notes and the season long story that comes with applications of new offerings in the industry.

Sulfur on Soybeans

Planted: April 27, 2021
Harvested: October 21, 2021
Variety/Population: Stine 36EB32, 140,000 ppa
Treatment: Obvius Plus F & I
Row Spacing: 30”
Rows: 8 row entries
Tillage/Rotation: Conventional; corn/soybean rotation
Soil Type(s): Drummer SCL, Flanagan SL; well drained



Trial Overview:
When it comes to Sulfur the focus over the last number of years has continued to be on the corn crop….but why is that? Sulfur in a plant is part of every living cell and part of a few of the amino acids that form proteins, it also is necessary for chlorophyll formation, therefore why deficiencies show a light green in color. We know that a 250 bu/ac corn crop needs about 20 lbs of S alone for the grain, and that supplemental applications with products such as ATS have provided us a consistent ROI. However beans have been somewhat over looked in the fact of what their demands are when it comes to S. An 80 bu/ac soybean crop needs 14.4 lbs of S just for the grain alone, but where is that coming from if atmospheric deposits aren’t being received anymore? The answer is from the soil, but do we need to supplement additional amounts, as we do in corn, to ensure that crop isn’t lacking in a crucial nutrient for growth and development? That’s what we tried to do in this study with a few different sources of Sulfur, at early season applications, as well as an in season foliar option.



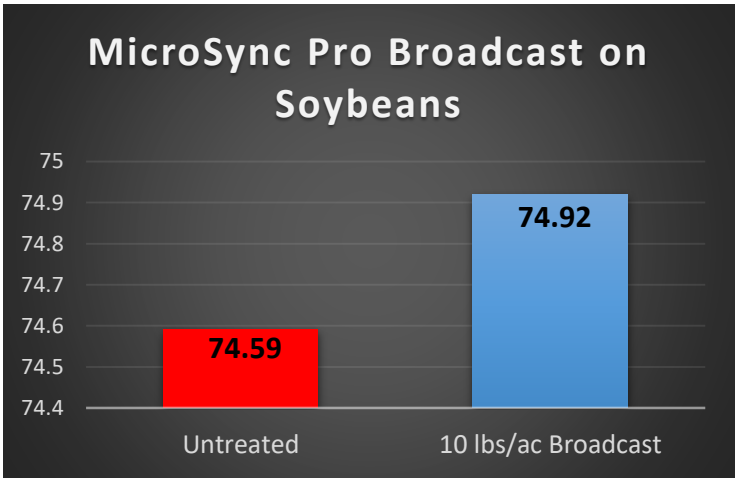
Summary:
Research out of Purdue in the past has shown some additional benefit when conducting a trial like this by using Dry AMS over ATS, so we wanted to make sure we used both products but had the same target N rates in the end when comparing the same S rate. When looking at the price point for most of these applications at $12.85/bu soybeans, atleast 1-1.25 bushel per acre gain was needed to at least breakeven. We unfortunately didn’t consistently see that in all applications, but the higher apps did provide a little more additional yield gain. My concern when it comes to early pre-plant applications of S on soybeans is that a soybean plant is very tap root based, where corn roots are more broad and out stretched at a 30-35 degree angle in the soil profile, so the corn plants ability to take up S might be easier than soybeans. Do we need to look at directing this application more towards the base of the plant going forward, and can we or would foliar options such as Taurus or even KTS be a viable alternative? Going to continue to expand our research on this going forward to try to better understand the direction we need to go, and if we actually even need to go.

MicroSync Pro for Soybeans

Planted: April 27, 2021
Harvested: October 21, 2021
Variety/Population: Stine 36EB32, 140,000 ppa
Treatment: Obvius Plus F & I
Row Spacing: 30”
Rows: 8 row entries
Tillage/Rotation: Conventional; corn/soybean rotation
Soil Type(s): Drummer SCL, Flanagan SL; well drained

Trial Overview

From the data that has been seen not only locally the past couple growing seasons, as well as from our Miller Ag Service locations down south for 3-5 years now, MicroSync Pro has been providing some nice yield response and performance year in and year out in corn. However looking through the nutritional demands of soybeans as well, we find that they also need some of the same key micronutrients that MicroSync Pro is bringing to the table. In this study we applied 10 lbs/ac MicroSync Pro in the fall of 2020 on cornstalks, and then chisel plowed the nutrition in, along with the P and K that was applied in our VRT program.



Summary

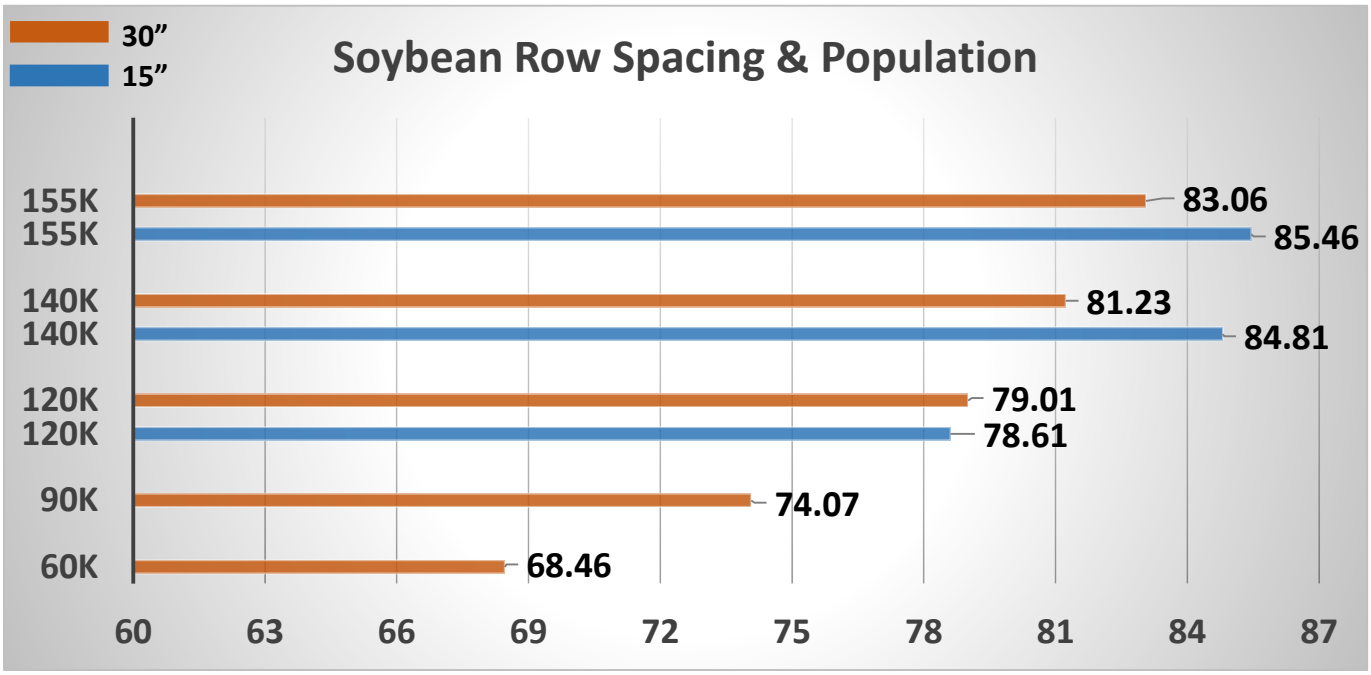
Through observations by myself and our intern team throughout the season and then looking at the above final results we didn’t see a significant difference between treated and untreated soybeans with the MicroSync Pro. Again I feel part of this goes back to the root structure of the soybean plant and the opportunities it has to lock on to some of these nutrients that we are supplementing. Foliar applications of some products, such as MicroPlus, has consistently shown positive ROI, as we know they are getting not only on the plants, but within the plants to provide some additional yield. As we look into how to better deliver this first shot of much needed nutrition in the future on soybeans, I feel we are going to concentrate on precise placement potentially within, off to the side, or over the row. The other side of this equation is also looking at in furrow or 2 x 2 starter formulations that could offer the same nutrient components but be delivered right on or next to the seed so that the sprouting plant has the highest potential to pull in the supplemental application that we are making.

