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Professional Agriculture[®]

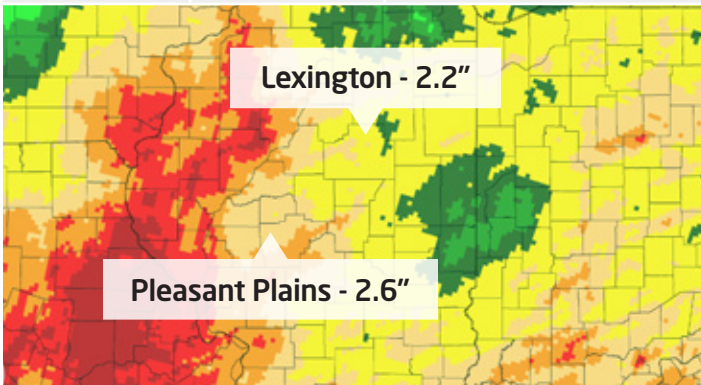
2021 BRANDT Research and Development Farm Results

Pleasant Plains and Lexington, IL

2021 Climate Data

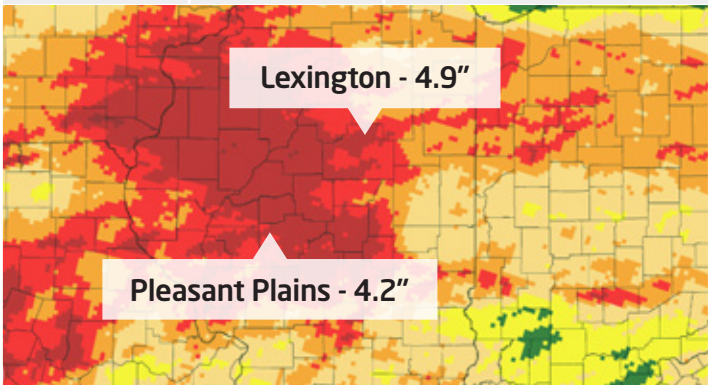
April

Location	Average Temp	Average Solar Rad
Pleasant Plains	53.6°	19.8
Lexington	52.4°	19.1



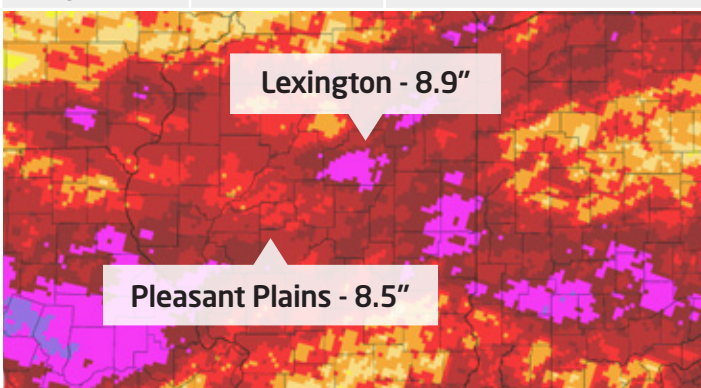
May

Location	Average Temp	Average Solar Rad
Pleasant Plains	62.0°	19.8
Lexington	60.4°	19.7



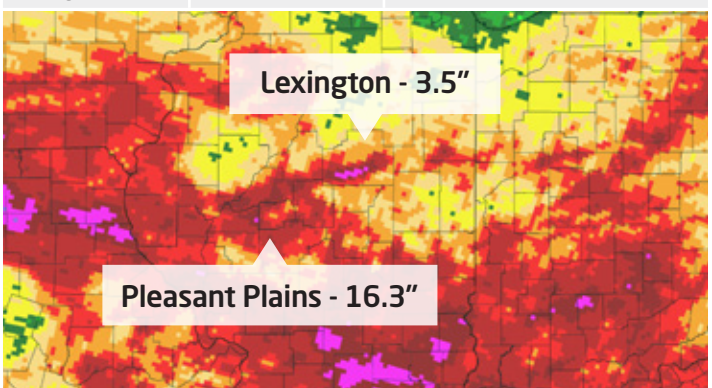
June

Location	Average Temp	Average Solar Rad
Pleasant Plains	75.4°	22.9
Lexington	74.6°	23.3



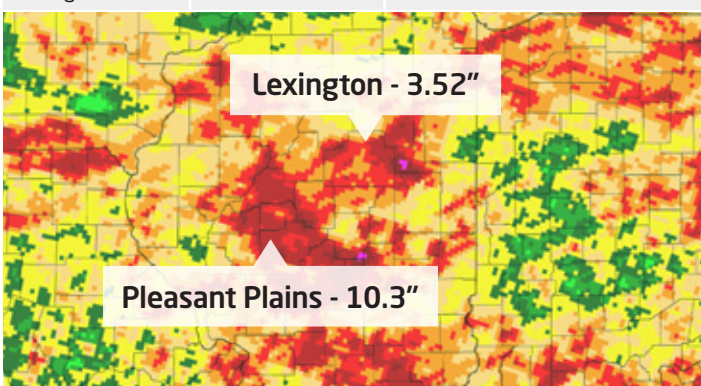
July

Location	Average Temp	Average Solar Rad
Pleasant Plains	75.2°	21.8
Lexington	74.0°	21.2



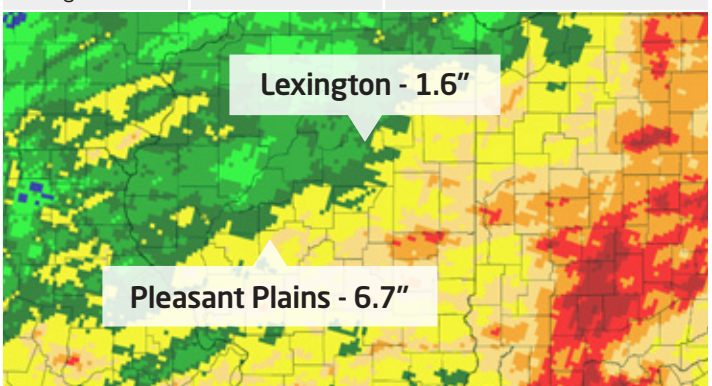
August

Location	Average Temp	Average Solar Rad
Pleasant Plains	75.8°	22.1
Lexington	74.8°	21.5



September

Location	Average Temp	Average Solar Rad
Pleasant Plains	70.4°	19.1
Lexington	69.6°	19.1



Rainfall 10.0" 8.0" 6.0" 5.0" 4.0" 3.0" 2.0" 1.5" 1.0" 0.5"

2021 BRANDT Research Results

To say 2021 was a challenging year would be an understatement, but resilience and perseverance are two common traits within our industry.

It is our culture to be forward-thinking and focus on the positive outcomes of the season. Challenges always bring opportunities to learn and that is always the case within our research.

As BRANDT continues to grow and evolve with the ever-changing agriculture industry, we expanded the research results within this annual publication to encompass insights from other geographies. It is shared knowledge and findings that make our products and recommendations the best in the business.

We learned a lot in 2021. Mother Nature blessed us with ample rainfall - too much at times - throughout central Illinois. Supply chain issues made weed control and fungicide applications difficult. But, when it came to harvest we experienced results to be proud of and learned a few things to make the next season better. That's the long-term goal: To do things better than we did the season before.

Thank you for your business in 2021. Please enjoy our research results and reach out to your BRANDT representative with questions or for additional information.

Brian Haschemeyer - VP BRANDT Discovery & Innovation

Ed Corrigan - Senior Technical Agronomist

Dan Froelich - Technical Agronomist

Steve Clement - Technical Systems Advisor

Weather maps can be found at: <https://water.weather.gov/precip/>
Water and Atmospheric Resources Monitoring Program. Illinois Climate Network. (2015).
Illinois State Water Survey, 2204 Griffith Drive, Champaign, IL 61820-7495.
<https://dx.doi.org/10.13012/J8MW2F2Q>

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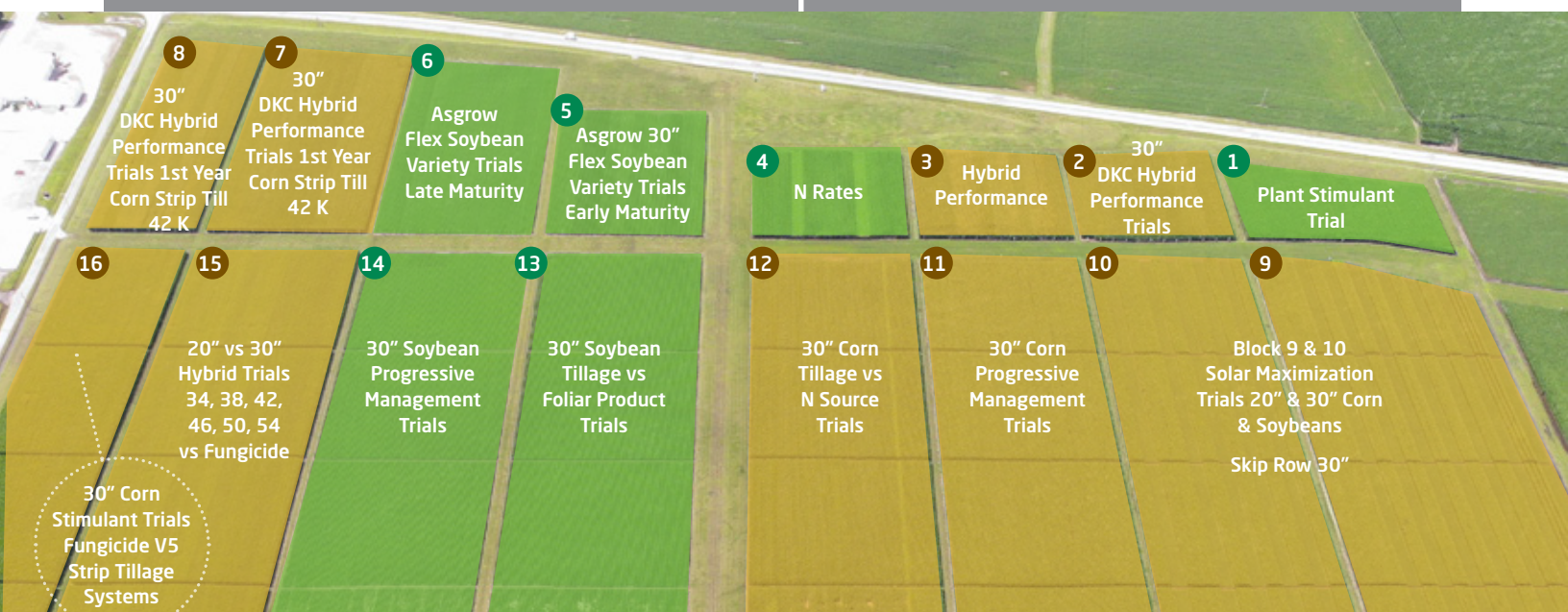
Pleasant Plains, IL

Omission Trials - Standard Treatment

Fall NH ₃	Spring NH ₃	Total Nutrition	Planting Date	Population	Harvest Date
160 Units	None	Corn: 190-50-150-30S Soybeans: 24-72-144-30S	4/5/21 - 4/16/21	Corn: 42,000 Soybeans: 120,000	9/14/21 - 9/22/21
Fungicide/Insecticide/Nutrition Application			Herbicide/Nutrition Application		
Corn: Hero®, BRANDT Smart B-Mo, Revytek™, BRANDT Smart Trio® Soybeans: Hero, BRANDT Smart Trio, BRANDT Smart K B & Revytek			Corn: (Pre-emergent) Resicore®; (Post-applied) BRANDT Smart Trio & BRANDT Smart B-Mo Soybeans: (Pre-emergent) Zidua® + Metribuzin; (Post-applied), BRANDT Smart Trio & BRANDT Smart B-Mo, Liberty®, Outlook®		

Trial Parameters

Block 1 - Continuous Corn <ul style="list-style-type: none"> Foliar Nutritional Stimulants Foliar V4 Stage Conventional Till 42,000 Population 	Block 2 - Continuous Corn <ul style="list-style-type: none"> Hybrid Trials 30" Row Width Conventional Till 42,000 Population 	Block 3 - Continuous Corn <ul style="list-style-type: none"> Hybrid Trials 30" Row Width Conventional Till 42,000 Population 	Block 4 - Continuous Corn <ul style="list-style-type: none"> Nutrient Response 0 to 300 Units of N (no P&K) Conventional Till 42,000 Population
Block 5 - First Year Soybeans <ul style="list-style-type: none"> Variety Trials 30" Row Width Conventional Till 120,000 Population 	Block 6 - First Year Soybeans <ul style="list-style-type: none"> Variety Trials 30" Row Width Conventional Till 120,000 Population 	Block 7 - First Year Corn <ul style="list-style-type: none"> Hybrid Trials 30" Row Width Strip Till 42,000 Population 	Block 8 - First Year Corn <ul style="list-style-type: none"> Hybrid Trials 30" Row Width Strip Till 42,000 Population
Block 9 - Intercropping <ul style="list-style-type: none"> Fall NH₃ Solar Maximization Conventional Till 42,000 Population 	Block 10 - Intercropping <ul style="list-style-type: none"> Fall NH₃ Sulfur Response at Plant Conventional Till 42,000 Population 	Block 11 - Continuous Corn <ul style="list-style-type: none"> Fall NH₃ Sulfur Response at Plant Conventional Till vs No Till 42,000 Population 	Block 12 - Continuous Corn <ul style="list-style-type: none"> Fall NH₃ vs 28% Sulfur Response at Plant Conventional Till vs No Till 42,000 Population
Block 13 - First Year Soybeans <ul style="list-style-type: none"> Fungicide Sulfur Response at Plant Conventional Till vs No Till 120,000 Population Foliar Nutritionals 	Block 14 - First Year Soybeans <ul style="list-style-type: none"> Progressive Foliar Treatments Sulfur Response at Plant Conventional Till vs No Till 120,000 Population 	Block 15 - First Year Corn <ul style="list-style-type: none"> High Yield Trial 20" vs 30" Row Width Fungicide Response vs Population 34,000 to 54,000 Population 	Block 16 - First Year Corn <ul style="list-style-type: none"> Sulfur Response at Plant Foliar Nutritional Stimulants 42,000 Population Fungicide Trials
Planting Date Trials <ul style="list-style-type: none"> Corn and Soybeans - 4/5/21 - 5/24/21 			Pipeline <ul style="list-style-type: none"> Population - 42,000 Corn and 120,000 Soybeans



Lexington, IL

Omission Trials - Standard Treatment

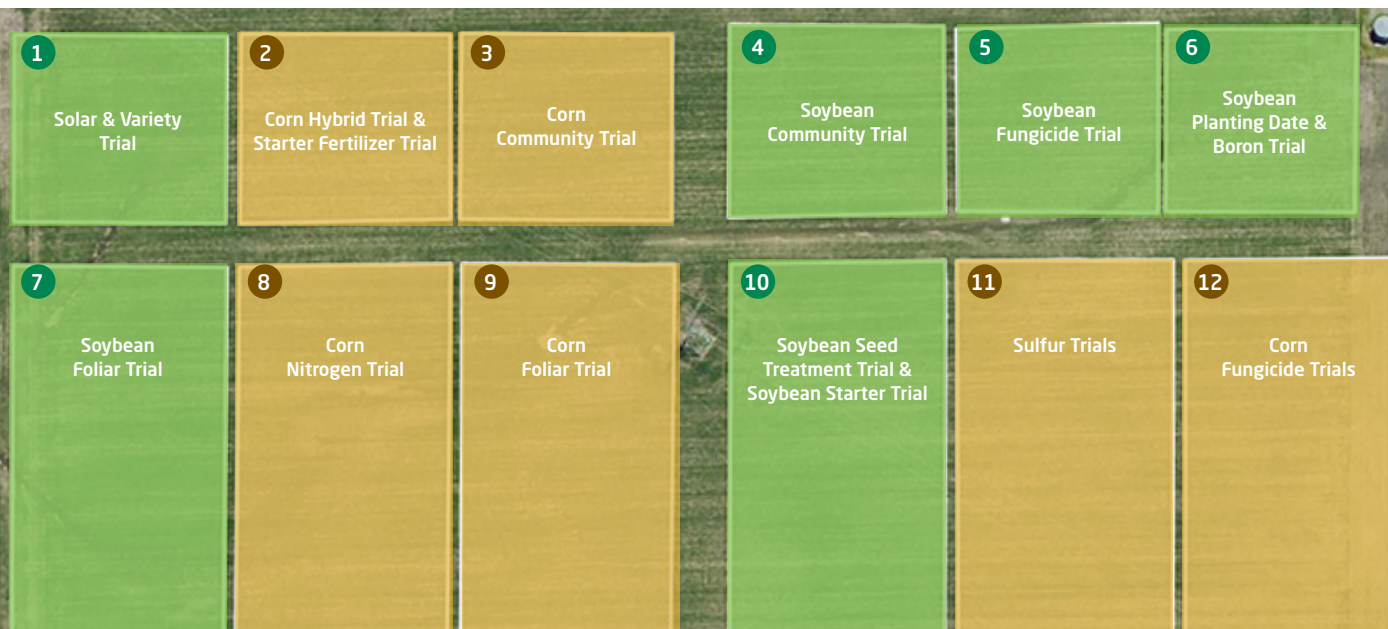
Total Nutrition	Planting Date	Population	Harvest Date
Corn: 200/240-92-120-30S Soybeans: 15-68-120-30s	Corn: 4/27/21 - 5/1/21 Soybeans: 4/19/21 - 4/22/21	Corn: 37,000 Soybeans: 125,000	Corn: 9/15/21 Soybeans: 11/8/21
Fall NH ₃	Preplant 28%	At Plant Nutrition	Side Dress 28%
Corn: 160 units	40-60 units rotation dependent	0	0
Fungicide/Insecticide/Nutrition Application		Herbicide/Nutrition Application	
Corn: Hero, BRANDT Smart K B, BRANDT Smart Trio, BRANDT Smart Fe Veltyma Soybeans: Hero, BRANDT Smart Trio, BRANDT Smart K B, Revytek		Corn: Resicore, Splitshot, BRANDT Smart Trio & BRANDT Smart K B Soybeans: (Pre-emergent) - Zidua Pro, (Post-applied) - Liberty, BRANDT Smart Trio, BRANDT Smart K B, & BRANDT Smart Fe	

Trial Parameters

Block 1 <ul style="list-style-type: none"> Variety Trials Traits and RMs Solar Maximization 	Block 2 <ul style="list-style-type: none"> Hybrid Trials Starter Fertilizers 	Block 3 <ul style="list-style-type: none"> BRANDT Community Trial Hybrid 2 Arrangement 	Block 4 <ul style="list-style-type: none"> BRANDT Community Trial Variety Arrangement
Block 5 <ul style="list-style-type: none"> Fungicide Trials Fungicide Timings Number of Applications w/ and w/o BRANDT micros 	Block 6 <ul style="list-style-type: none"> Planting Date Trial Foliar Nutrient Trials 	Block 7 <ul style="list-style-type: none"> Foliar Nutrient Trials Various Products and Application Timings 	Block 8 <ul style="list-style-type: none"> Nitrogen Trials Variable Rate and Timings
Block 9 <ul style="list-style-type: none"> Foliar Nutrient Trials Various Products and Application Timings 	Block 10 <ul style="list-style-type: none"> Seed Treatments Starter Fertilizers 	Block 11 <ul style="list-style-type: none"> Sulfur Trials 	Block 12 <ul style="list-style-type: none"> Fungicide Trials Various Products and Application Timings

We use an omission style plot technique at our research farms to determine the value of each individual application as it is omitted. We can then analyze the data to determine yield and return on investment outcomes. The goal is to develop local insights to maximize yield and return on every acre.