Soybean Row Spacing and Population

Planted: April 14, 2021
Harvested: October 21, 2021
Variety/Population: Stine 36EB32, population study
Treatment: Obvius Plus F & I
Row Spacing: 15" & 30"
Rows: 12 row or 22 row Entries
Tillage/Rotation: Conventional; corn/soybean rotation
Soil Type(s): Drummer SCL, Flanagan SL; well drained

Trial Overview:

We decided to bring a row spacing and population study back on the Innovation Farm for the 2022 growing season. In 2021 we looked at these 2 variables but also implemented a planting date study as well, but after multiple years of research and results we felt like the early planting thought process has been fairly adapted by most and could be omitted in 2022. However row spacing questions continue to flood the marketplace, as well as not so much of understanding that we should be lowering our soybean populations at planting, depending on multiple factors, but how low could we reduce them, and still feel like we saw economic benefit. Therefore that is what we wanted to mimic in this study, with one planting date on April 14th, but multiple populations and 2 separate row spacing's. Unfortunately with our old 7000 Deere planter we could only take 15" populations down so far, so had to adjust accordingly.



Summary:

Our early planting study brought challenges with it when it came to mother nature influencers. We saw 28 degree temps a couple nights in a row on the 21st and 22nd of April, as well as just cool temps and reduced GDU accumulation throughout most of April. These adverse events created not only emergence issues, but caused some plants to completely die off in lower areas of the trial. Heavy residue contributed to the accumulation of more moisture, frost, and cooler zones that also didn't help the newly emerged soybeans, even though the field was conventionally tilled. Although many times the reduction in stand has helped push yields higher, as plants are forced to stack nodes and branch out, when we started off with lower populations to begin with this created a larger limiting factor than could be overcome in our 60K and 90K replications. Although we can never out predict the cards that mother nature will deal us, its still proven that soybeans can go through some rough times and still persevere, and reducing populations, to a certain level, has shown great returns over the years. That level of reduction though should be managed and evaluated not only every year, but potentially for every field. Its also tough to ignore the yield separation we have seen 2 years in a row now with 15" vs 30" soybeans. We realize planters aren't cheap, but this might be something to look at on your own farms, even if its just splitting the rows with a 30" planter as a potential trial.

Soybean Singulation

Planted: April 27, 2021
Harvested: October 21, 2021
Variety/Population: Stine 36EB32, 140,000 ppa
Treatment: Obvius Plus F & I
Row Spacing: 30”
Rows: 8 row entries
Tillage/Rotation: Conventional; corn/soybean rotation
Soil Type(s): Drummer SCL, Flanagan SL; well drained

Trial Overview:
After seeing multiple data sets on soybean populations the last few years, one item that hasn’t been focused on as much in soybeans as it has in corn is even spacing. For corn we all strive for that “picket fence” stand, to provide that plant plenty of room for root growth and minimize it’s competition from neighboring plants. Soybeans over the years have gone from the controlled spill of a drill to a more consistent drop out of planters, but what would happen if we precisely spaced these seeds. To figure this out we compared precisions 56 cell singulation plate to the 80 cell standard plate we had been using for years with our plot planter. The singulation plate uses the corn ejector to knock seeds out and prevent gaps and doubles from occurring, while the standard plate has its own bean ejector to achieve this same spacing.

Soybean Singulation		
Population	**Plates**	**Yield (bu/ac)**
60K	**Standard**	**80.5**
60K	**Singulation**	**80.84**
100K	**Standard**	**84.79**
100K	**Singulation**	**82.38**
140K	**Standard**	**81.9**
140K	**Singulation**	**82.91**

2021 Overall Results not showing drastic differences between either seed plate used

Summary:
The overall outcome of our testing of this concept in 2021 didn’t show us that implementing the 56 cell singulation plate over the 80 cell standard plate offered consistent yield gain. The goal of the research farm is to try to conduct study’s in a controlled setting in 500’-600’ strips, and we are curious if the lack of variability that was offered in these planting conditions didn’t show the true potential benefit that has been seen by others who have tested this. The singulation of a seed is driven by a number of factors with one of the major ones we feel being the speed of travel when planting and how that planter is reacting to not only the speed of travel but the ground conditions it is traveling over. The likelihood of skips, doubles, or just uneven spacing could drastically rise in these real field settings, and the result of that uneven placement in our opinion could generate a limiting factor that may potentially attribute to a yield decline come harvest. During planting season there are a lot irons in the fire with planting, hybrid/variety placement, tillage, spraying, and etc, so although times can be overwhelming don’t ever overlook the small things such as placement of corn or soybean seeds in that profile, and be sure to understand how it could directly correlate to your overall performance at season end.

Soybean Treatment Comparison

Planted: April 27, 2021
Harvested: October 21, 2021
Variety/Population: Stine 36EB32, 140,000 ppa
Treatment: Treatment Comparisons
Row Spacing: 30”
Rows: 8 row entries
Tillage/Rotation: Conventional; corn/soybean rotation
Soil Type(s): Drummer SCL, Flanagan SL; well drained

Trial Overview:
Soybean seed treatment options continue to be at the top of our radar when looking at continued ways to increase yield and maximize a trip across the field. This past growing season we decided to take some of the consistent foundational mixes that we have seen provide ROI the last number of years and combine some of those offerings together as one to maybe see if 2+2 might equal 6!! We were also asked to evaluate some new offerings in the market that have some more specialized focuses, such as white mold, nematodes, SDS, bio-stimulants, or even additional fungicide MOA.

Seed Treatment **2021**	Yield	Yield Rank
F & I (Cruiser Maxx Vibrance) + Vayantis	82.48	1
F & I + Ethaboxam	82.34	2
F & I + Seed+ Graphite	82.14	3
F & I + Ethaboxam + Seed+Graphite	82	4
F & I + Relyna	81.94	5
F & I Only	**81.62**	6
F & I (Defendis)	81.57	7
F & I + Ilevo	81.38	8
F & I (Cruiser Maxx Vibrance)	81.32	9
F & I + Precide Ultra	80.69	10
F & I + Saltro	80.66	11
F & I + Trunemco	80.66	11
F & I + Cygin	80.08	13
F & I + Indigo M34 Talc	79.84	14
F & I + Heads Up	79.58	15
F & I + VPH Biostimulant	79.56	16
F & I + Indigo M34 WP & Biotrinsic E13 WD	79.48	17
F & I + Tag Team LCO	78.95	18

Seed Treatment **2020**	Yield	Yield Rank
F/I + Ethaboxam	71.9	1
F/I + 1/2 rate Ilevo	70.3	2
F/I + Seed + Graphite	70	3
F/I + Full Rate Saltro	69.8	4
F/I + Ascend Pro & Tuxedo	69.7	5
F/I + Full Rate Ilevo	69.2	6
F/I + Moly Dry	69	7
F/I Only	**68.9**	8
F/I + Azoxystrobin	68.5	9
F/I + Ascend Pro & Takeoff	68	10
F/I + Ascend Pro	67.1	11
F/I + Takeoff	67	12
F/I + Tuxedo **(wheel track issue)**	65.1	13

Seed Treatment **2019**	Yield	Yield Rank
F/I + Intego Solo	71.4	1
Intego Suite or Halifax F/I	70.6	2
F/I + TagTeam	68.7	3
F/I + Moly Dry	68.2	4
F/I + BioFlex	68.2	4
F/I + Cygin	68	6
F/I – **Control****	67.9	7
F/I + Lalfix Duo	66.9	8
F/I + BioCore	62.7	#N/A

Summary:
When summarizing this study we felt it was important to not only show 2021’s results but also the 2 previous years data sets. The first thing that pops out when looking at all 3 of these was that this was the first growing season that we were able to obtain consistent 80 +/- bushel per acre soybeans across the whole study. We feel like that is a very important observation as you dive even deeper and see that although treatments were important, the separation or potential gain out of some of the extras added onto the bean didn't provide a great deal of yield gain or even loss for that matter, versus the check. When looking at products in addition to the standard F & I in most cases it takes maybe a bushel or so to provide consistent ROI, and the past few seasons we have seen that and more with products such as Ethaboxam, Seed + Graphite, and etc. So why not such the big gains in 2021? I think the biggest reason was that we obviously had ideal growing conditions on this quadrant where the study was conducted, and adverse factors once these seeds were planted towards the end of April were not as prevalent as they were in early to mid April. Although we wish we could consistently have these environments each year, that isn’t reality and therefore we must plan for the worst and hope for the best in my opinion, and that’s were a solid foundation treatment program is necessary, as well as some of the additional overtreatment options such as Seed +, Ethaboxam, Saltro/Ilevo, and maybe even inoculants such as Precide Ultra. From our research these above mentioned look to be a solid baseline that can provide economic benefit, and then as we go further than that it might be on a field by field or case by case basis, depending on what your targeting or need to control. We plan to continue to implement these studies on the farm, and we will continue to chip away in hopes of finding that next piece of the yield puzzle.

Starter Fertilizer on Soybeans

Planted: April 27, 2021
Harvested: October 21, 2021
Variety/Population: Stine 36EB32, 140,000 ppa
Treatment: Obvius Plus F & I
Row Spacing: 30”
Rows: 8 row entries
Tillage/Rotation: Conventional; corn/soybean rotation
Soil Type(s): Drummer SCL, Flanagan SL; well drained

Trial Overview

It has been a few years since we have taken the opportunity to look at starter options when planting soybeans, mainly because our past trial results didn’t show a lot of benefit. Much of that was likely driven by the fact that the soybean seed is very sensitive in comparison to corn, so those starters that we were evaluating had to be applied at a rate greatly reduced for that seeds protection. The reduction in rate we felt was getting to the point that it might have been unnecessary to implement this practice. However in recent times starter fertilizers, as well as methods of application have changed, so we wanted to revisit this thought process, and introduce some new products to the farm. Our plot planter is fitted with the Precision Furrow Jet starter fertilizer application tip, where it can place a band of starter either within the furrow or ¾” on each side of the furrow and side. Also with the addition of the Yield 360 Bandits, this gave us another option for application with applying solution 2 x 2 x 2. Within the study we wanted to not only just look at basic starters that have been seen to provide net return in other studies, but also look at placement, rates, and then stimulators that ask that growing soybean plant to do or produce more.