Throughout the book, there are areas where an economic analysis is paired with yield. For consistency, we use the 2021 harvest crop insurance price of \$5.37/bu for corn and \$12.30/bu for soybeans.

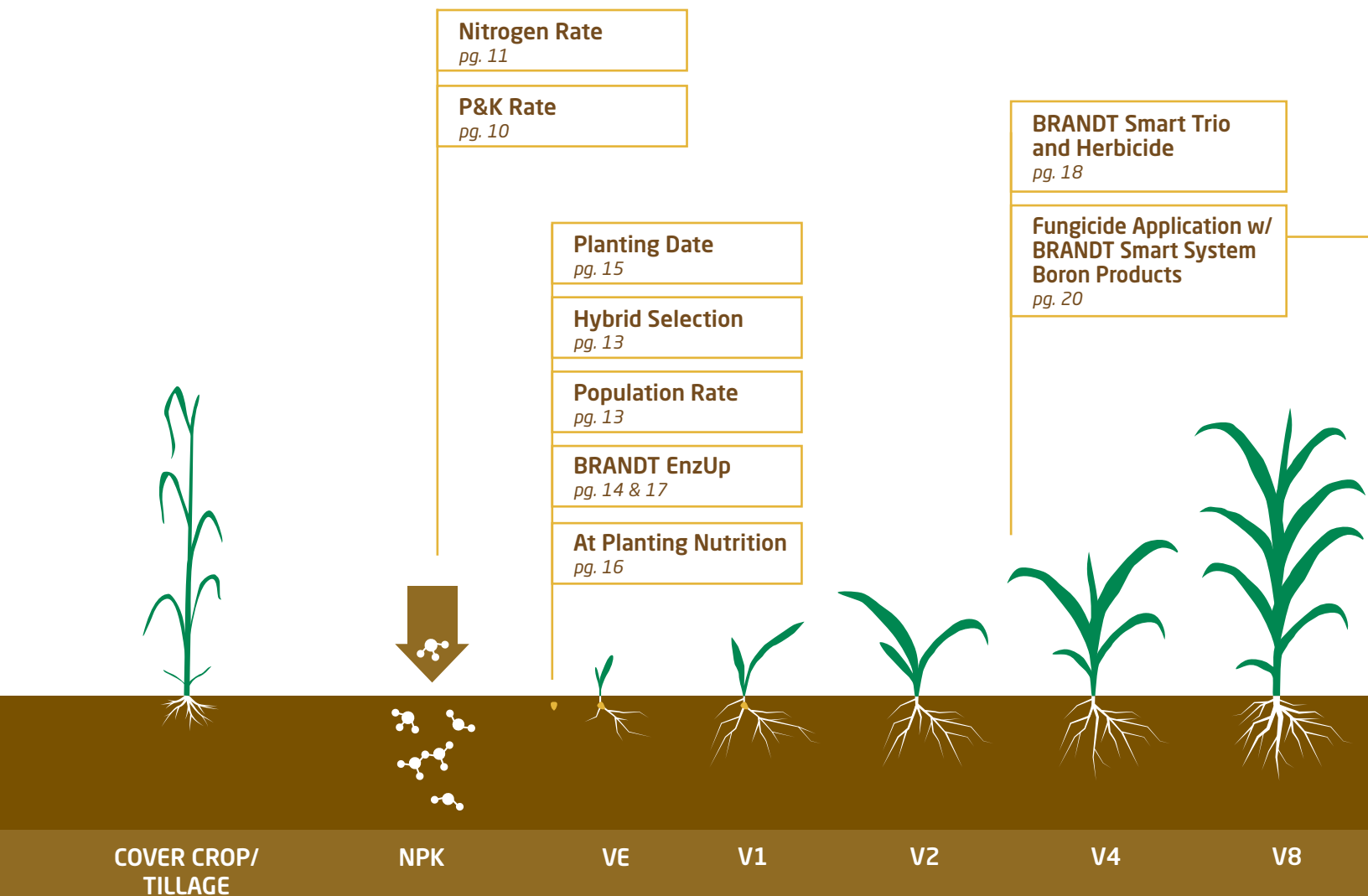


BRANDT Corn Production Base Applications

The BRANDT base applications reflect a high yield management recommendation that can be implemented in parts or as a whole to fit within a grower's current program. Applications for 2021 were:

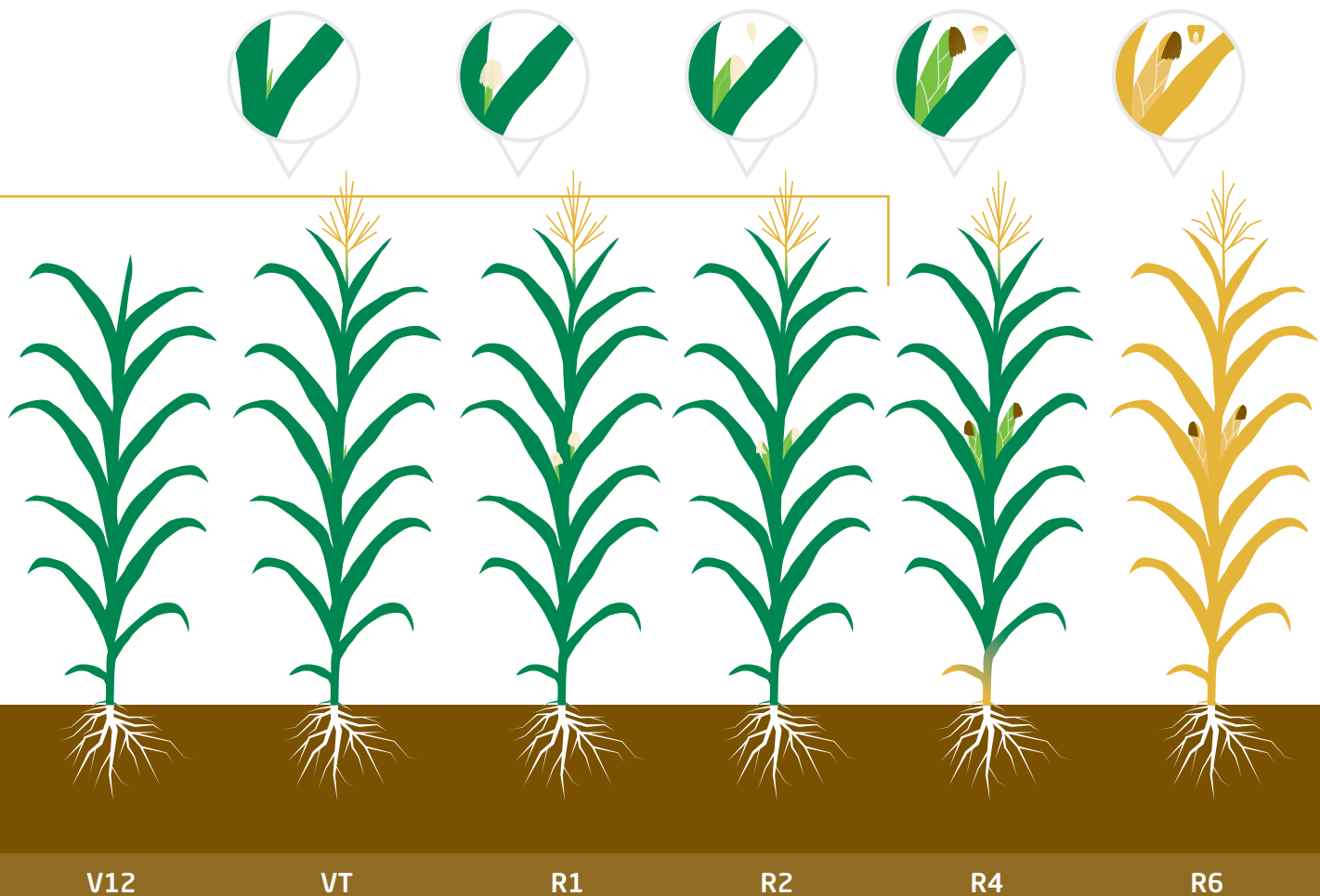
- 15-50-150 suspension in fall
- Fall NH_3 - 160 units
- Band at plant 14-0-0-30S (2x0)
- 2.5 gal/ac in furrow starter + BRANDT® EnzUp® Zn
- 42,000 population
- Conventional till in fall, Salford in fall
- Plant on top of RTK ammonia line
- Pre-emergent herbicide at plant with water
- BRANDT Smart Trio, BRANDT Smart B-Mo
- Fungicide at R1 + BRANDT Smart K B + insecticide

We have illustrated the production practices as they relate to application timing. Please note how many important decisions are made before and at planting.



Production Practice Rankings		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	10 yr Avg	10 yr ROI
1	Planting Date	67.6	99.6	94.2	41.8	97.3	47.0	36.4	100.2	72.9	127.7	78.5	\$\$\$
2	Hybrid Variance	39.3	18.1	11.5	47.1	33.1	35.1	65.3	66.3	38.7	79.8	44.6	\$\$\$
3	Solar Maximization	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	39.6	34.8	37.2	\$\$\$
4	Nitrogen Rate	16.3	47.8	36.1	35.7	31.2	15.1	14.9	12.6	36.4	77.5	31.1	3.7
5	Crop Rotation Penalty	10.3	6.3	20.3	33.6	9.9	21.9	11.2	37.1	63	24.1	28.5	\$\$\$
6	Strobilurin Response	51.7	13.4	14.3	21.2	27.2	17.0	24.8	46.8	32.6	36.8	27.3	4.7
7	Tillage System	n/a	n/a	19.7	15.0	19.5	18.8	22.1	19.8	38.3	52.1	25.7	7.7
8	P&K Rate	23.3	10.7	16.7	10.1	14.1	16.0	24.1	8.3	66.0	34.3	22.8	2.2
9	BRANDT Smart Trio	22.0	22.1	34.1	17.5	15.8	6.5	15.1	9.6	33.4	10.1	18.4	21.9
10	Population Rate	3.7	32.5	27.3	40.4	12.3	16.6	7.0	19.5	7.5	22.9	18.5	2.2
11	Row Width 20" vs 30"	n/a	n/a	n/a	n/a	10.8	4.1	36.5	36.0	6.8	13.7	18.0	\$\$\$
12	Nitrogen Timing	n/a	23	20.5	7.6	16.3	2	21.7	0	30.4	17.1	17.3	\$\$\$
13	Banding Nitrogen	n/a	13.0	15.4	22.9	11.9	20.9	n/a	n/a	n/a	n/a	16.8	\$\$\$
14	Starter (28% + ATS at Plant)	4.0	11.1	13.6	13.6	13.4	6.7	21.3	15.5	18.8	29.1	13.8	4.9
15	Boron at Tassel	4.0	n/a	9.3	5.9	6.8	12.4	n/a	8.5	6.3	7.1	7.5	10.0
16	Zinc (1qt/ac)	8.1	4.6	20.7	5.0	1.2	4.1	4.1	5.8	7.4	3.9	6.9	5.9

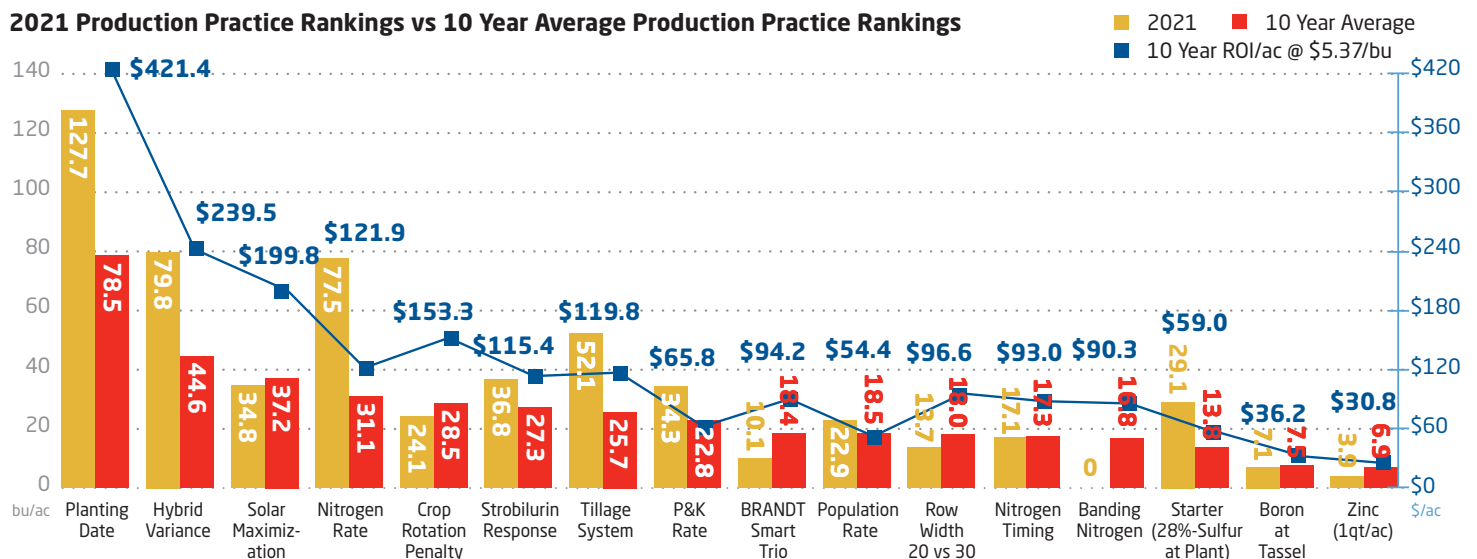
The ROI (Return On Investment) listed is calculated using the 2021 fall crop insurance price of \$5.37 per bushel, multiplied by the yield response per acre, minus the cost per acre of a practice. For every dollar invested per acre in a practice, the ROI factor is how many dollars you get in return. We use a symbol of \$\$\$ for practices that had no measurable cost per acre, but offer the best ROI.



We Have Determined the “Top 5” Corn Grower Insights Based on BRANDT Research Farm Data

1. Planting early in ideal conditions continually produces the highest yields. The addition of ATS at planting adds additional yield and ROI.
2. Hybrid selection and placement was highly favorable in 2021.
3. In 2021, the MRTN (Maximum Return to Nitrogen) was higher than in past years. Higher nitrogen rates increased yield on corn acres due to increased rainfall and late disease pressure.
4. Response to fungicide was significant on our research farms and on local grower acres.
5. Early nutrition, banded or broadcast, around the planting window increased soil activity and produced a positive response in establishing the young plants.

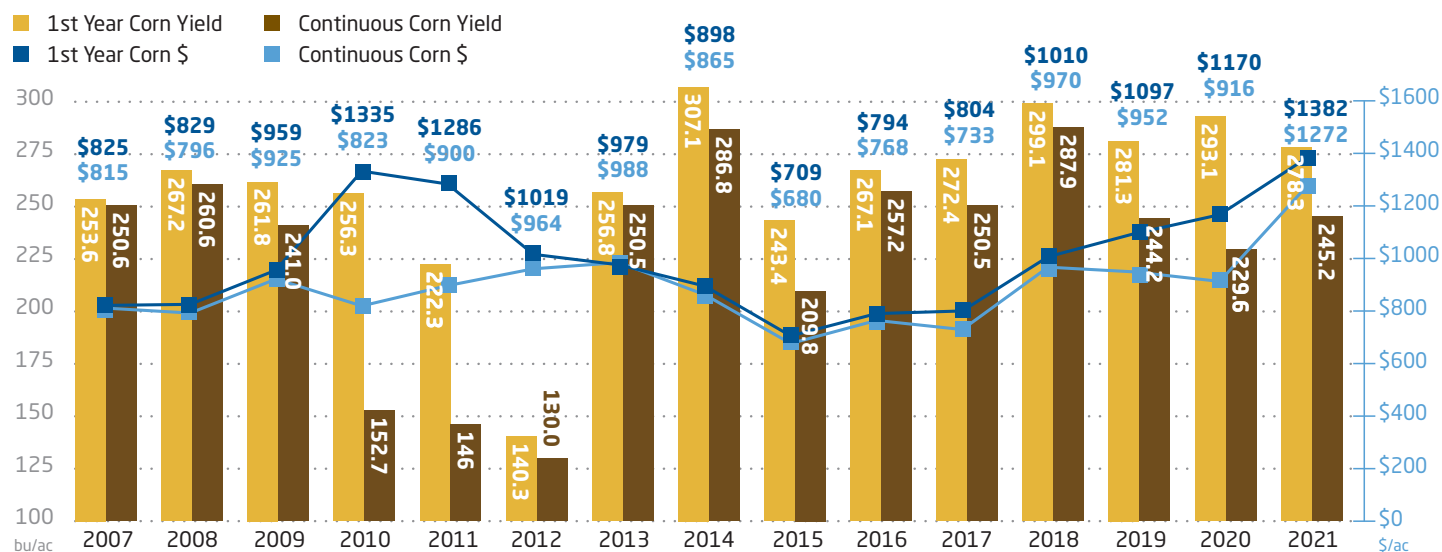
2021 Production Practice Rankings vs 10 Year Average Production Practice Rankings



Corn Revenue

- With great yields and favorable markets, 2021 corn revenue was at an all time high on the research farm
- Although commodity grain prices are favorable there were still plenty of challenges in 2021 that will be with growers through the 2022 season
- The BRANDT Research and Development Farm has continued to provide valued insights in how to maximize the value of your input cost in central Illinois
- Foliar products such as fungicide, insecticide, and nutritionals provided up to 25% of the yield and profitability lift to achieve the record level of revenue

Multi-Year Yield Response to Rotation - Pleasant Plains

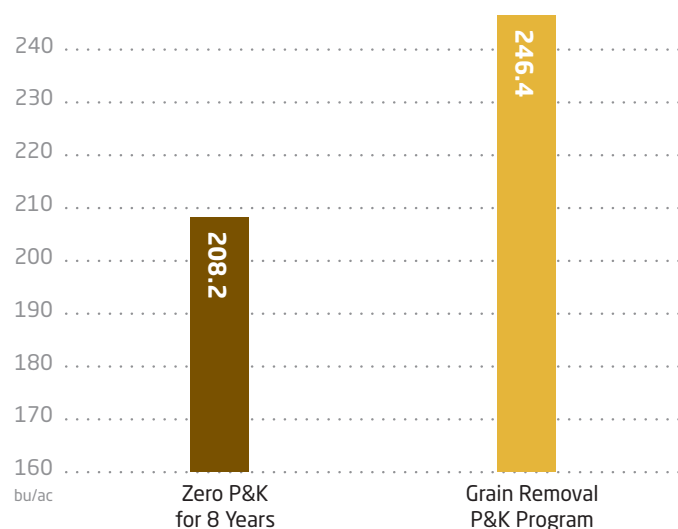


Corn P&K

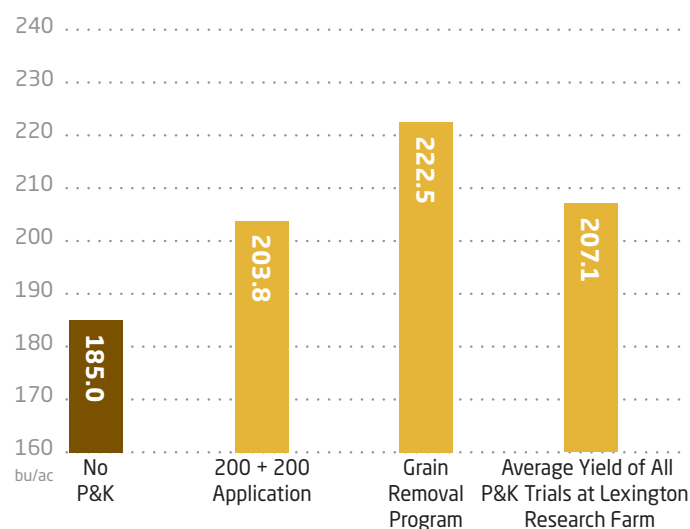
Phosphorus and potassium are two elements that are essential in maintaining and increasing soil productivity to support current and future corn yields.

- One of our longest running trials on the research farm demonstrates the importance of routine P&K fertilization
- The University of Illinois has clear guidelines to help determine an accurate grain removal fertilizer strategy

2021 Yield Response to 8 Year P&K Grain Removal Program - Pleasant Plains



Response to P&K Applications - Lexington



Fertilizer Rate Examples Based on U of I Recommendations

Crop	Nutrients Removed		Fertilizer			
Corn Yield	P ₂ O ₅	K ₂ O	DAP	or	MAP	Potash
300	111	72	241		213	120
275	102	66	221		196	110
250	93	60	201		178	100
225	83	54	181		160	90
200	74	48	161		142	80
(bu/ac)	(lbs/ac)		(lbs/ac)			

Crop	Nutrients Removed		Fertilizer			
Soybean Yield	P ₂ O ₅	K ₂ O	DAP	or	MAP	Potash
100	75	117	163		144	195
90	68	105	147		130	176
80	60	94	130		115	156
70	53	82	114		101	137
(bu/ac)	(lbs/ac)		(lbs/ac)			

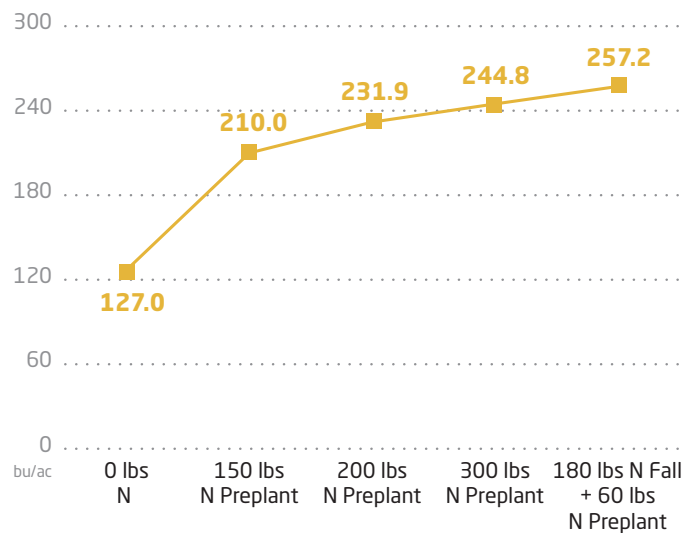
Two Crop Combined Fertilizer Maintenance

Corn		Soybeans		DAP	or	MAP	Potash
250	+	70	=	315		279	237
(bu/ac)		(bu/ac)				(lbs/ac)	

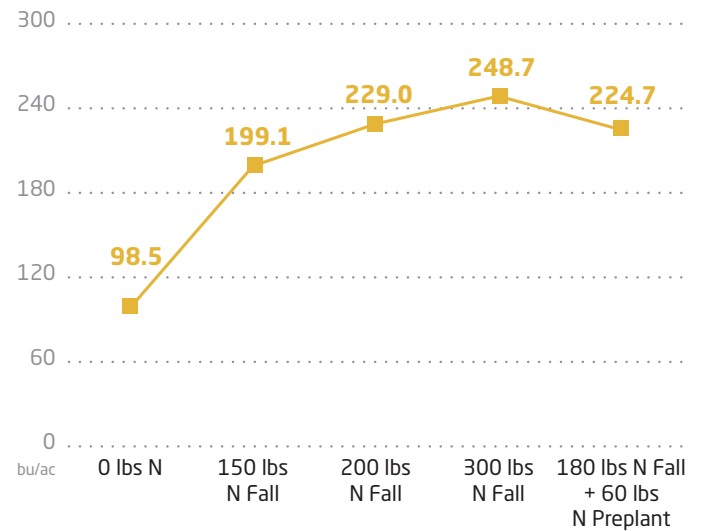
Corn Maximum Return to Nitrogen (MRTN)

- The MRTN was higher at the Pleasant Plains Research Farm than in past years. Higher nitrogen rates increased corn yields due to increased rainfall and late disease pressure
- As we have seen in past years, the MRTN range for the research farm falls between 175 and 225 lbs of nitrogen
- The University of Illinois has developed an app to assist in determining the MRTN on your farm

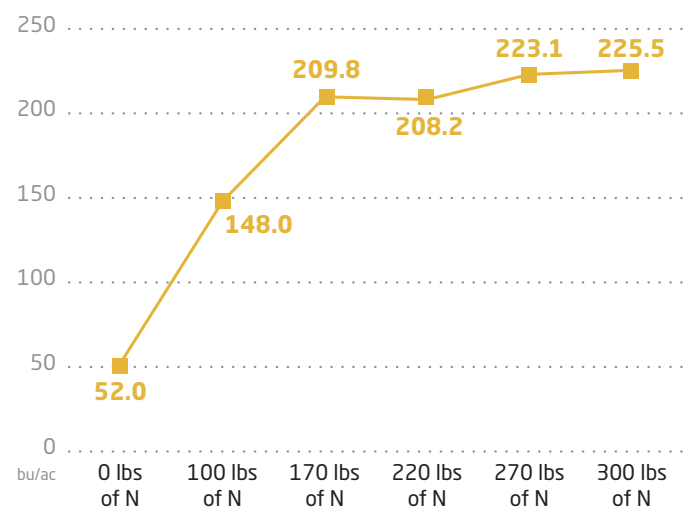
Spring Applied - 2021 Corn Yield Response to Different N Rates - Lexington



Fall Applied - 2021 Corn Yield Response to Different N Rates - Lexington



2021 Corn Yield Response to N Rate Continuous Corn - Pleasant Plains



Solar Maximization and Intercropping Trials

Two trial types were studied in 2021 relating to maximizing solar opportunity: Skip row planting and intercropping.

Skip Row Planting

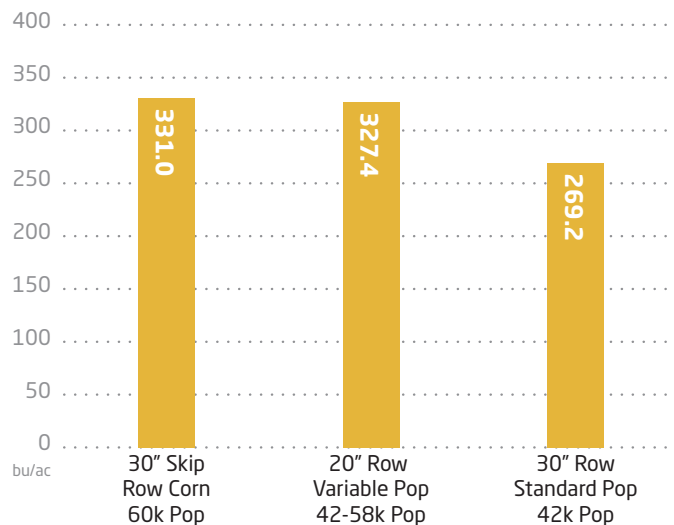
- Every third row is not planted
- Produced highest yield on first year corn when compared to a 20" row variable population and 30" row standard population
- Other studies have determined skip row planting could be beneficial under drought conditions

Intercropping

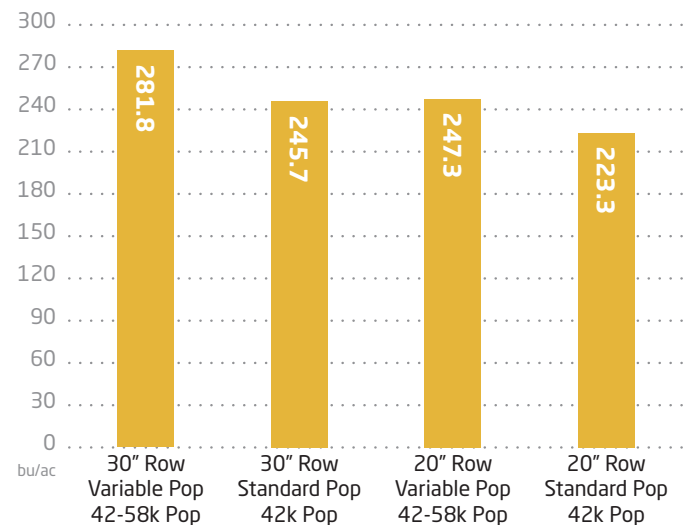
In our 2021 intercropping system, we added variable rate planting populations. We increased population on the outer rows of the corn crop to maximize the number of plants exposed to the increased sunlight.

- Both 20" and 30" row width with variable population produced the highest yield in this trial

1st Year Corn Solar Maximization



Corn on Corn Solar Maximization



30" Row, Skip Row, 60k Pop, Intercropped



20" Row, Variable Pop, Intercropped

Corn Hybrid Selection

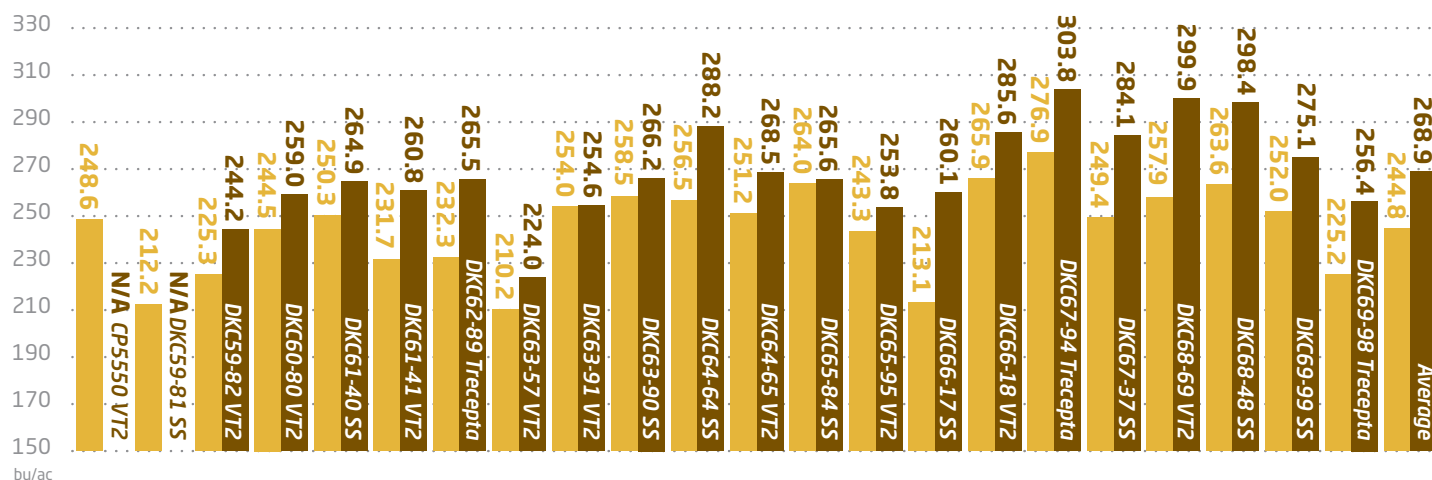
As noted in our "Top 5 Grower Insights", hybrid selection always ranks among the most important decision on your farm. We work with our partners to determine the best hybrids for our geography.

Long term observations:

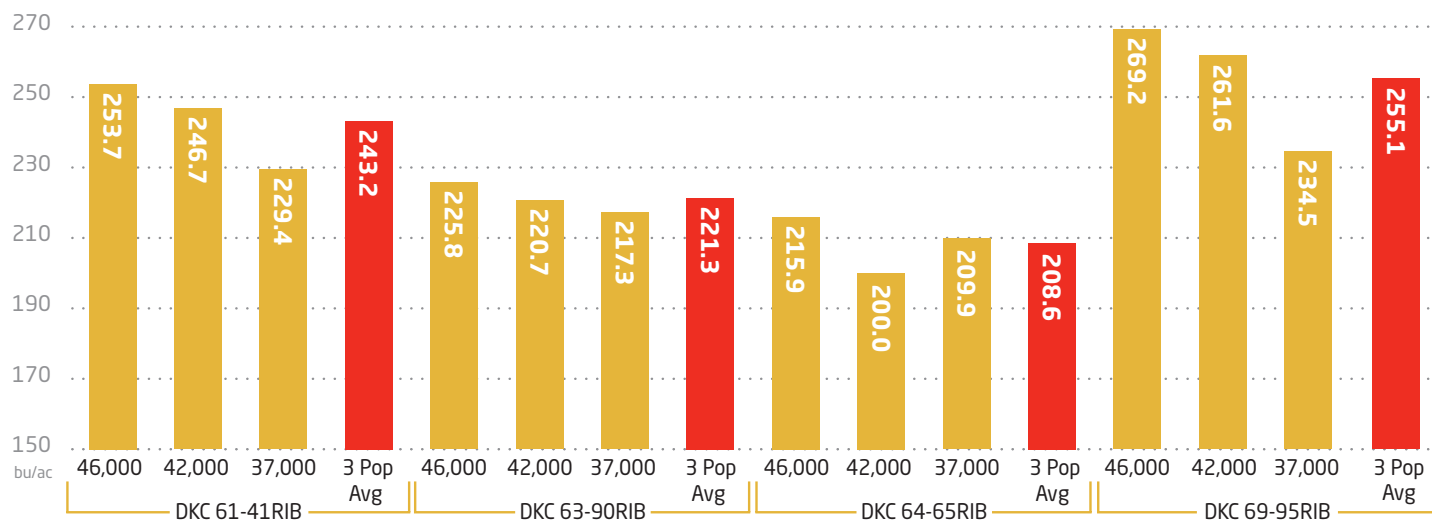
- Hybrids with a longer relative maturity are yielding higher
- Select a hybrid that has good standability for your soils
- Higher disease ratings are becoming increasingly important with different and new diseases showing up in the area, such as tar spot and southern rust

Corn Hybrid and Crop Rotation Trial - Pleasant Plains

Continuous Corn 1st Year Corn



Corn Hybrid and Population Study - Lexington



BRANDT EnzUp Grain ST Corn Seed Overtreatment

In 2019, BRANDT launched a product line with a new enzyme technology - BRANDT EnzUp - which is designed for a soil application to benefit young plants. That same technology will soon be available as a corn overtreat product to accommodate grower demand.

BRANDT EnzUp Grain ST contains a proprietary enzyme technology that enhances seed development to get the crop off to a fast and healthy start. This formulation is designed for use as a seed treatment on all soil types.

BRANDT EnzUp Grain ST is compatible with most fungicides and insecticide seed treatments. It may also be applied as an overtreatment if preferred.