Soybean Starter Fertilizer Evaluation Innovation Farm 2021

Yield Rank	Soybean Starter Study	Application Method	Rate per Acre	Bu/Acre	Bu/Acre Diff. from UTC	Net $ Return/A	ROI Rank
6	Cygin & H2O	Furrow Jet Centers	2 oz/ac & 3 gal/ac	78.99	4.68	$56.20	1
5	KTS, ATS, LCBF Boost, & 32%	Bandits	3 gal/ac, 3 gal/ac, 2 gal/ac, & 3 gal/ac	79.67	5.36	$36.41	2
1	QuickGrow Complete Soybeans	Furrow Jet Centers	3 gal/ac	79.36	5.05	$30.75	3
4	QuickGrow LTE	Furrow Jet Wings	5 gal/ac	78.31	4	$18.85	4
2	Marco Boost	Bandits	10 gal/ac	77.13	2.82	$11.64	5
3	QuickGrow LTE	Furrow Jet Wings	7.5 gal/ac	75.68	1.37	($31.22)	6
7	UTC	-	No Starter	74.31	-		

- **$12.85/bu Soybeans, QuickGrow Complete Soybeans: $11.38/gal, Marco Boost: $2.46/gal, KTS: $4.70/gal, ATS: $1.84/gal, 32%: $1.95/gal, LCBF Boost: $3.50/gal, Cygin: $252.00/gal, QuickGrow LTE: $6.51/gal**

Summary

VERY excited with the results discovered within this research project!!! As discussed in previous pages the condensed root system of the soybean plant makes us feel like one of the best placement methods for additional products that need pulled in by the root system is obviously as close to that growing root system as you can get. However the fear with starters has always been that salt index and the detriment it can cause. Within this study it seems the QuickGrow class of starters provide a safe option for soybeans, at rates from 3-5 gallons, depending on the product. Also when looking at blends that are of very high salt loads and placing them in the 360 Bandits, we not only visually saw bigger plant mass and roots, but this equated to yield that provided a consistent ROI. These soybean management practices could be a huge game changer in pushing soybean yields up to the next tier, and we will be jumping into more research head first in 2022, to try to not only provide another year of consistent data, but see if we can drive things up even higher.

What's Next for Soybean Foliars?

Planted: April 27, 2021
Harvested: October 21, 2021
Variety/Population: Stine 36EB32, 140,000 ppa
Treatment: Obvius Plus F & I
Row Spacing: 30"
Rows: 8 row entries
Tillage/Rotation: Conventional; corn/soybean rotation
Soil Type(s): Drummer SCL, Flanagan SL; well drained

Trial Overview:
Foliar applications on soybeans during the post application of herbicides has shown to provide a lot of potential opportunity in regards to economic return. The foundation of a vast majority of our post applications typically includes a 1 qt/ac rate of MicroPlus, and after testing this for over 10+ years now we feel like that is a necessary part of the total program. When looking at this years protocol we wanted to start with that baseline of MicroPlus on all applications, with the understanding that it is now just part of the program, and then bolt on some additional components to see if we can trigger that plant to do more. Many of these products included biostimulants, stress mitigators, amino acids, PGR's, and then some new concepts out there that are looking at late season potassium demands. As with any trip that we make across our crops we want to make sure that we maximize that trip, and if there are products that make sense to add in, then our goal at United Prairie is to find them and test them to the max, not only on the research farm, but eventually in real field settings.

Upgrade Options for Post Soybean Applications

Treatment	Bu/Acre	Moisture	Bu/Acre Diff.	Net $ Return/A	ROI Rank
1 qt/ac Microplus Post fb1 qt/ac MicroPlus R3-R4	82.34	13.6%	2.5	$22.38	1
1 qt/ac MicroPlus R3-R4	81.86	14.1%	2.02	$21.08	2
1 pt/ac Kriss Post	82.29	14.1%	2.45	$19.20	3
1 gal/ac KTS Post	81.28	13.8%	1.44	$13.80	4
1 qt/ac MP, 4 oz/ac Ascend SL, & 1 pta/c Takeoff LS R3-R4	82.15	13.8%	2.31	$13.78	5
1 pt/ac Ingrained Post	81.14	14.1%	1.3	$10.46	6
4 oz/ac Ascend SL, & 1 pt/ac Takeoff LS Post	81.42	13.5%	1.58	$9.27	7
1 qt/ac MicroPlus Post	80.66	14.1%	0.82	$5.66	8
2 gal/ac LCBF Boost Post	80.66	13.7%	0.82	$3.54	9
UTC	79.84	11.3%	-	-	-
1.8 grams/gal PiKSi Dust Post	79.75	13.9%	-0.09	($14.66)	10
4 oz/ac Cygin Pro Post	79.18	13.9%	-0.66	($18.01)	11

Summary:
Overall we were very pleased with our findings this year, especially with the introduction of some new products and concepts into this multi-year study. Although some of our table stake applications like MicroPlus, may have only provided us less than a bushel gain this growing season, the return on that investment still made some consistent money, and that's what its all about. As we look at larger scale evaluations of some of the practices implemented last year and wanting to replicate this year with PGR's and products such as Takeoff LS that are geared towards higher demands out of each and every plant, we are beginning to see some nice benefit, and want to replicate this to an even larger scale. The Amino Acid conversation and future of this topic I feel is in it's infancy and we will be taking a much deeper look into this in 2022, and how we can put together this full system to maximize top yields. Lastly tissue testing continues to show a lack of late season Potassium in not only soybeans but also corn plants, and KTS might be offering some solutions if this is a issue that plagues your field. As with any of our studies we always want to make sure the necessary foundation is set, to offset what we are asking these plants to demand from the soil and mother nature, and we want to encourage you as growers to do the same on your own acres.

Late Soybean Foliar Applications

Planted: April 27, 2021
Harvested: October 21, 2021
Variety/Population: Stine 36EB32, 140,000 ppa
Treatment: Obvius Plus F & I
Row Spacing: 30”
Rows: 8 row entries
Tillage/Rotation: Conventional; corn/soybean rotation
Soil Type(s): Drummer SCL, Flanagan SL; well drained

Trial Overview

At United Prairie we have conversations on a regular basis asking what the next steps are to achieving higher yields in soybeans. As we all know there are multiple steps to take to achieve this, but if the foundation is set, I feel like in many growing seasons the opportunity for higher yields are there, but that plant typically needs some assistance to get there, because limiting factors are always being faced. This study focuses solely on what are those late season foliar products that could be applied in either with a trip of fungicide and insecticide at R3-R-4 or even later that can assist that soybean plant with flower retention, pod development, soybean seed size, and etc. Many of these products are geared toward nutrient based needs, whether that be from delivering a true nutrient to the plant, or driving that plant to pull in more nutrition to offset demands created. Also some products take a deeper look into key functions that can naturally happen in a soybean plant at a given time, but might need a little help from a supplementary source to trigger exactly when needed.

Pushing the Limits on Later Foliar Applications

Treatment	Bu/Acre	Moisture	Bu/Acre Diff.	Net $ Return/A	ROI Rank
R3 PTL, 1 gal SRN25B	89.69	13.3%	7.51	$88.17	1
R3 PTL & 1 gal/ac KTS	88.19	13.7%	6.01	$72.53	2
R3 PTL fb R5 PTL	89.24	13.6%	7.06	$70.00	3
R3 PTL, 2 gal LCBF Boost	87.1	13.7%	4.92	$56.22	4
R3 PTL, 4 oz Ascend, 1 pt Takeoff	86.11	13.6%	3.93	$37.89	5
R3 PTL, 5 oz Utrisha Blue N, 4 oz Ascend SL, & 1 pt Takeoff	87.1	13.7%	4.92	$36.61	6
R3 PTL, 1 pt Kriss	85.23	13.8%	3.05	$26.91	7
R3 PTL, 5 oz Utrisha Blue N	85.12	13.5%	2.94	$23.78	8
R3 PTL, 1 qt MicroPlus	83.73	13.6%	1.55	$15.04	9
R3 PTL	**82.18**	**13.3%**	-	-	-

- **P = 4 oz/ac Priaxor, T = 4 oz/ac Tilt, L = 3.8 oz/ec Lambda Cy Insecticide$12.85/bu Soybeans, Utrisha: $44.80/lb, Ascend SL: $202.29/gal, KTS: $4.70/gal, Takeoff LS: $37.68/gal, SRN25B: $8.33/gal, LCBF Boost: $3.50/gal, Kriss: $98.28/gal, MicroPlus: $19.50/gal, Priaxor; $555.00/gal, Tilt: $53.75/gal, Lambda Cy: $56.70/gal**

Summary

Tremendous response seen this year on some of the products that were run within these studies. The first key is to set the stage for disease and stress management with an application of fungicide and insecticide, which was implemented in each study. Looking at some of the top yields and returns, late season Nitrogen, Potassium, and even Sulfur showed some response. I can’t say that I’ve consistently seen that in the past, however as the soybean plant reaches R5 nodules are shutting down and supplemental N and other nutrients are definitively needed based on uptake charts to finish the plants off and these maybe a couple options. A secondary application of F & I at R5 also showed some nice response, which tells me that late season stress and disease was still present and our R3 app was beneficial but bushels were left on the table potentially in 2021. When mixing these compounds going forward, we are going to get a more in depth understanding of the functionality of each item that is being added in the mix and if a synergistic effect can be seen in 2022

Fungicide Timing Product Comparisons

Planted: April 27, 2021
Harvested: October 21, 2021
Variety/Population: Stine 36EB32, 140,000 ppa
Treatment: Obvius Plus F & I
Row Spacing: 30”
Rows: 8 row entries
Tillage/Rotation: Conventional; corn/soybean rotation
Soil Type(s): Drummer SCL, Flanagan SL; well drained

Trial Overview

Over the last number of years we have continued to compare the performance differences between multiple fungicide offerings in the market place. We wanted to have a better idea of what not only provided the strongest disease control year in and year out, but who also provided the longest residual, and reduced the highest amount of stress during certain growing seasons. This year with the onset of Tar Spot in corn, we wanted to attempt to make a proactive approach in soybeans with some of these newer, longer lasting residual products, and therefore introduced an R1-2 application to see if this provided positive profit.

Soybean R1-R2 Application	Rate per Acre	Bu/Acre	Bu/Acre Diff.	Net $ Return/A	ROI Rank
Delaro Complete & Lambda Cy	8 oz & 3.8 oz	86.56	1.54	($13.44)	1
Revytek & Lambda Cy	8 oz & 3.8 oz	85.44	0.42	($20.09)	2
Priaxor, Tilt, & Lambda Cy	4 oz, 4 oz, & 3.8 oz	84.34	-0.68	($34.22)	3
UTC	-	85.02			

Soybean R3-R4 Application	Rate per Acre	Bu/Acre	Bu/Acre Diff.	Net $ Return/A	ROI Rank
Miravis Top & Lambda Cy	13.7 oz & 3.8 oz	88.42	7.13	$71.23	1
Priaxor, Tilt, & Lambda Cy	4 oz, 4 oz, & 3.8 oz	87.44	6.15	$58.32	2
Delaro Complete & Lambda Cy	8 oz & 3.8 oz	86.59	5.3	$34.88	3
Revytek & Lambda Cy	8 oz & 3.8 oz	85.98	4.69	$34.78	4
Aproach Prima & Lambda Cy	6.8 oz & 3.8 oz	84.92	3.63	$29.98	5
Lambda Cy	3.8 oz	82.29	1	$11.17	6
Generic Azoxy Prop & Lambda Cy	14 oz & 3.8 oz	82.77	1.48	$4.24	7
Lucento & Lambda Cy	5 oz & 3.8 oz	83.16	1.87	$3.05	8
Protegeam YLD & Lambda Cy	4 oz & 3.8 oz	81.84	0.55	($4.29)	9
UTC	-	81.29			

*** $12.85/bu Soybeans, Lambda Cy: $56.70/gal, Delaro Complete: $504.68/gal, Priaxor: $555.00/gal, Tilt: $53.75/gal, Miravis Top: $174.74/gal, Revytek: $380.85/gal, Aproach Prima: $282.00/gal, Lucento: $493.98/gal, Protegeam YLD: $309.61/gal, Azoxy Prop: $119.70/gal**
NO REBATE OFFERS WERE FACTORED INTO FINAL PRICING OF INDIVIDUAL PRODUCTS

Summary

The R2-R3 window of application although helped spread our workload out within the growing season, showed little to no yield benefit over the untreated check, and a negative return on investment with the addition of the product expense at this timing. However the sweet spot of timing we have seen for years, continued to not disappoint with a strong showing from many of the products that we tested. Many of the products that introduce the SDHI MOA seem to be a standout in regards to yield gain. I like to compare this to the residual foundation discussion we have had for years in soybeans and will have to a greater extent this year. The more modes we can put out there, the stronger the rate the actives provides, which in turn can provide longer protection throughout a crucial period of the growing season, with flower retention, pod development, and seed fill. Implementing these applications into your program in our opinion should be a planned approach year in and year out, and we have multiple years of data to support this statement that any of our sales agronomists are willing to share.