Field Trials

Corn

IL, 2021 (bu/ac)

9.0 Advantage



IL, 2021 (bu/ac)

3.5 Advantage



IL, 2021 (bu/ac)

4.6 Advantage



IN, 2021 (bu/ac)

2.1 Advantage



OH, 2021 (bu/ac)

4.2 Advantage



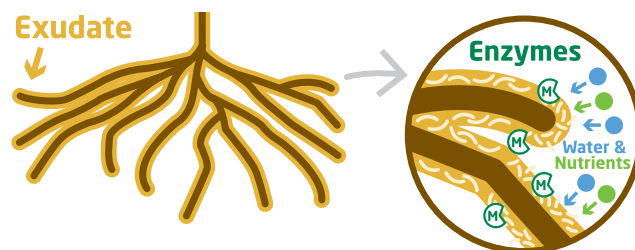
WI, 2021 (bu/ac)

6.5 Advantage

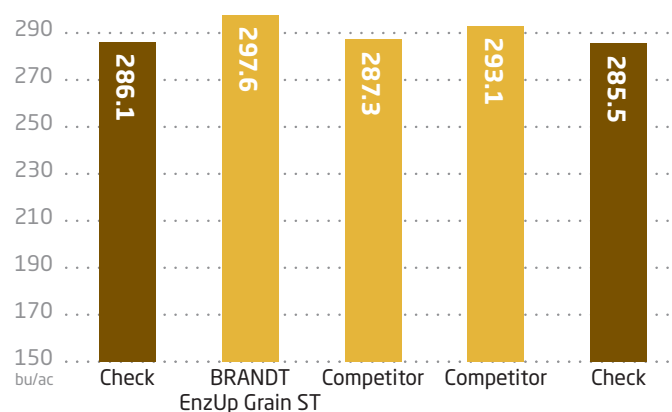


Average of 6 Trials

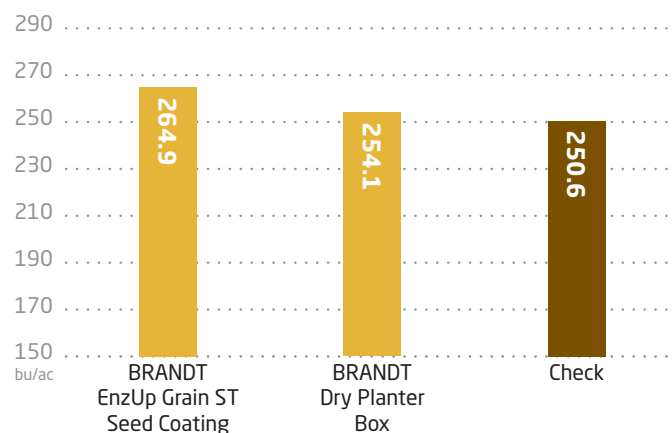
5.0 Advantage



BRANDT EnzUp Grain ST Corn Seed Overtreatment - Pleasant Plains



BRANDT Experimental Seed Treatments - Lexington

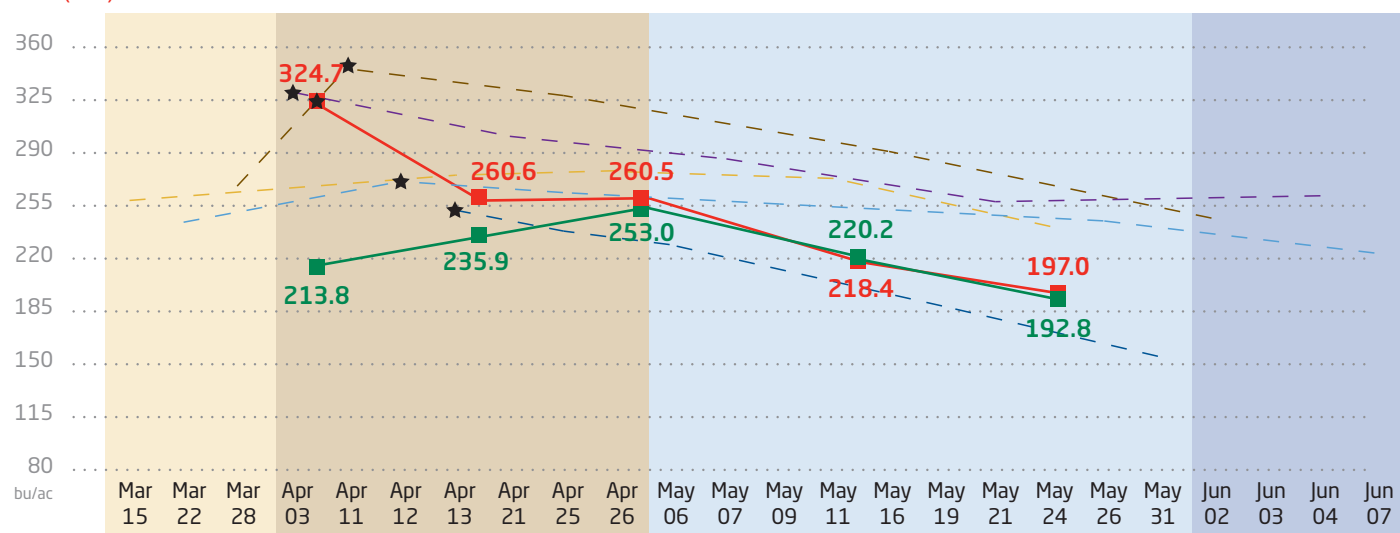


Corn Planting Date Trials

- 6 years of planting date trial data points to April as the top yielding month to plant corn in central Illinois
- The addition of early season sulfur provides a significant yield increase due to lack of sulfur mineralization from the cooler soils
- The key is to plant when soil conditions are favorable

Corn Yield Response to Planting Date - Pleasant Plains

■ 2021 ATS (2x0) ■ 2021 No ATS — 2020 Trial — 2019 Trial — 2018 Trial — 2017 Trial — 2016 Trial



★ Top Yield by Year (April 3 - 13)



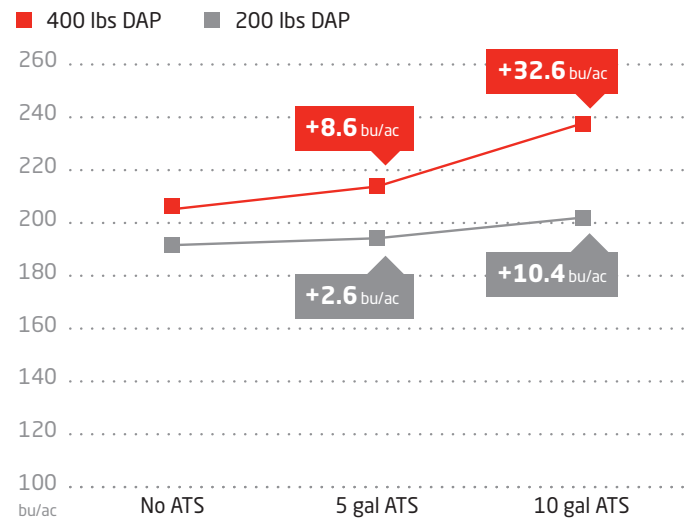
Corn Response to Ammonium Thiosulfate (ATS) - Multi Year

This is the sixth year for monitoring corn yield response to ATS. Sulfur management plays a significant role in our high yield environment at the Pleasant Plains research farm. Ammonium Thiosulfate is 12-0-0-26S. Of that, 50% of the sulfur is in the elemental form and 50% in the sulfate form. This is important because only sulfate is readily available to the plant. Elemental sulfur slowly converts to sulfate over time. This provides a very effective, slow release capability.

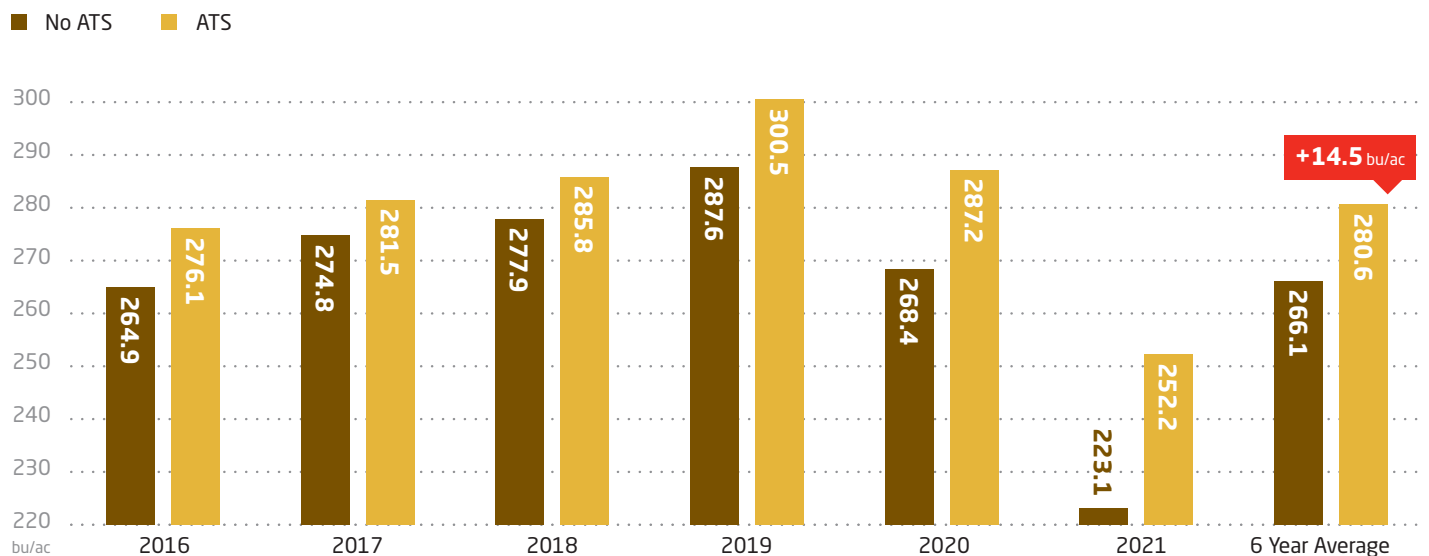
- The 6 year average yield advantage to 10 gal/ac of ATS is 14.5 bu/ac
- In this specific trial ATS was applied 2 x 0 at planting
- We have had success with both banded and broadcast ATS application scenarios

ATS mixes perfectly with 28% N and together makes a great combination for a spring application to feed the crop at early development stages.

Sulfur Rate vs Applied Rate of DAP - Lexington



6 Year Corn Yield Response to ATS Applied at Planting - Pleasant Plains



BRANDT In-Furrow Product Trial

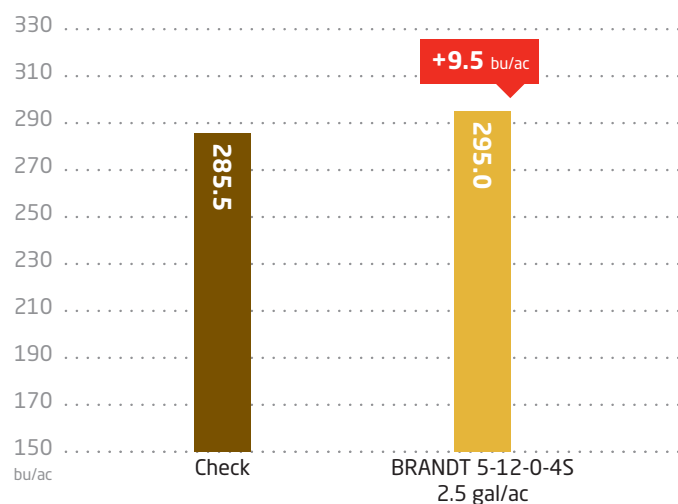
The addition of early season nutrition has been a key component to increased yields on our research farms and trials throughout corn growing regions. Nutrient availability is determined by environmental conditions such as temperature and moisture. By introducing nutrition near the seed, during or near the time of planting, we can introduce needed nutrients earlier when soil activity is minimal.

- BRANDT 5-12-0-4S continues to show promising results on our research farms and on-farm trials. Three years of data shows an average yield increase of 8.2 bu/ac
- BRANDT EnzUp Zn introduces enzymes to assist water and nutrient uptake. Zinc is essential to early growth development and improves early plant vigor and establishment

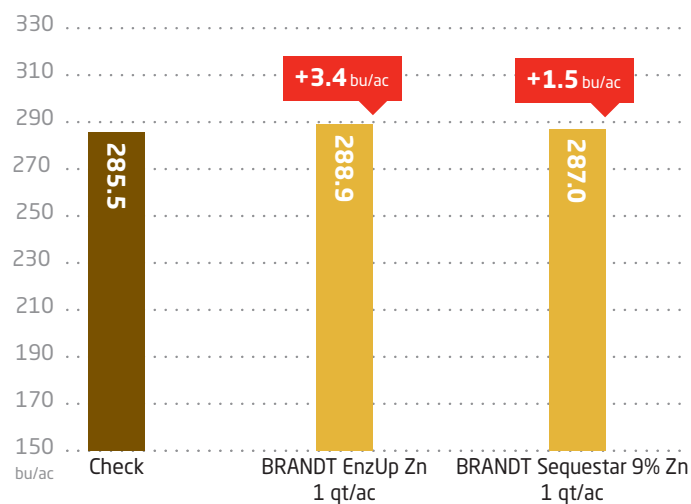
Pins Represent Multi-State Trials



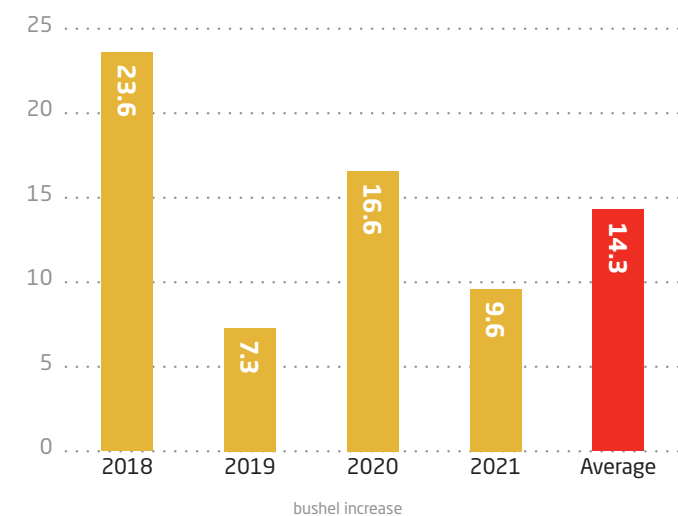
BRANDT 5-12-0-4S Product Trial - Pleasant Plains



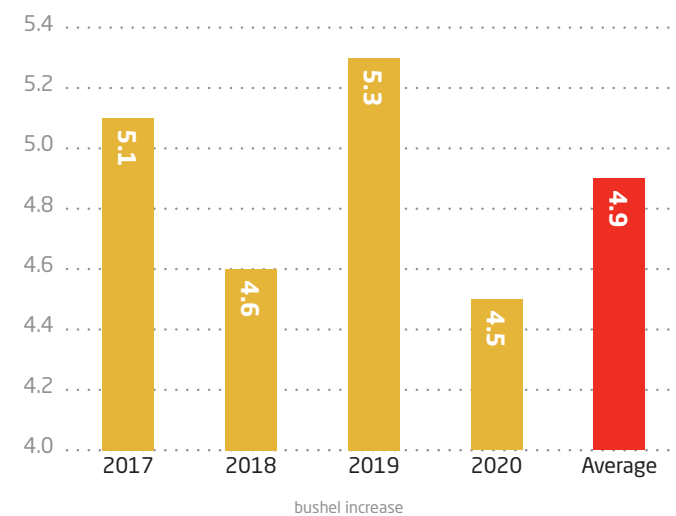
BRANDT In-Furrow Zn Product Trial - Pleasant Plains



**BRANDT 5-12-0-4S + BRANDT EnzUp Zn
4 Year Yield Advantage - Lexington**



**BRANDT EnzUp Corn - Multi-Year, Multi-State Data
- 92 Total Trials**

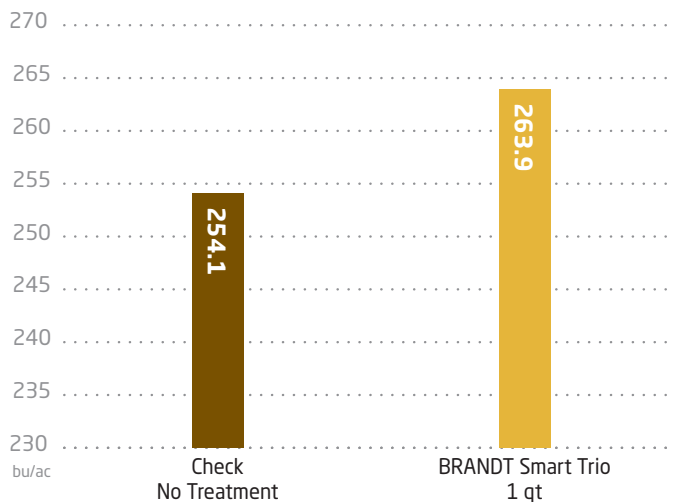


Corn V4 Foliar Trials

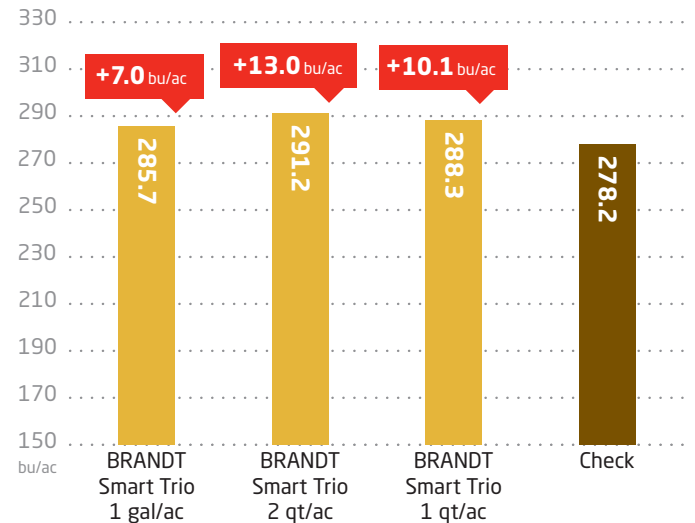
BRANDT Smart Trio has been our flagship foliar micronutrient product since its development nearly 15 years ago.

- Success is achieved at various application rates. Increased application rates may be needed on soil types where deficiencies are present
- The 2 qt/ac application rate has consistently been the highest yielding on our research farm. The recommended rate is 1-2 qt/ac

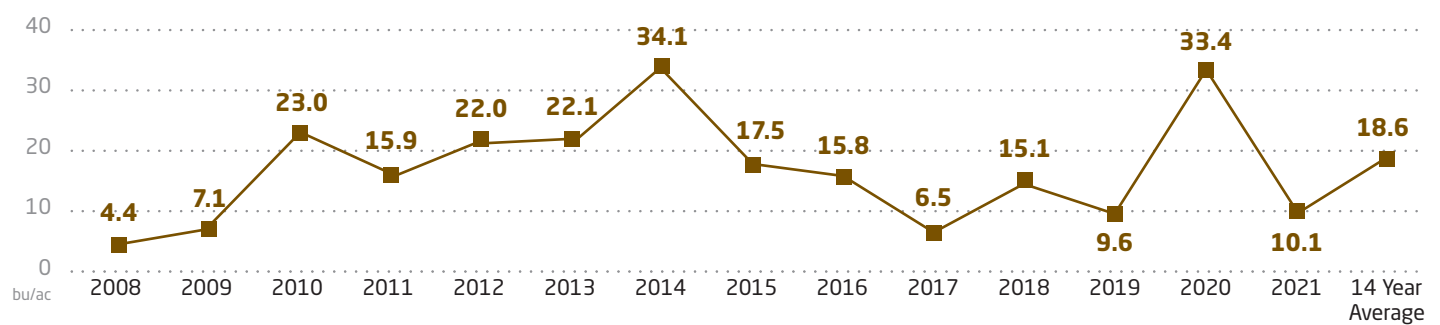
BRANDT Smart Trio on Corn/Soybean Rotation - Lexington



2021 BRANDT Smart Trio Rate Trial - Continuous Corn - Pleasant Plains



14 Year Yield Increase with BRANDT Smart Trio @ 1 qt/ac on Continuous Corn



Progressive Foliar Management

The objective of this trial is to push the limits of yield through multiple applications of crop protection and nutritional products. Then analyze the correlation between yield and return on investment for each application.

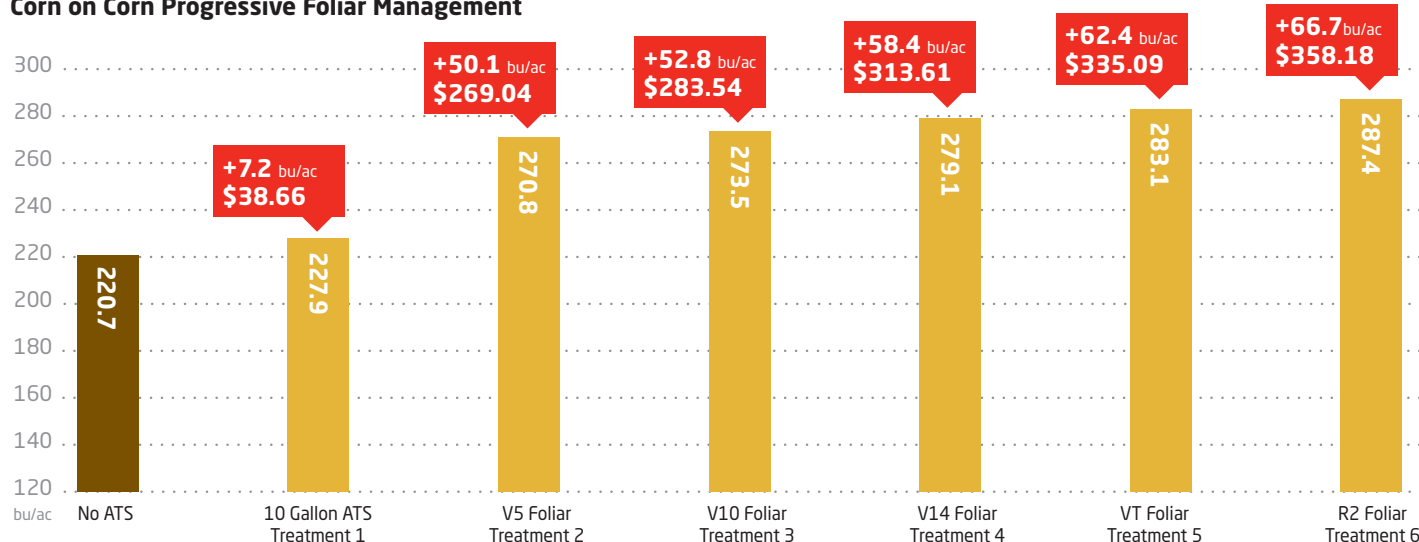
Corn Post Application Trip Trial

- Not only did each additional application increase yield, it also increased the return
- The timing of applications is critical to meet seasonal nutrient demand, but also to alleviate stresses caused by pests
- Four, or even five applications across a field after emergence is not common practice, and can be profitable under the right conditions



Treatment	Timing	Product	Yield Increase	\$/acre
Treatment 1	At Planting	10 Gallon ATS	7.2	\$38.66
Treatment 2	V5 Foliar	Treatment 1 + BRANDT Smart Trio (1qt/ac) + BRANDT Smart B-Mo (1pt/ac) + Fungicide	50.1	\$269.04
Treatment 3	V10 Foliar	Treatment 1 & 2 + BRANDT Smart Trio (1qt/ac) + BRANDT Smart B-Mo (1pt/ac)	52.8	\$283.54
Treatment 4	V14 Foliar	Treatment 1, 2 & 3 + BRANDT Smart Trio (1qt/ac) + BRANDT Smart K B (1qt/ac)	58.4	\$313.61
Treatment 5	VT Foliar	Treatment 1, 2, 3 & 4 + BRANDT Smart Trio (1qt/ac) + BRANDT Smart K B (1qt/ac) + Fungicide	62.4	\$335.09
Treatment 6	R2 Foliar	Treatment 1, 2, 3, 4 & 5 + BRANDT Smart Trio (1qt/ac) + BRANDT Smart K B (1qt/ac)	66.7	\$358.18

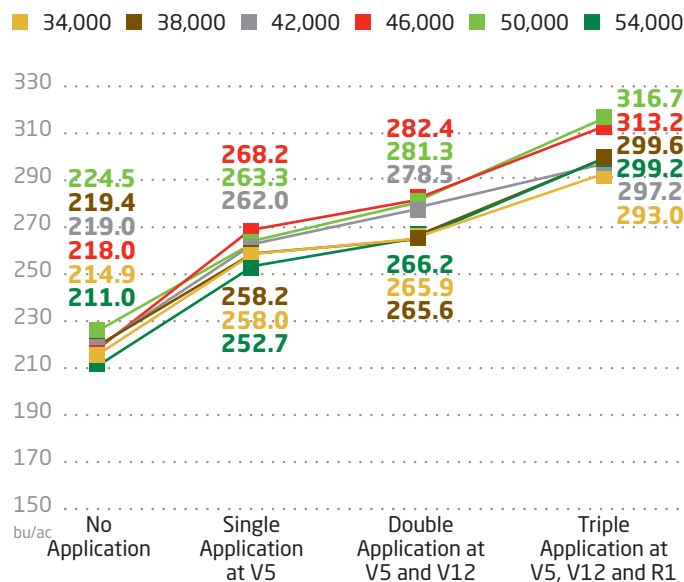
Corn on Corn Progressive Foliar Management



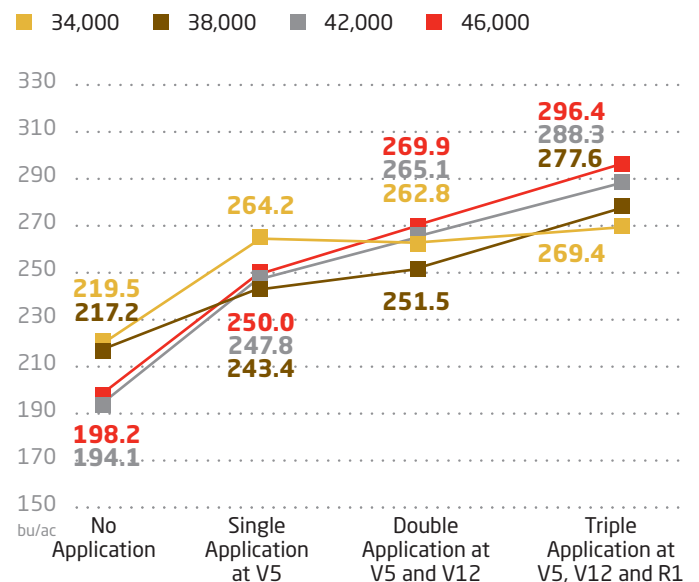
Response to Fungicide and BRANDT Products

- Early and increased applications of fungicides with BRANDT foliar nutrient products increased yields under both 20" and 30" row planting scenarios
- We observed increased disease pressure in 2021
- Tar Spot was observed on our research farm for the first time
- Multiple and earlier applications of fungicides take a preventative approach to disease management. Additionally, we are able to spoon feed essential nutrients during the same application

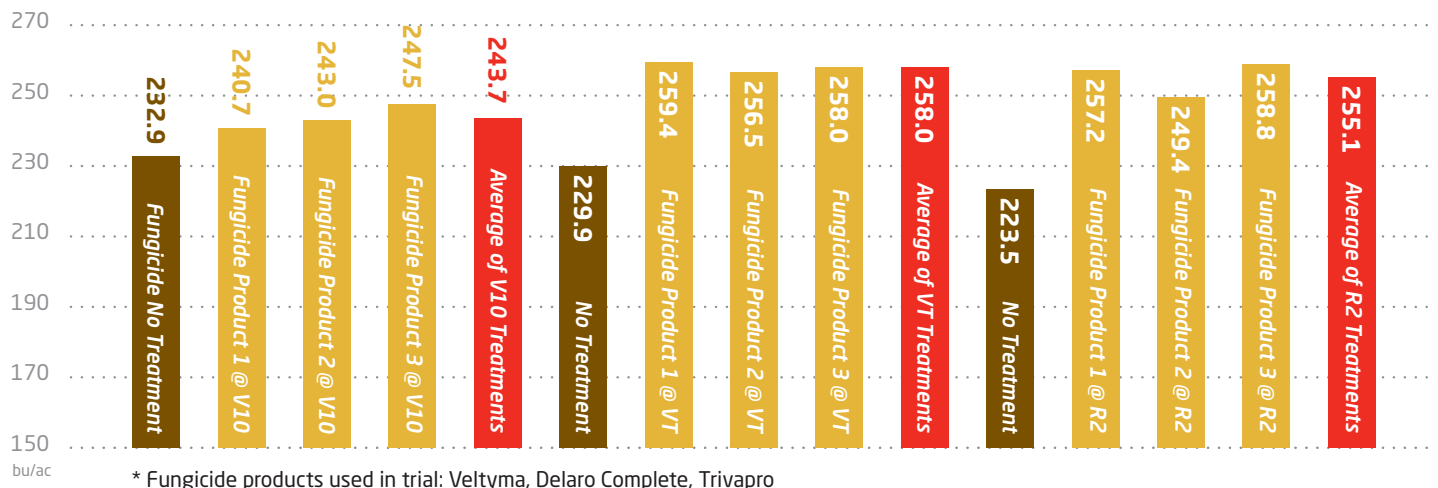
Corn Yield Response to Fungicide and BRANDT Products at Various Application Timings and Planting Populations - 20" rows - Pleasant Plains



Corn Yield Response to Fungicide and BRANDT Products at Various Application Timings and Planting Populations - 30" rows - Pleasant Plains