Miravis® Top

Revytek™ Fungicide

Aproach® Prima FUNGICIDE

Priaxor® Xemium® Brand Fungicide

Corn On Farm Research

Side by Side Results - United Prairie 2021

Corn Treatments	# of Trials Yield Data Received	% Positive Yield Response	Range of Bu/Ac Response	Ave. Response bu/a	Average Return on Investment $
MicroNutrient Granual Fertilizer					
MicroSync Pro (10 lbs/ac)	16	67%	-4.08 to 11.99	3.7	$9.06
In Furrow Liquid Products					
Xyway Fungicide (15.2 oz/ac)	2	50%	-10.57 to .564	-10.01	($73.76)
NH3 Trials					
Centuro vs N-Serve	2	100%	2.55 to 8.54	5.545	$18.96
Sidedress Trials					
Invigorate (1 qt/ac)	5	100%	6.9 to 13.74	12.266	$53.67
Foliar Products					
Ascend SL (4 oz/ac) & Takeoff LS (1 pt/ac)	3	100%	2.88 to 8.29	5.96	$19.66
Hydrigro 802 (1 qt/ac)	8	50%	-3.22 to 2.6	.83	$.59
Utrisha Blue N (5 oz/ac)	2	50%	-3.6 to 4.79	0.6	($10.91)
Corn Fungicide					
Summary of all corn VT Fungicide Applications 2021	8	88%	-1.02 to 37.91	17.245	$57.12
2nd App Fungicide Applications @ R4-R5	5	100%	2.19 to 31.3	15.314	$47.18

MicroSync Pro: $10.00/ac, Xyway Fungicide: $22.21/ac, Avg Cost per Acre Corn Fungicide Applied: $31.69/ac, N-Serve: $13.04/Acre, Centuro: $9.60/ac (100 lbs/ac N), Invigorate: $9.50/Ac, Ascend SL: $6.32/ac, Takeoff LS: $4.71/Ac, Hydrigro 802: $3.68/ac, Utrisha Blue N: $14.00/ac

(Bu/Ac difference from UTC x $5.15/bu corn - cost of treatment = Net $ Return/Ac)

Corn Products S x S Summary

Just as it has been in the past, our focus with grower on farm side by sides is to take some key findings out of the past innovation farm trials and get them out on a larger field setting to determine if we can continue to see similar income returns. This year proved to be a little more challenging to get on farm trials out the door, as there were a number of herbicide supply chain issues and delays in applications throughout the season. We know it is crucial to make sure that we get the basics taken care of first and foremost during the season, so wanted to insure we did that and then incorporate studies where it made the most sense for the grower and the trial. In addition to the above listed delays, we also experienced a few products that were sold off with a company acquisition and EPA registrations were not renewed for the 2021 growing season. Although this was unfortunate to see, we are still going to keep an eye out for their potential return to market in the future. None the less, even with all these obstacles presented to us, the sales team was still able to capture some great information for 2021.

Product Overview

Ascend SL & Takeoff LS showed some consistency in performance on our s x s's once again this season. From our experience when introducing these products, whose sole purpose is not only demanding the plant to grow bigger stalks, leaves, and roots, but also assisting in the uptake of nutrition, you must insure you are prepared to offset the added plant demands. We focused on growers that had those foundations set, and this proved to show positive results. Although Xyway didn't show up well in the 2 studies we had on farms, it did show up positive on the controlled study at the Innovation Farm. We feel much more testing and evaluation is needed on this product going forward but are optimistic of its abilities. MicroSync Pro continues to show great returns and helps offset the corn plants nutritional demands consistently. Late season fungicide in corn in 2021 was a definite must, and even in heavy tar spot scenarios a secondary trip proved worthy on our studies. This 2nd trip may not be an every year return, but something to consider going forward. Invigorate is a biological product containing 22 different microbes that we had actually worked with many years ago in another form and had success with. This product came back under a new name in 2021 and we look forward to expanding our research on it through multiple delivery mechanisms in 2022. Lastly when looking at a new biological introduced in 2021, Utrish Blue N, there were a lot of unknowns about it and its specific application timing. Applications were put on late this year but thoughts for 2022 is to hit timings earlier and prepare for the plants highest N uptake between V8-VT.

Soybean On Farm Research

Side by Side Results - United Prairie 2021

Soybean Treatments	# of Trials Yield Data Received	% Positive Yield Response	Range of Bu/Ac Response	Ave. Response bu/a	Average Return on Investment $
MicroNutrient Granual Fertilizer					
MicroSync Pro (10 lbs/ac)	2	50%	-1.24 to 2.11	0.435	($4.41)
Sulfur on Soybeans					
Dry AMS (100 lbs/ac)	2	100%	.53 to 2	1.265	($3.19)
Foliar Products					
Ascend SL (4 oz/ac) & Takeoff LS (1 pt/ac)	5	67%	-.33 to 2.84	1.71	$10.94
MicroPlus (1 qt/ac)	3	7%	-.5 to 1.8	0.82	$5.66
Soybean Fungicide					
Summary of all Soybean R3-R4 Fungicide Applications 2021	1	100%	3.24	3.24	$9.38

MicroSync Pro (10 lbs/ac): $10.00/ac, Dry AMS (21-0-0-24): $19.45/acre applied @ 100 lbs/ac, Ascend SL: $6.32/ac, Takeoff LS: $4.71/ac, MicroPlus: $4.88/ac, Avg Cost per Acre Soybean Fungicide and Insecticide Applied: $32.25/Acre

(Bu/Ac difference from UTC X $12.85/bu soybeans - cost of treatment = Net $ Return/A)

Soybean Products S x S Summary

As with the corn studies for 2021 the soybean on farm trial protocols were also a little challenging to get completed this growing season. As many growers started off planting in early to mid April, some of the inconsistency in stands in soybeans coming out of the cool spell of mid to late April concerned us when looking at receiving usable data. Many times in some of these settings population targets were anywhere from 130-140K ppa at planting time, but after the adverse weather in some cases and where minimum tillage was practiced, stands got as low as 60-70K ppa. Looking back now at final yields, it was very surprising to see just how much these soybean plants could compensate themselves from a 40-50% reduction in stand from target, and implementing more of these studies on what I would consider an already stressed acre may have potentially shown higher gains. Some of the studies that were implemented though, and that we felt would show consistent response from the beginning, did not let us down in our findings. When it came to MicroSync Pro ahead of soybeans however, we haven't seen the consistent response with this product on soybeans. We feel much of that is correlating back to the soybean plants nutritional demands early season, and that maybe our attention would be better focused on an alternative nutrient makeup to get within the soil profile, or to try to band those nutrients next to the bean plants very tap root based structure. New findings are showing also potential gains from supplemental foliar applications season long, so we will be targeting this more in 2022.