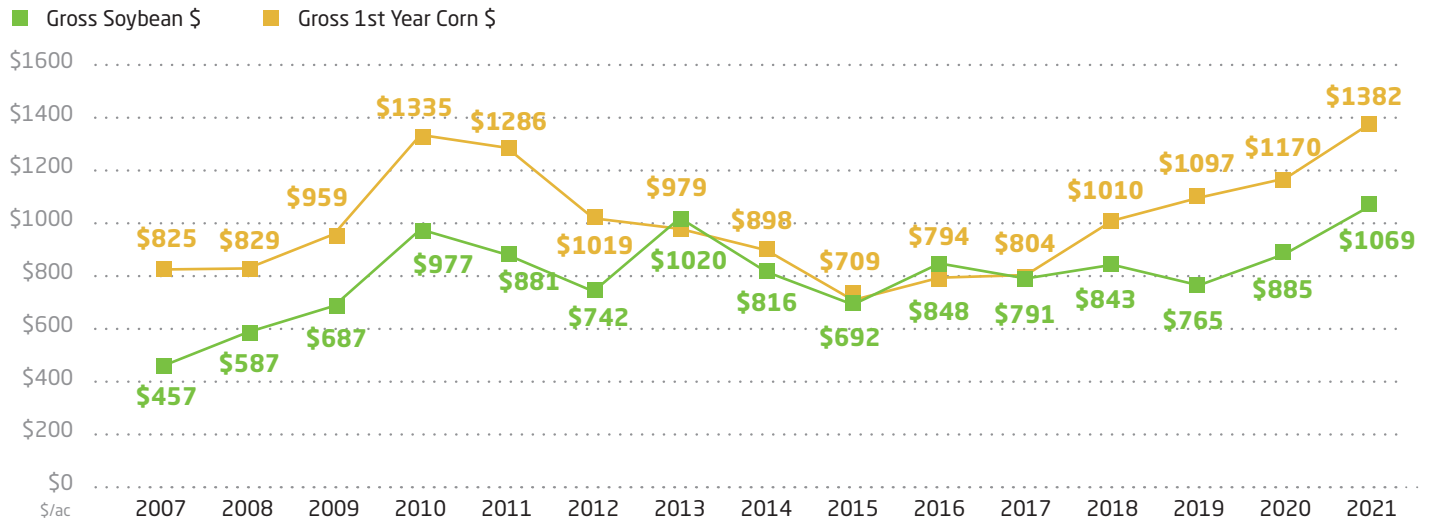


2021 Corn Fungicide Trial - Lexington

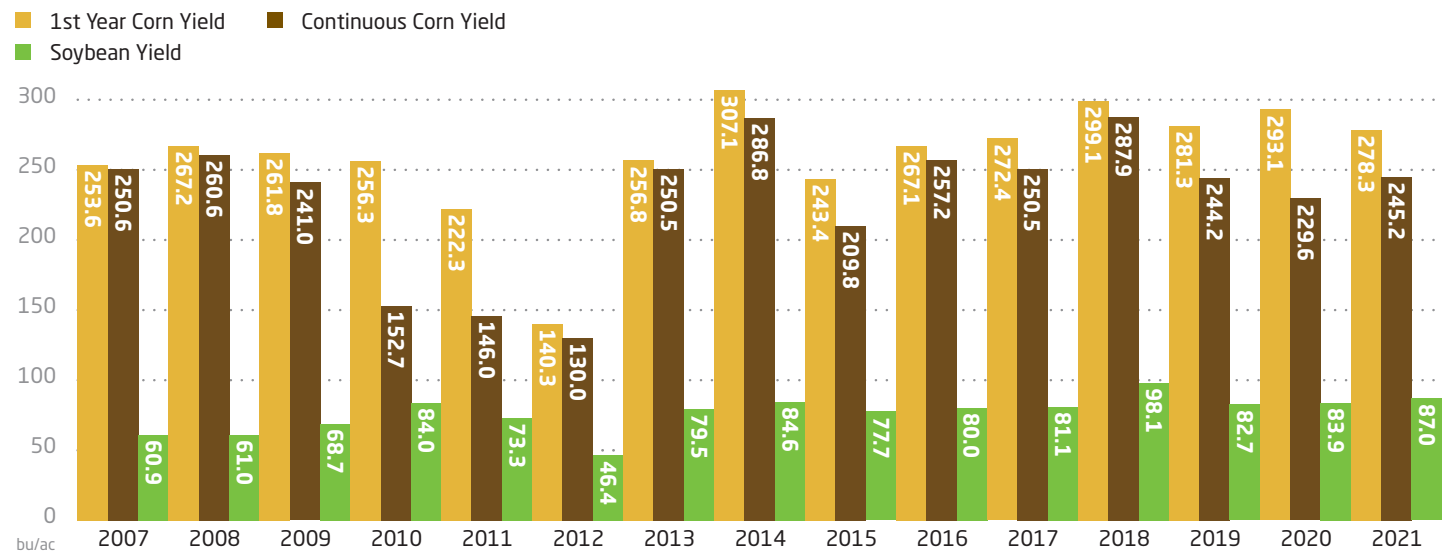


2007-2021 Yield & Revenue

15 Year Crop Revenue - Pleasant Plains



Multi-Year Yield Response to Rotation - Pleasant Plains



Evolution of Management Practices

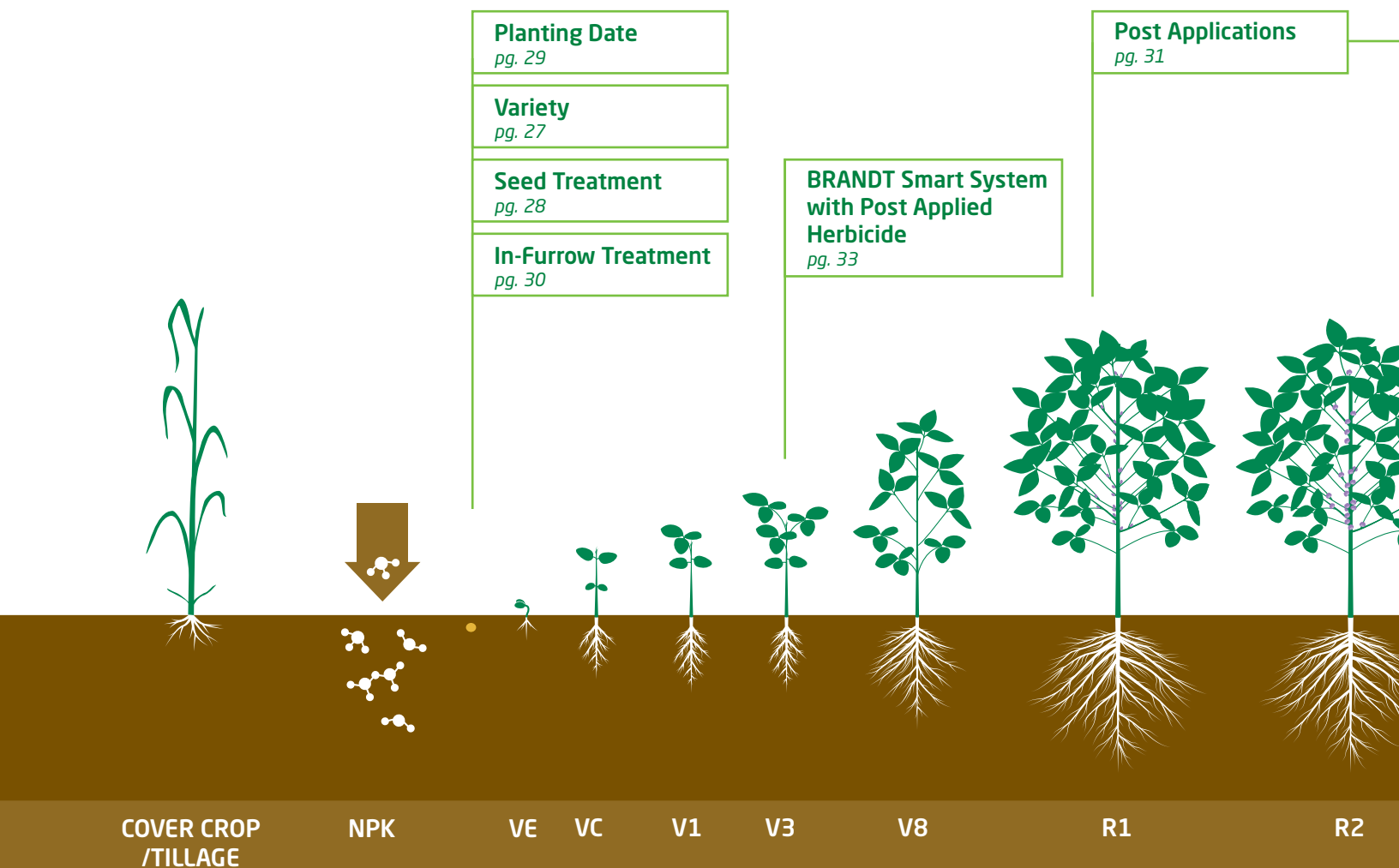
	2012	2013	2014	2015	2016
Environment	Record warm temperatures and dry spring creating perfect soil conditions. Light frost April 9. The warm and dry spring led into a very dry and hot summer. An early dry harvest.	A moderately cool and moist winter led to a cool and wet spring. Light rains in April and late May with cloudy conditions. A cloudy summer was warm with ample moisture slowing crop maturity. Warm and dry harvest conditions through the fall.	A cold winter led to an early spring with warm temperatures and dry soils. A rainy May and June turned into a moderate temperature summer with ample moisture. The fall began dry and quickly moved into a cold and rainy late harvest.	A moderately cool/moist winter led to a cool/dry spring. Light rains fell in April and May making good planting conditions with slow corn emergence due to the cold. June was unusually wet with 20 plus inches for the month. July and August were dry and cooler than normal.	A record rainfall in late December flushed a lot of residue and mobile nutrients into the watersheds. Even with this loss of nutrients, the soil conditions at planting time were excellent. A 45 day dry spell starting in June led to one of the wettest July's on record with above average temps.
Identified Practices	<ul style="list-style-type: none"> • Early planting maximized yields except for scattered frosted fields • Corn tasseling followed potash applications • Fungicides applied at VT slowed plant metabolism and drought stress • Sulfur applications with zinc maximized yields • Foliar insecticides improved yields and reduced green stem syndrome 	<ul style="list-style-type: none"> • Fall applied nitrogen moved deeper into the 2nd foot of soils • Crops suffered from transient nutrient deficiencies until June • At plant applications of nitrogen, sulfur, and zinc were valuable • Early growth stage applications of nutrients and stimulants added yield • Late applied side dress nitrogen had no effect on yield 	<ul style="list-style-type: none"> • Banding beats broadcast nitrogen applications at plant • Late side-dress nitrogen applications did not perform well • Higher plant densities and narrow rows maximized the nutrition • Sulfur is needed on corn and soybeans • Hormone applications need adequate nutrition to perform 	<ul style="list-style-type: none"> • Even emergence fields were critical for top yields • Banded nitrogen at planting time improved nitrogen efficiency • Hybrids with early plant vigor maximized yields • Insect damage was minimal in 2015 due to the wet June • Cover crops improved soybean yields 	<ul style="list-style-type: none"> • Plant early for the best yields • Mobile nutrient management had the best ROI • Strobilurin and boron applications greatly improved yields by reducing stress on corn and soybeans • At plant applications of nutrients were the most efficient due to the dry June weather • Cover crops improved soybean yields
Advancing Practices	<ul style="list-style-type: none"> • Apply sulfur • Fungicides reduce stress • Potash reduces stress • Early flowering • Lower pH of foliar insecticides • Narrow row shading improves yields • Strobilurins stopped frost damage • Cover crops absorb unused nutrition 	<ul style="list-style-type: none"> • Hormones assist plants • Apply sulfur • Split apply nitrogen • Higher populations • Apply side dress nitrogen early • Long maturity soybeans • Seed treatments • Foliar applications mitigate transient nutrient deficiencies 	<ul style="list-style-type: none"> • Banding at plant • Early foliar applications • VOTIVO® treated seed • High populations • Strip till provided better plant health • Sulfur at plant on soybeans • Crown rot controlled with potash 	<ul style="list-style-type: none"> • Even corn emergence • Band nitrogen at plant • Cover crop allelopathy did not affect soybeans • Allelopathy in corn was stopped by strip tillage • Amplified boron deficiency • Zinc at plant continues to improve yields • Plant soybeans by the end of April to maximize yields 	<ul style="list-style-type: none"> • Even corn emergence • Band nitrogen at plant • Cover crop allelopathy did not affect soybeans • Allelopathy in corn was stopped by strip tillage • Amplified boron deficiency • Zinc at plant continues to improve yields • Plant soybeans by the end of April to maximize yields

2017	2018	2019	2020	2021
A mild and dry winter led to an early spring warm up. Excellent soil conditions for early April planting was interrupted on April 27 with heavy rains over 7 days. A dry summer with periods of high night time heat stressed crops through August.	A mild and near record dry fall and winter preceded gentle rains in February and March that recharged soils for planting. Excellent soil planting conditions and near perfect emergence set the stage for top yields.	Wet conditions began on Halloween 2018 which impeded harvest, tillage and fertilizer applications. Wet conditions continued through the winter to spring. This made for unprecedented late and unfavorable planting conditions.	Soybean stubble was dry enough to apply NH ₃ early November 2019. Corn stalk ground was damp which limited tillage and fall ammonia. It was late March before soils began to dry out enough for tillage or spring ammonia. The soil temperature at 4" remained near 50° from early April to mid May.	Fall NH ₃ and tillage was achieved on soybean ground. Corn ground held off until spring due to damp conditions under residue. The soil temperature at 4" remained near 50° from early April to mid May. Excessive rains though June/July.
<ul style="list-style-type: none"> Plant early for the best yields Sulfur management had the best ROI Strobilurin and boron applications greatly improved yields by reducing stress on corn and soybeans At plant applications of nutrients were the most efficient due to the dry May to August weather Cover crops improved soybean yields 	<ul style="list-style-type: none"> Plant early for the best yields Yellow corn from sulfur deficiency was the talk of the state! Must apply sulfur at planting Strobilurin and boron improved yields by reducing disease and stress on corn and soybeans At plant applications of nutrients were the most efficient due to the dry June to August weather The coldest April on record pushed record yields in conventional tilled fields 	<ul style="list-style-type: none"> Must apply sulfur "at plant" in a sulfate form. Early and late application timing failed due to rainfall Strobilurin and boron improved yields by reducing disease and stress on corn and bean At plant applications of nutrients were the most efficient due to a wet spring followed by a dry June Foliar applications of micronutrients, hormones, and fungicides drove yields 	<ul style="list-style-type: none"> Planting early April into the 50° soils. Soils were mellow with only some fields dry enough to plant It was imperative to "prime" the soil with nutrients to feed the young plants and the microbial population using enzymes Applications of N, P, and S at planting time assisted the mineralization process until soil temps elevated to the 70° Corn plants improved with early stress reducing applications of foliar nutrients and fungicides The carbon penalty of corn on corn immobilized high amounts of N and S. Sidedressing N and S improved yields 	<ul style="list-style-type: none"> Using a strip freshener bar before planting provided a better planting environment. Planting began in early April into the 50° soils. Soils were mellow with only some fields dry enough to plant It was imperative to "prime" the soil with nutrients to feed the young plants and the microbial population using enzymes, sulfur, iron, zinc and starter fertilizer Small corn & soybean plants with limited soil mineralization improved with early stress reducing applications of foliar nutrients containing zinc, manganese, sulfur The carbon penalty of corn on corn immobilized small amounts of nitrogen and sulfur. Sidedressing nitrogen and sulfur in April & May improved yields due to the wet July Stalk residue in no till soybeans reduced early plant growth, which increased the risk of weed outbreaks
<ul style="list-style-type: none"> Even corn emergence Band nitrogen at plant Terminate cover crops in mid March Protect early planted crops with foliar insecticides Increase B applications; amplified boron deficiency Sulfur at plant continues to improve yields and mineralization Plant soybeans by mid April to maximize yields 	<ul style="list-style-type: none"> Near perfect corn emergence Band nitrogen at plant Terminate cover crops early Protect early planted soybeans with foliar insecticides and seed treatments Sulfur at plant continues to improve yields and starts early season mineralization Multiple post foliar applications of nutrients turns poverty peas into prairie pearls 	<ul style="list-style-type: none"> Plant soybeans first Band nitrogen at plant Protect early planted soybean with foliar insecticides and seed treatments Wet soils at planting respond to fungicide seed treatments Sulfur at plant continues to improve yields and starts early season mineralization Multiple post foliar applications of nutrients turns poverty peas into prairie pearls 	<ul style="list-style-type: none"> Prime soil with enzymes Band N & S at plant Foliar insecticides on soybeans Soybean seed treatments containing Methyloctrophs improve rooting & nodules Cold soils respond to fungicide seed treatments Sulfur at plant continues to improve yields and starts early season mineralization Multiple post foliar applications of nutrients turns poverty peas into prairie pearls Help eliminate early stress with fungicide & BRANDT Smart B-Mo 	<ul style="list-style-type: none"> Prime soil with enzymes Nitrogen/sulfur, zinc at planting Freshen the strip Soybean seed treatments containing Methyloctrophs improve rooting & nodules Sulfur at plant continues to improve yields and starts early season mineralization Multiple post foliar applications of nutrients turns poverty peas into prairie pearls Help eliminate early stress with fungicide & BRANDT Smart Trio

BRANDT Production Base Applications

The BRANDT omission trial design is based on providing all the treatments and then removing one to see what value each practice has on yield of that phenotype. This creates an environment where the yield responses reflect the total high management system rather than a limited response due to some or all parts of the system.

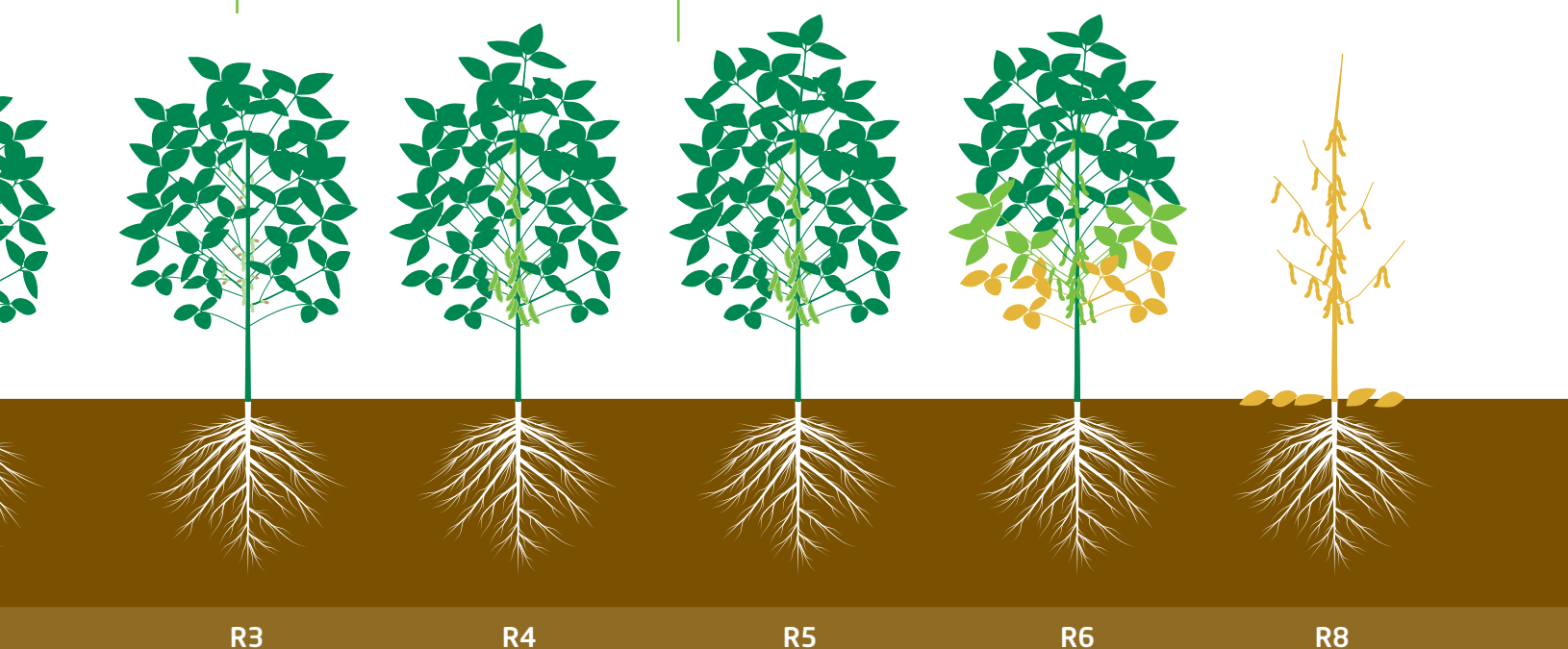
- 15-50-150 suspension in fall
- 120,000 population
- 10 gal/ac ATS at plant (2x0)
- BRANDT Battleground® seed treatment
- Conventional tillage
- Spring applied pre-emergent herbicide prior to plant
- Post applied herbicide tank mixes + BRANDT Smart Trio plus BRANDT Smart B-Mo at 3rd trifoliolate
- Foliar insecticide at R1 plus 1 qt/ac BRANDT Smart Trio plus 1 qt/ac BRANDT Smart K B
- Strobilurin at R3/insecticide + 1 qt/ac BRANDT Smart Trio plus 1 qt/ac BRANDT Smart K B



Production Practice Rankings		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	10 yr Avg	10 yr ROI
1	Planting Date	6.8	8.3	13.6	11	45.3	51.8	23.9	18.1	8.5	15.1	20.2	\$\$\$
2	Variety	14.6	19.3	17.5	7	12.4	23.5	16.7	12.5	11.5	26.2	17.0	\$\$\$
3	Maturity	10.2	13	8.5	0	12.4	23.5	16.7	12.5	5.5	26.2	13.2	\$\$\$
4	BRANDT Smart B-Mo at R2-R4	n/a	1	7.4	n/a	2	10.3	6.3	5.2	12.9	7.5	10.6	9.3
5	Seed Treatment	11.9	7.4	5.5	8.5	12.9	7.5	16.3	24.4	7.2	3.4	10.1	5.3
6	P&K Rate	3.5	4	5.2	n/a	n/a	15.4	n/a	9	15.4	n/a	9.0	1
7	Strobilurin	4	3.1	6.5	3.2	9.1	4.2	10	8.7	17.1	15.7	8.2	2.9
8	Foliar Insecticide	5.7	4.9	3.4	n/a	2.9	5.1	n/a	n/a	3.4	3	7.2	5.2
9	Sulfur (ATS)	n/a	3.8	4.8	4.8	8.8	12.2	14.1	8.1	1.9	2.7	6.8	6.2
10	BRANDT Smart Trio	3.9	3.4	3.3	n/a	n/a	2	2.8	6.5	2	2.8	6.1	5.9
11	Cover Crop	n/a	n/a	n/a	9.5	0	1.4	-2	n/a	n/a	n/a	3.0	1.6
12	Row Width 20" vs 30"	n/a	n/a	n/a	n/a	2.8	1.3	5	2.1	n/a	2.2	2.7	\$\$\$
13	Population	2.8	3.6	0	n/a	n/a	n/a	n/a	2.1	n/a	n/a	2.2	1.9

The ROI (Return On Investment) listed is calculated using the 2020 fall crop insurance price of \$12.30 per bushel, multiplied by the yield response per acre, minus the cost per acre of a practice. For every dollar invested per acre in a practice, the ROI factor is how many dollars you get in return. We use a symbol of \$\$\$ for practices that had no measurable cost per acre, but offer the best ROI.

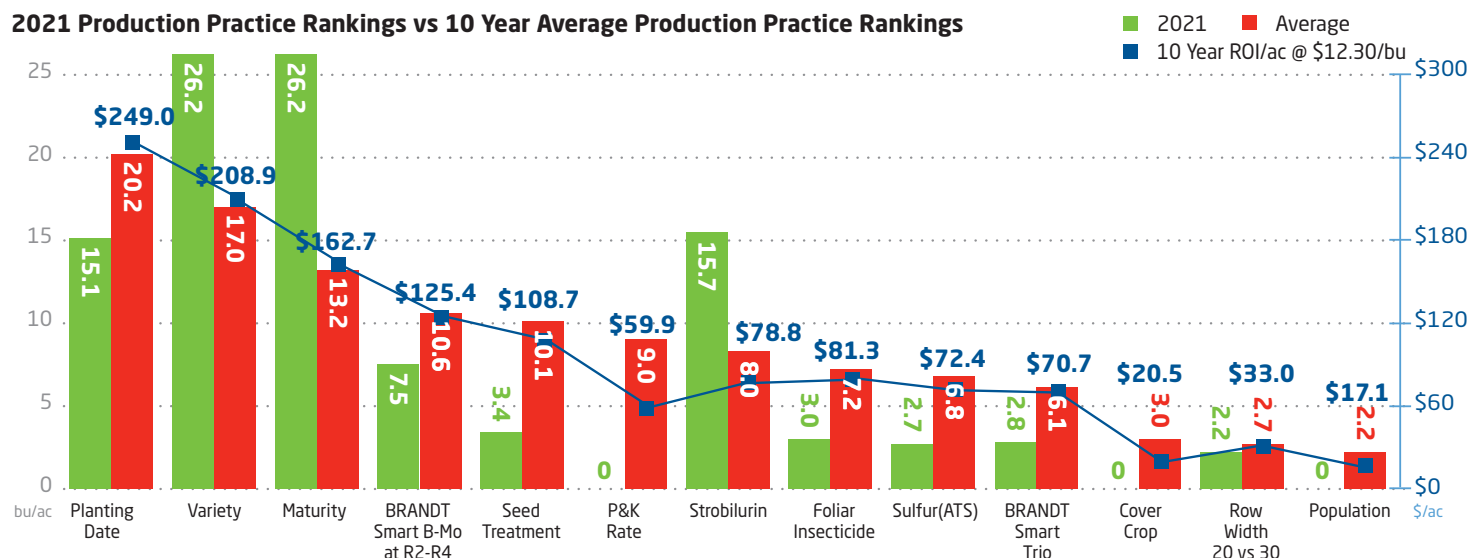
**Fungicide plus
BRANDT Smart B-Mo at R2-R4**
pg. 32 & 33



We Have Determined the “Top 5” Soybean Grower Insights Based on BRANDT Research Farm Data

1. Six years of planting date data suggests early planting with ATS produces the highest yields.
2. Residue reduction - managing corn residue from prior crop.
3. Starter fertilizers combined with BRANDT EnzUp technology increases early soil activity and added nutrition to set the foundation for healthy plants.
4. There are great genetics and high yield producers in a wide range of maturities. However, we consistently see the higher yielding soybeans from the 3.6 to 4.1 RM range.
5. Fungicide combined with BRANDT foliar products continue to generate increased yield and return at the research farm.