Sulfur in general continues to be a hot topic especially in corn, but knowing that soybeans require this nutrient as well we wanted to try to supplement with an alternative source. Unfortunately although we did see a little yield gain, this gain did not offset the cost of the product and application. Again not giving up on this one, and feeling like placement and timing will be crucial for success. Some of our baseline foliars such as Ascend SL, Takeoff LS, and MicroPlus continue to show the economic return that we are looking for every year. Going forward the MicroPlus is likely going to be a standard for every post trip we make on the research farm, and once again where the stage is set for success we will supplement additional PGR's and stimulants into that plant. Last evaluation was fungicide and insecticide on soybeans. Although there was only 1 side by side received back on this, this was of no surprise. Vast majority of growers have seen the consistent pay off on this application at R3-R4 timing, and therefore are doing less testing and more just spraying. We foresee this trend continuing going forward in both corn and soybeans, and will likely move away from this study to some extent unless new product offerings or suggested application timing(s) are needed and seen to show benefit.

TAR SPOT

- Tar Spot found all across Illinois during the 2021 growing season, with some areas suffering heavier infestations and yield declines than others
- Infection occurs with cooler temps (60°-70° F), and high humidity
- Corn plant is susceptible to Tar Spot at all growth stages, but leaf wetness is major driver
- Infection can occur 2-4 weeks before the spots will be seen on the leaves
- The disease will take advantage of stressed tissue or other limiting factors and can cause significant yield loss
- Study's are being evaluated on best performing fungicide products and application timings, but most consistent ROI has still been seen at VT-R1
- Focus on multiple MOA products and increased use rates for best results

CROWN ROT

- Crown Rots were evident in a number of fields in multiple areas across the United Prairie footprint
- Growing season started cold, then dried out for a number of weeks, followed up with heavy amounts of water in areas, which created nutrient losses, those losses lead to a number of compounded issues happening in the plant
- Crown Rot causes late season standability and harvest issues for many
- Crown Rot can infect all hybrids if the right conditions are present
- Seed treatments may help initially but run out of steam before the onset of the rot really takes place
- Fungicide applications won't provide direct control
- Focus on strong agronomic hybrids, and helping that plant use it's own defense mechanisms to control
- More info being looked at with in-furrow or 2 x 2 fungicide applications and there potential benefit

ARMYWORMS

- Fall Armyworm infestations occurred in late August in many hay fields locally
- These infestations started in the south and moth flights worked there way north through Illinois and farther
- Concerns on resistance of certain insecticides such as Lambda Cyhalothrin were seen in many places, but still seemed effective here in Illinois
- As hay fields were stripped to nothing, some of the pressure moved into corn and soybean fields
- Proactive scouting and monitoring helped to keep this issue at bay in many fields, through not only the first generation of infestation, but a 2nd one as well

United Prairie Summer Internship

United Prairie summer internship program provides you an opportunity to get a more in depth look into what is all involved in the retail fertilizer and chemical industry. Our goal is to provide you with multiple opportunities and experiences throughout the summer, that you will take back home with you and implement within your future careers. If looking for an internship for the Summer of 2023 please feel free to reach out to Kyle Meece to learn more about our United Prairie Internship Offering.

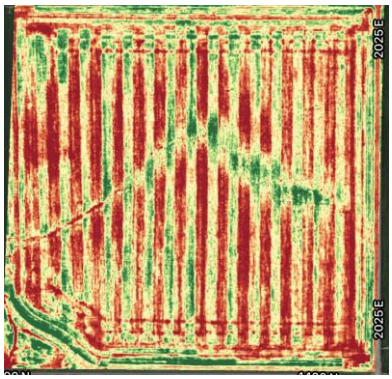
Kyle Meece- Agronomy Manager
Cell: 217-552-9350
Email: kmeece@unitedprairie.com

- All interns are provided the opportunity to achieve their Part 107 Drone License Certification through a Parkland training course
- State of the art technology such as iPads and Drones are provided for each intern to use throughout the growing season.
- Extensive agronomic training and real field scouting experiences provided throughout the summer to help you understand the growth and development of the corn and soybean crops as well as identify any unwanted limiting factors
- Work with others your age to establish friendships and relationships in the agriculture industry
- Take part in on farm research and work with multiple products to better understand there ROI, within our 60 acre Innovation Farm

- Opportunity to ride with multiple employees within United Prairie to get a broader overview of their day to day activities and focuses
- Experience the chance of running some of the equipment used to complete our research trials (sprayers, planter, sidedress bar, etc)
- One on one interactions with growers throughout Central IL
- Help to continue building your resume through opportunities and experiences offered at United Prairie.

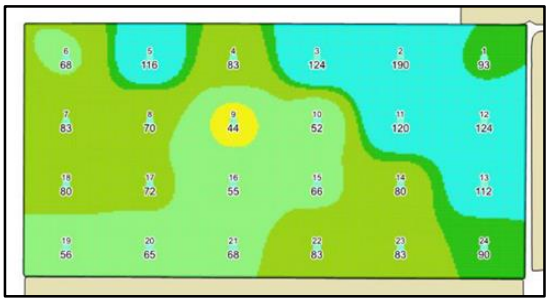
United Prairie Technology Services

United Prairie is always striving to find the next tool from a technology perspective that can bring value to your operation. The foundation of any program though should start with implementing a strong soil testing service to gather results looking at not only OM, pH, P, & K, but also taking into account CEC and Base Saturation. Those levels are then put into an algorithm where we are looking at building fertility levels on the farm from a number of different angles, whether that be through a standard removal practice, VRT applying based off your soil holding capacity, looking at historical yield data to provide necessary amounts where needed, or even taking a different approach and looking to build or maintain levels using Base Saturation and CEC as part of the algorithm. As we continue to also dig deeper into understanding what all happens within our soil profile we are beginning to evaluate micro nutrient levels within our soil testing program and how to alleviate yet another potential limiting factor. We are also implementing drones into our scouting program and with some of our sales agronomist. These devices not only allow us to evaluate fields from a different perspective, but also will give us the ability to review stand counts established early in the season, as well as capture imagery in the event we are trying to diagnose an issue or look at a potential trial implemented on a portion of the farm. Technology is an ever changing environment and we will continue to strive to be leaders in the industry when it comes to bringing new ideas and innovations to market in this arena. **Contact your United Prairie Sales Agronomist for more information about all our technology service offerings.**