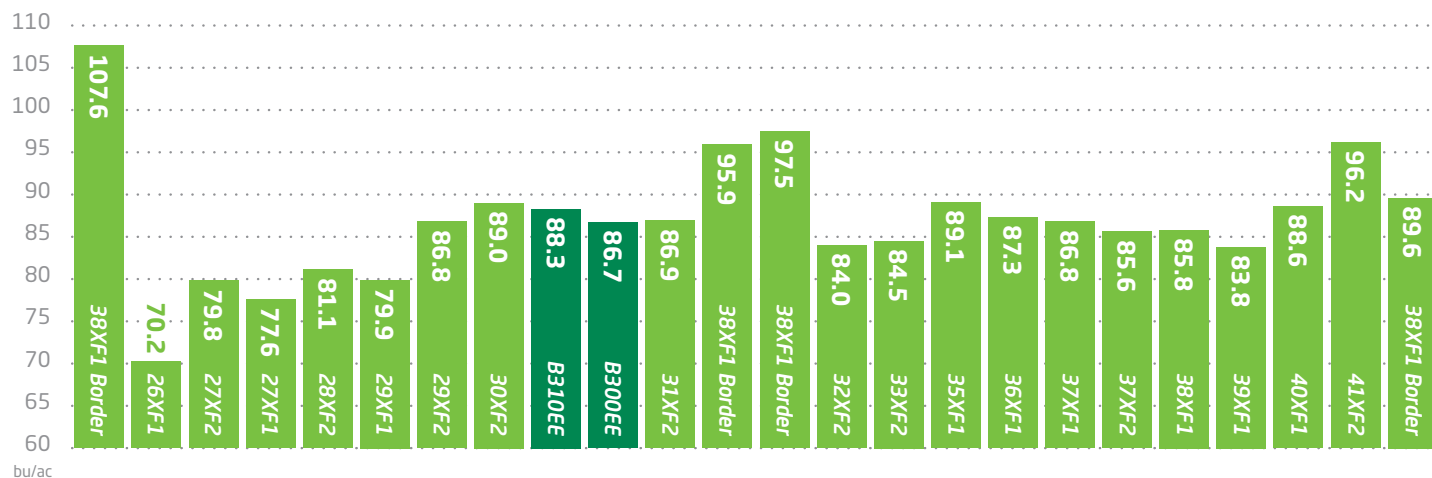
2021 Production Practice Rankings vs 10 Year Average Production Practice Rankings



Soybean Variety Trials

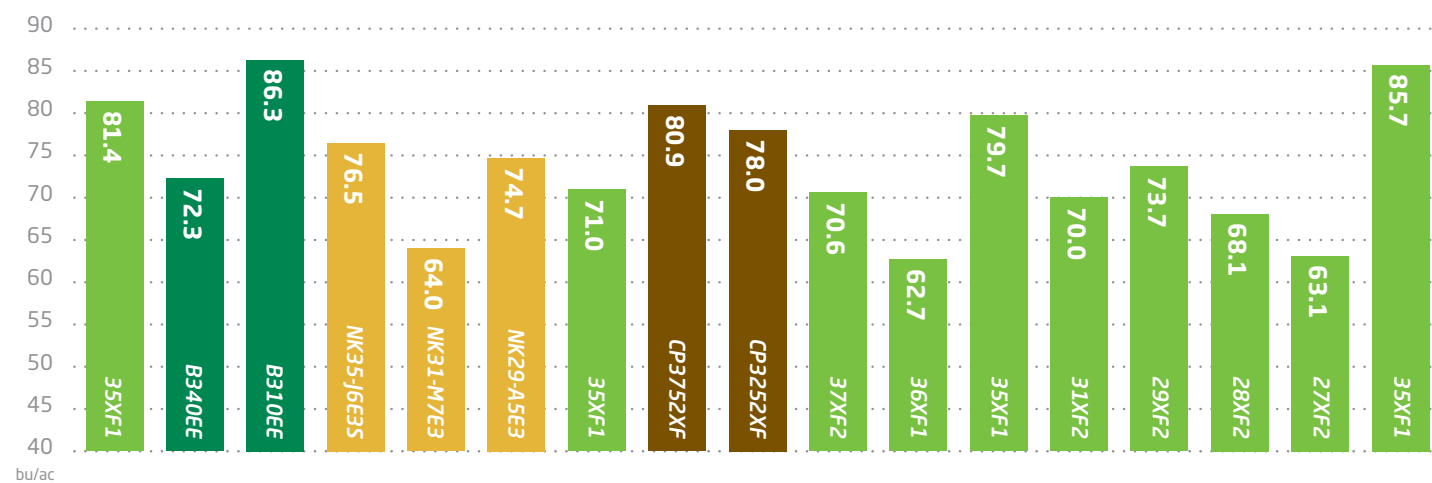
Soybean Variety and Trait Performance

■ Asgrow XtendFlex® ■ Brevant Enlist E3®



Soybean Variety and Trait Performance - Lexington

■ Asgrow XtendFlex® ■ Brevant Enlist E3® ■ NK Enlist E3 ■ Croplan Xtendflex

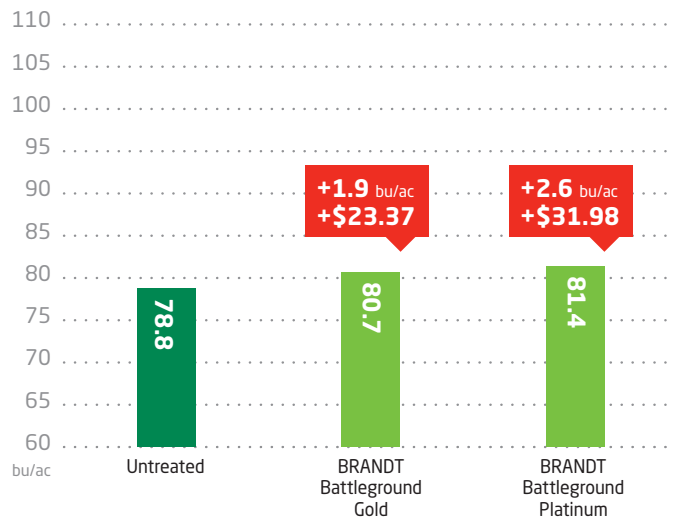


Soybean Seed Treatment Trial

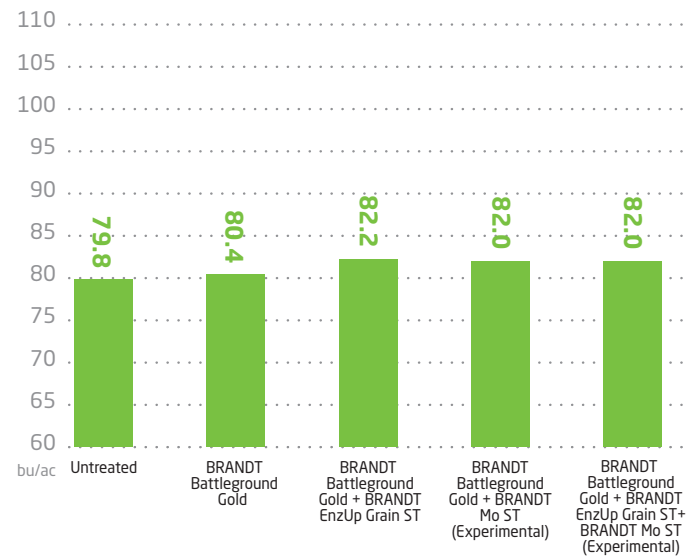
Soybean seed treatment technologies continue to improve at a rapid pace. BRANDT is aligned with leading seed treatment technology partners to offer BRANDT Battleground as a total package offering to protect and enhance early soybean growth.

Additionally, BRANDT is currently developing and testing proprietary enzyme and nutrient combinations to further advance soybean yields.

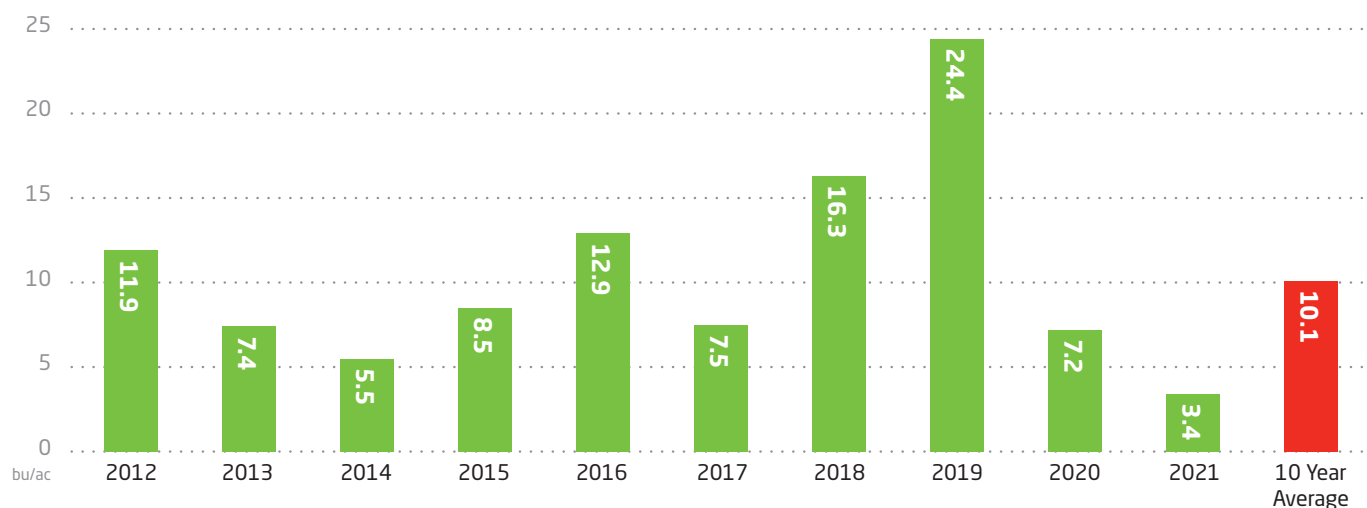
Soybean Yield Response to BRANDT Battleground Seed Treatments - Pleasant Plains



Soybean Yield Response to BRANDT EnzUp and Nutrient Seed Treatments - Pleasant Plains



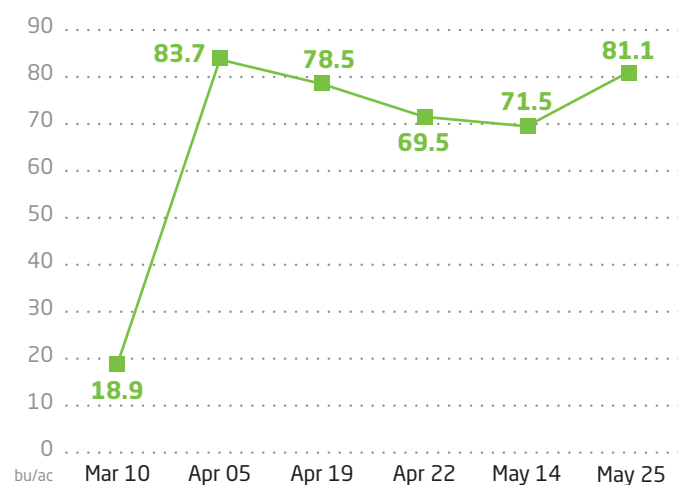
10 Year Yield Response to All Research Farm Soybean Seed Treatments - Pleasant Plains



Soybean Planting Date Trial

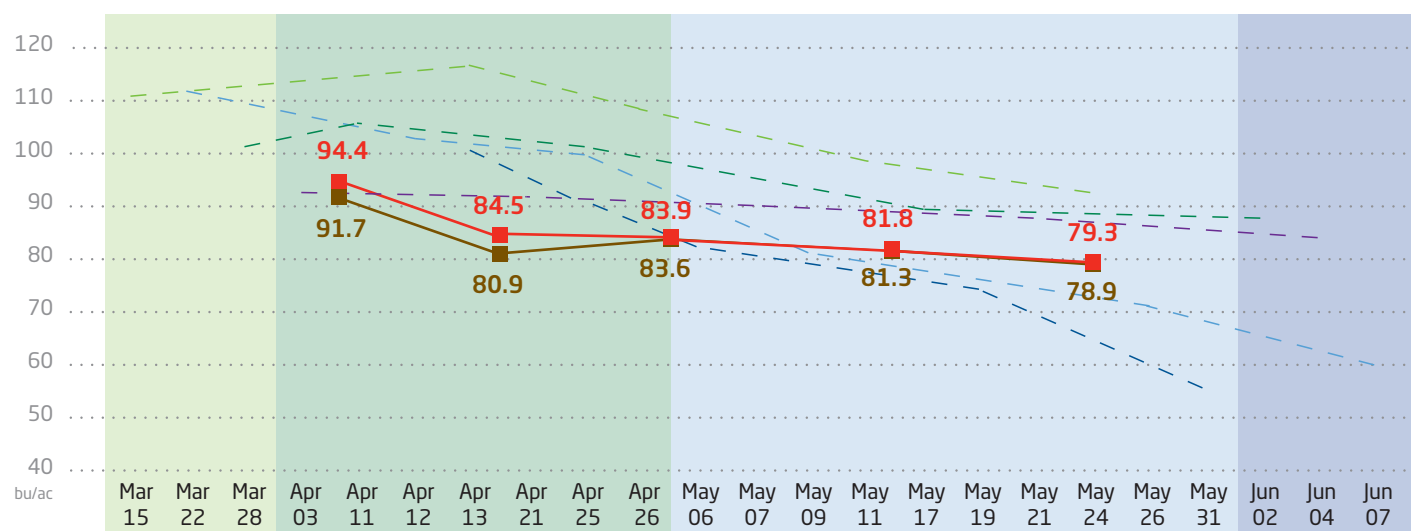
- Seed treatment was BRANDT Battleground Gold
- Early April planting at both research farms generated the highest yield
- Added nutrition, such as ATS, at planting added additional yield

Soybean Planting Date - Lexington



Soybean Yield Response to Planting Date - Pleasant Plains

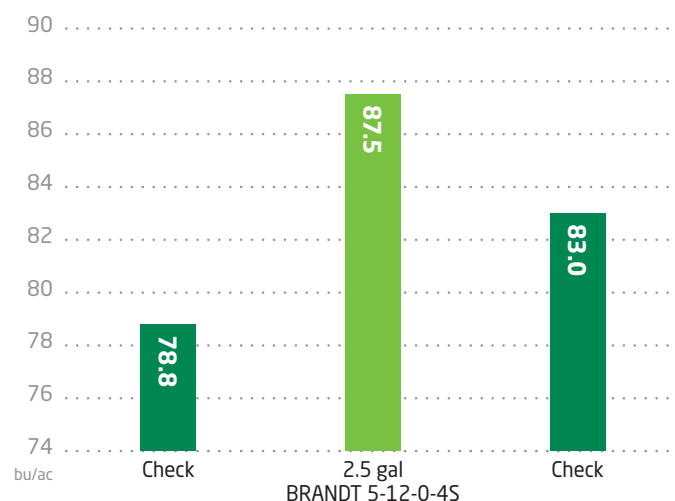
■ 2021 ATS ■ 2021 No ATS — 2020 Trial — 2019 Trial — 2018 Trial — 2017 Trial — 2016 Trial



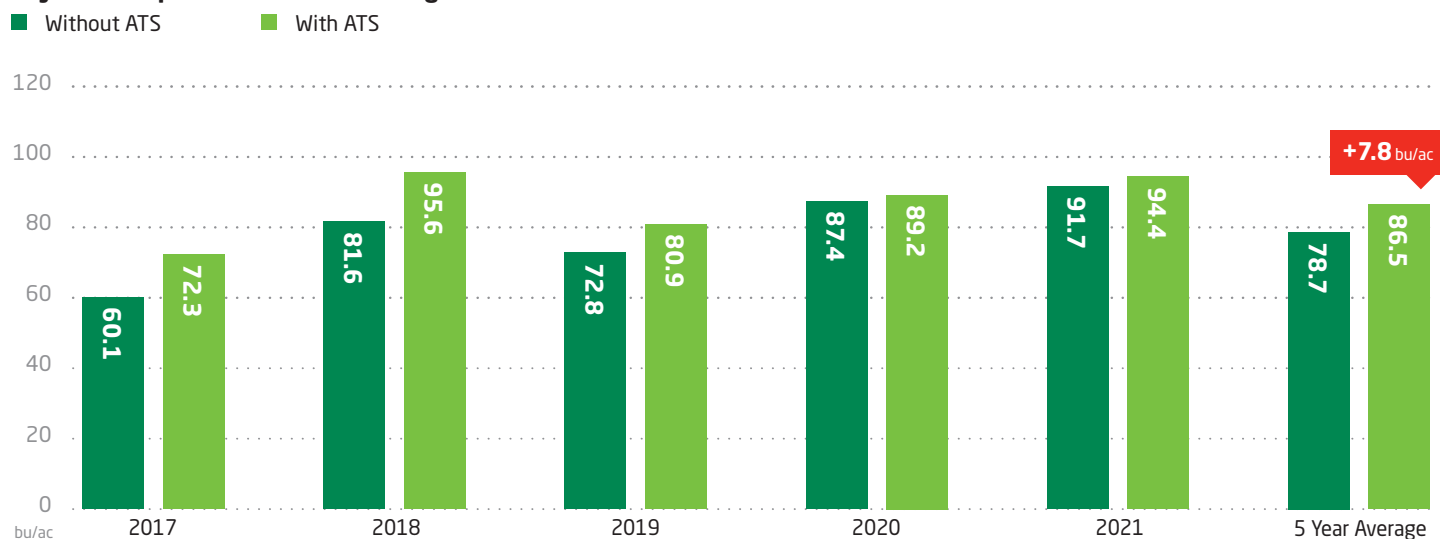
Soybean Response to In-Furrow Treatments