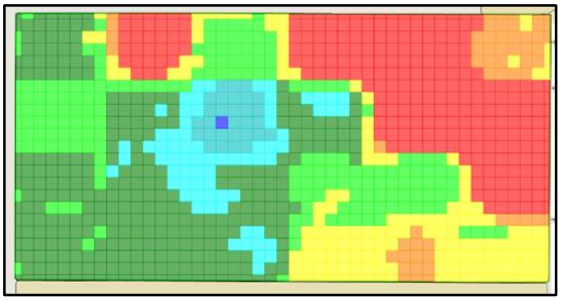


Drone Low Resolution Imagery

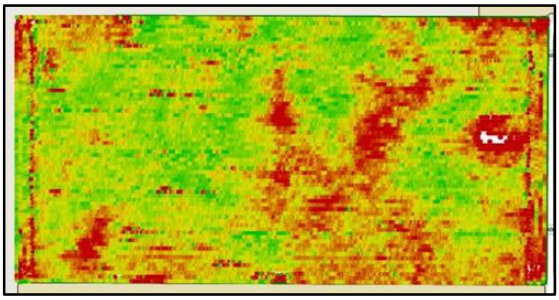
Drone Aerial Photography



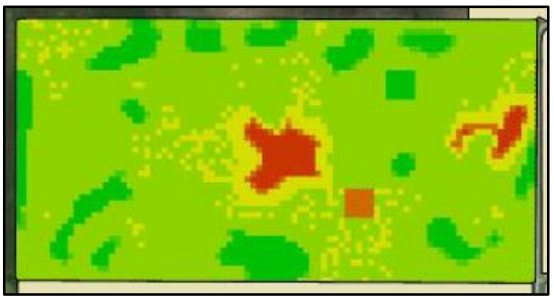
Soil Testing



VRT Fertilizer Recommendations



Yield Mapping

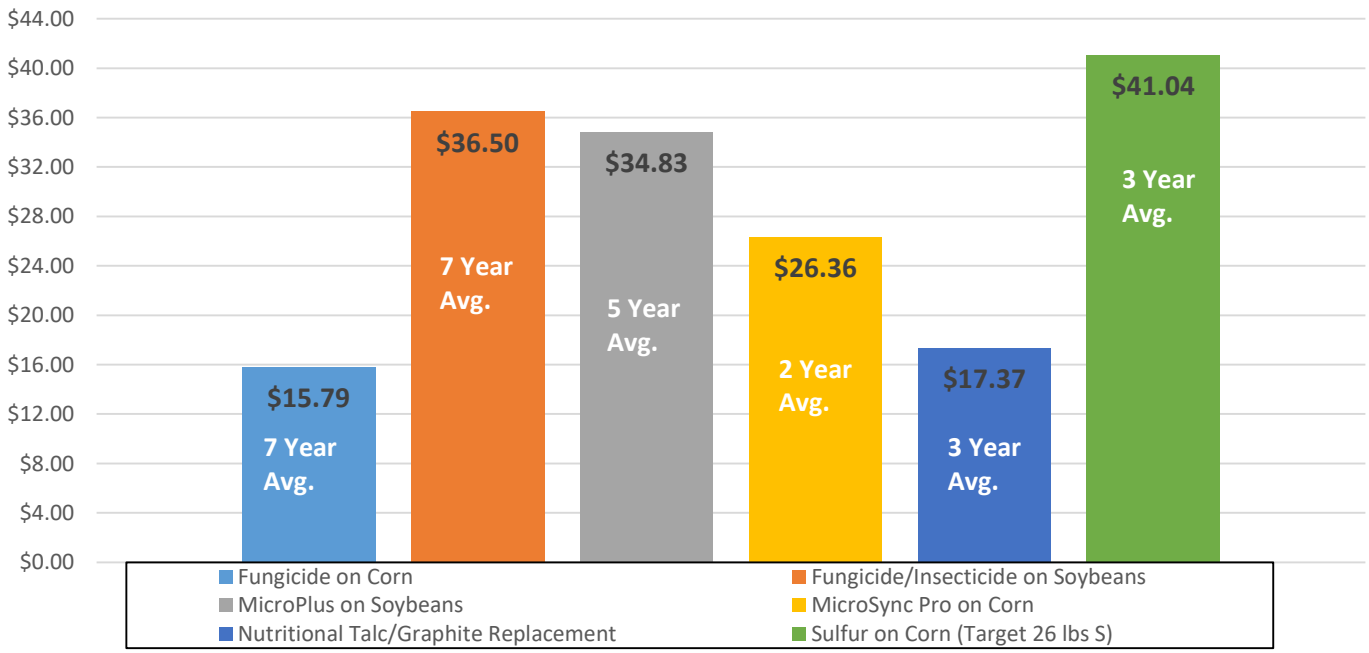


Variable Rate Seeding Recommendations

Multi-Year Side by Side Summary **ROI** Results

Return on Investment (ROI) - 2015, 2016, 2017,2018, 2019, 2020, 2021

Since the start of our localized research, United Prairie's focus has always been to find the products that not only fit agronomically in your operation but also economically, with a final goal of understanding what the ROI is on each of those products or practices. As we move out of the 2021 growing season and move into what looks to be a very challenging 2022 season, we feel there is a great deal of importance in understanding the economic return that has been seen over the last number of years with what we look at now as our foundational practices/products. This below chart does just that, and illustrates the average profit per acre achieved over multiple years and multiple data sets. We have also added a couple new practices the past few years, that we want to keep honing in on for seasons to come, and continue to show what hopes to be a consistent gain in yield and profit received from here on out. We look forward to expanding not only the number of studies that we conduct each year, but also increasing the size of the footprint that we are implementing our studies within. We have already invested in some new tools to make this goal happen, and can't wait to share our findings in 2022!!



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In Memory of Randy Snyder

We wanted to dedicate this years 2021 Trial Results book in memory of a fallen team mate and a well known sales agronomist in Central IL…..Randy Snyder. Randy spent all 46 years of his career involved in fertilizer and chemical sales, and established countless relationships and friendships with a number of growers from throughout the area. The knowledge and care that he took in establishing recommendations for his growers, as well as making sure that their success was put at the forefront of his focus will never be able to be replaced, but hopefully carried on in his memory. We keep Randy's family in our prayers, and know that although Randy is no longer with us, he will always be a part of our United Prairie Family.

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United Prairie

2021 Trial Results