- It has been well established that earlier planting dates with added nutrition on soybeans have increased yield
- As growers plant soybeans earlier into cool wet soils the response to in-furrow starter applications is more likely to be greater
- In-furrow starter applications have increase leaf surface area on early vegetative growth and established a better root system vs control
- 5 year average yield increase to in-furrow applications with BRANDT 5-12-0 4S has been 7.8 bu/ac

5-12-0-4S In-Furrow Starter Response - Pleasant Plains



Soybean Response to ATS at Planting - Pleasant Plains

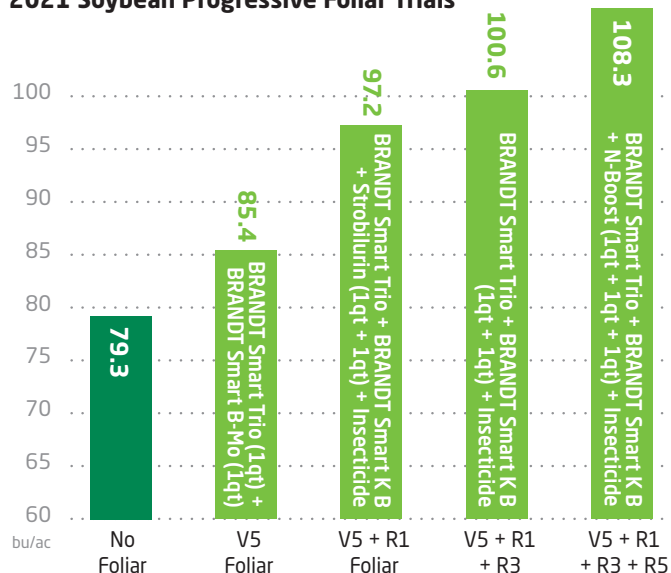


Progressive Foliar Trials

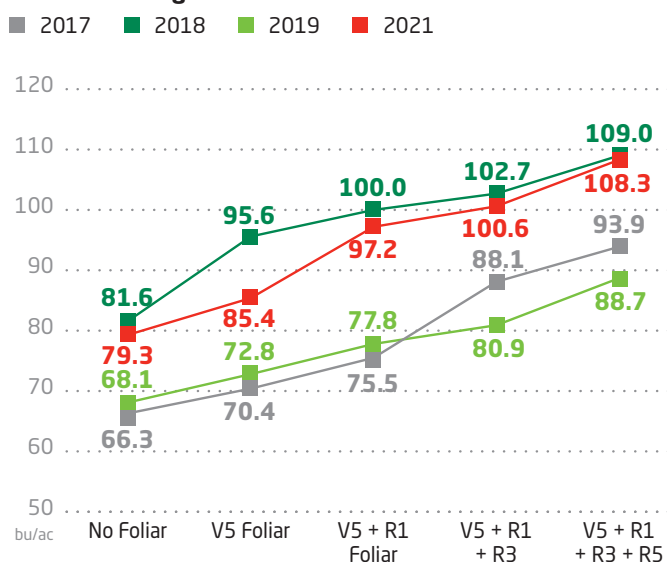
- Foliar application trials over the last 4 years provided 25% of the final yield
- Planting soybeans earlier in combination with a longer maturity soybean maximizes the foliar treatments
- Foliar applications from R3 to R6 stage maximizes yield and improves protein content of soybeans
- Increasing one pod per plant increases soybean yield by two bushels per acre, so adding 5 pods at the top of the plant can increase yields 10 bushel per acre

Treatment	Timing	Product	Yield Increase	\$/acre
Treatment 1	V5 Foliar	BRANDT Smart Trio (1qt/ac) + BRANDT Smart B-Mo (1qt/ac)	6.1	\$75.03
Treatment 2	R1 Foliar	Treatment 1 + BRANDT Smart Trio (1qt/ac) + BRANDT Smart K B (1qt/ac) + Insecticide + Fungicide	17.9	\$220.17
Treatment 3	R3 Foliar	Treatment 1 & 2 + BRANDT Smart Trio (1qt/ac) + BRANDT Smart K B (1qt/ac) + Insecticide	21.3	\$261.99
Treatment 4	R5 Foliar	Treatment 1, 2 & 3 + BRANDT Smart Trio (1qt/ac) + BRANDT Smart K B (1qt/ac) + N Boost (1qt/ac) + Insecticide	29	\$356.70

2021 Soybean Progressive Foliar Trials



Multi-Year Progressive Foliar Trials

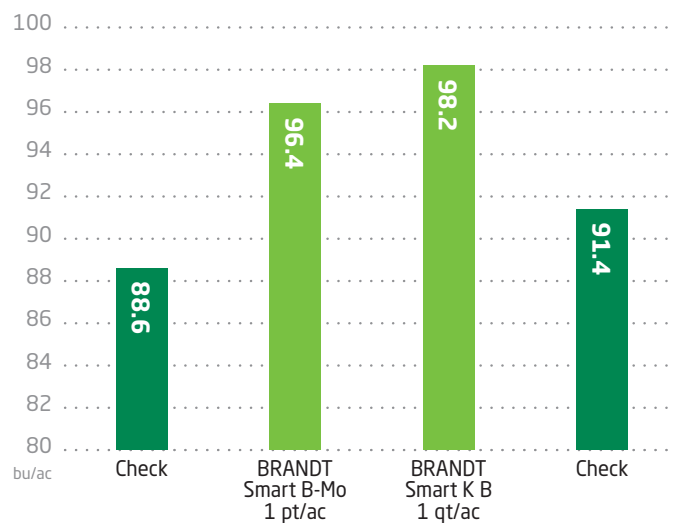


Soybean Fungicide Trial

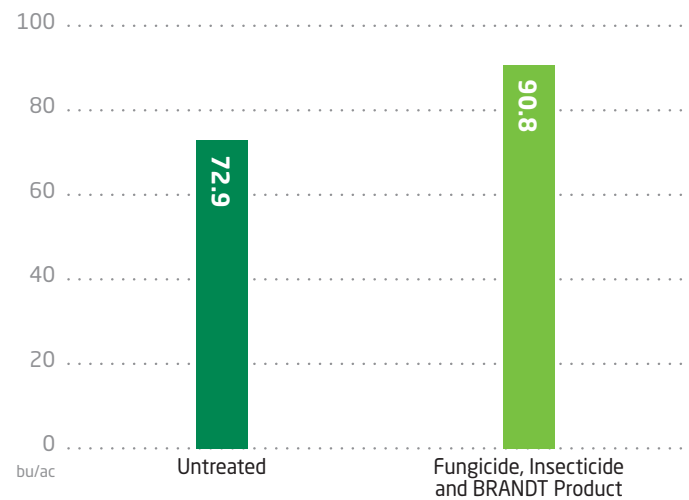
- Matching an insecticide and nutritional to the fungicide improves photosynthesis, disease resistance, and maximizes nitrogen manufacturing and utilization
- Foliar insecticides not only protect the plant from leaf and pod feeding but can also reduce rootworm egg lay and root damage in the following year of corn
- By adding the new BRANDT Smart K B to a fungicide application, the plant can more efficiently move sugars from leaves to pods as well as up-regulate nodule production of nitrogen using the boron and molybdenum in BRANDT Smart K B
- Zinc, manganese, and boron are key nutrients to assist the fungicide to minimize disease infestations in plants, so consider adding BRANDT Smart Trio to the BRANDT Smart K B

Soybean plants are on average 3 to 5 feet tall and can have up to 20 nodes on the main stem. The plant has the ability to produce 600 pods per plant, but on average there are 50 to 100 pods per plant. Most pods are set on the lowest nodes to middle of the plant. The easiest way to increase yield is to focus on increasing the pod count per node from the center of the plant to the top.

R3 Foliar Trials with Fungicide/Insecticide

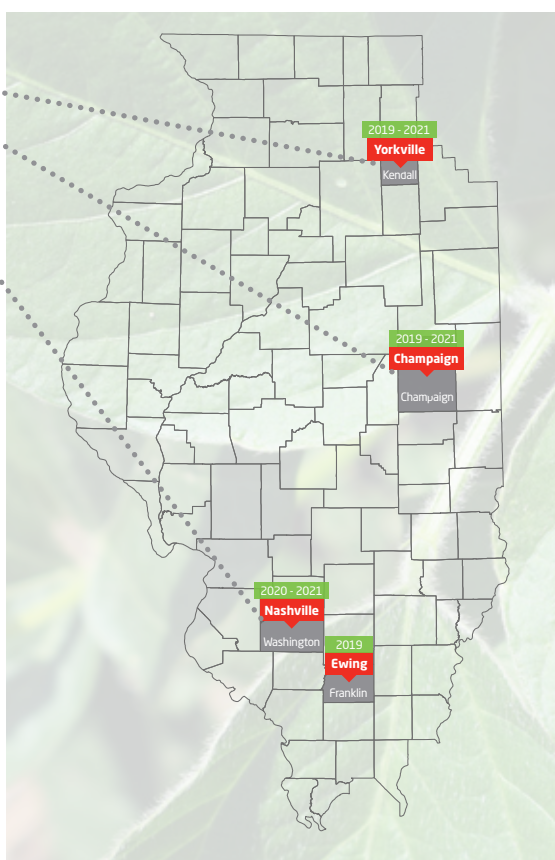
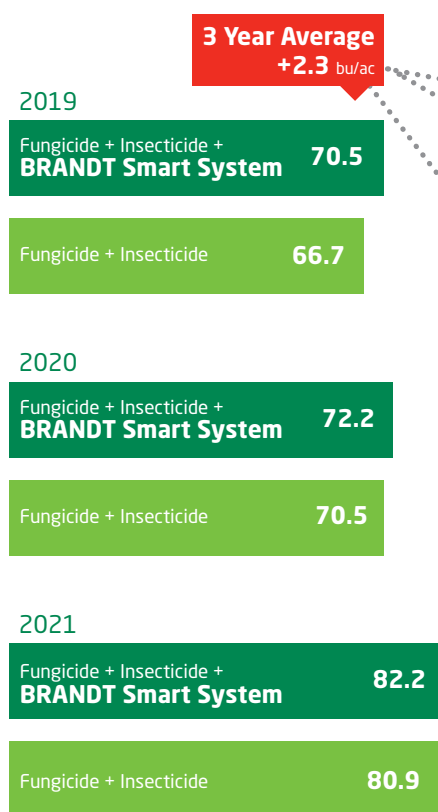


Response to Fungicide, Insecticide, BRANDT Smart Trio, BRANDT Smart K B at R3



BRANDT® Smart System® on Soybeans

- Foliar applied BRANDT Smart System products were trialed with the University of Illinois in a high fertility and management system to evaluate the responsiveness to micronutrients at R3 timing with fungicide and insecticide
- BRANDT Smart System micronutrients are designed for maximum foliar uptake and compatibility with post applied pesticides
- Post application of BRANDT Smart Trio and BRANDT Smart B-Mo/BRANDT Smart K B with fungicide and insecticide application averaged a 2.3 bu/ac yield increase of fungicide and insecticide over 9 total trials in 3 years
- The average grower return on investment in these trials is approximately \$20 to \$30/acre
- Earlier vegetative timings of BRANDT Smart System can also have a significant impact on plant growth particularly in known geographies and soil conditions that have yield-limiting micronutrient deficiencies. The most common micronutrient deficiencies in early vegetative soybeans include Mn, Fe, Zn and B



Research Conducted By
Dr. Fred Below and Logan Woodward

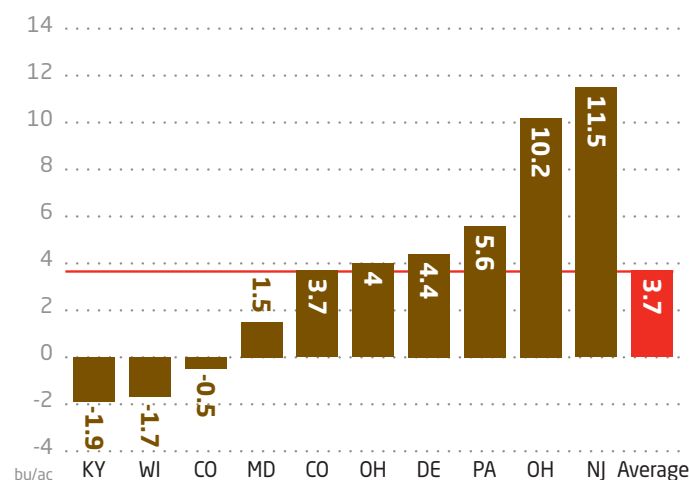


BRANDT EnzUp Grain ST Trials

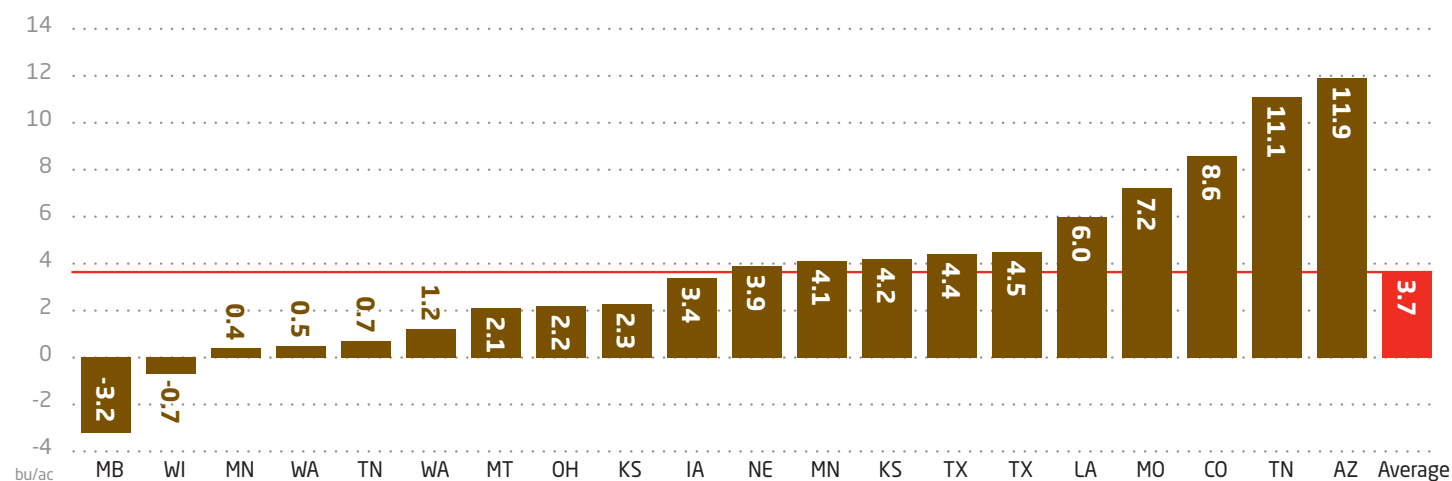
New for 2022, BRANDT EnzUp Grain ST is a seed treatment with enzyme technology for wheat and corn that improves early plant vigor and health.

- Average yield increase was 3.7 bu/ac over 30 trials. Of the 30 trials, 20 were replicated plot design and 10 were large block grower, 20 acres, side by side trials. The average grower return on investment in these trials is approximately \$20 to 30/acre with a win rate was 72% in 2021/22 winter wheat growing season.
- Yield improvement was determined to be a result of better establishment, root growth and vigor.
- BRANDT EnzUp Grain ST is mixed with and applied at the same time as most fungicides and insecticide seed treatments. It may also be applied as an over-treatment if preferred.
- Do you have an interest in running a 20 acre side by side trial? If, YES, please contact your BRANDT representative.

BRANDT EnzUp Grain ST: Grower Trials - Yield Results



BRANDT EnzUp Grain ST: Replicated Trials - Yield Results



Summary

On behalf of BRANDT we want to thank you, our customers, for your business. Our valued relationship is built on sound agronomic and business practices so that we can grow our crops and businesses for future generations. Navigating challenges, as we did in 2021, takes teamwork to achieve the positive results we have experienced. We stand ready to navigate all challenges as we enter the 2022 growing season.

This is the 17th year of production at our Pleasant Plains, IL farm and 10th year for Lexington, IL. Parts of the data set will look familiar as we continue to build on our multi-year trends, but there are some new products and practices we are experimenting with that show some positive results. We focus on practices and outcomes that benefit your operation and we also take risks to push the limits of production agriculture. In 2021, we were fortunate to have favorable weather conditions. When paired with our production methods, resulted in very good yields at both of our farms. These yields combined with grain prices increased revenue on the farms as well.

We were glad to welcome everyone back for in-person BRANDT Agronomy Days in 2021. These are important events that give our customers valuable interaction with BRANDT agronomy experts. Our research farm is always available for private tours. Work with your BRANDT representative on those arrangements. There is more research and demonstrations on the farm than are represented in this book and some of the early season observations can prove valuable for in-season applications to increase yield.

Several practices that are common on your farms today started on our research farms. The addition of early season ATS applications has increased every season and now we looked to fine tune the rates to generate maximum return on those applications. BRANDT Smart System products with herbicide applications started with our flagship product, BRANDT Smart Trio, and continue to evolve with new chemistries in the market to battle weed resistance. We continually analyze new fungicide chemistries and application timings to protect yield. As noted, tar spot was first observed on the research farm this year. We value our relationship with industry partners and work closely with them to bring the best recommendations to your farms.

We hope you benefit from our research farm results and please contact your BRANDT representative with questions or further detailed information. Also, please plan to attend our annual agronomy day and schedule a private tour of the farm with one of our agronomists or team members.

We wish you a successful, prosperous, and healthy 2022.

Team BRANDT

BRANDT RETAIL LOCATIONS

Ashland	217 476 3438
Auburn	217 438 6158
Cooksville	309 725 3710
Cropsey	309 377 3121
Fairbury	815 692 2612
Farmersville	217 381 2546
Fisher	217 897 6920
Franklin	217 675 2302
Galesville	217 489 2141
Grand Mound, IA	563 847 3931
Greenvview	217 968 5589
Gridley	309 747 2233
Lexington	309 365 7201
Lincoln	217 735 2571
Mt. Auburn	217 676 3231
New Berlin	217 488 3125
Niantic	217 668 2228
Oakford	217 635 5765
Pleasant Plains	217 626 1127
Raymond	217 229 3442
Towanda	309 728 2294
Virginia	217 452 3545
Waverly	217 391 9705
Williamsville	217 566 2113
Wyanet	815 699 7701

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