

**Supplement your  
Soybeans**

ADVANSix



**2021  
HARVEST  
REPORT**

# Get Serious About Soybeans

Soybeans are no longer just a rotational crop for corn. So, it's time to get serious about soybean nutrition management to maximize growers' ROI.

Today's high-yielding soybean varieties require more nitrogen and sulfur than their predecessors. Over the last decade, cleaner air has contributed to a decline in atmospheric sulfur available to the crop. Research shows that biological nitrogen fixation accounts for roughly half of soybean total nitrogen needs, and that the higher the soybean yield, the greater the gap between total nitrogen uptake and what the plant can naturally fix. Soybeans also require readily available sulfur all season.

To accurately assess the impact a new management approach could have on soybean yields, AdvanSix enrolled six soybean growers and their retail agronomists in its Supplement Your Soybeans program. While each grower experienced unique challenges on their farms which are detailed later in the report, it's clear that a higher level of management, including nutrient accessibility, can lead to more soybeans per acre.

Mercedes Gearhart, corporate agronomist at AdvanSix, gathered some of the key agronomic takeaways from this program, which include:

- Maximum physiological health is needed to maximize soybean yield, and maximum plant health is not achieved without readily available nitrogen and sulfur, from emergence through pod fill.
- Soybeans treated with ammonium sulfate at planting started off better as the readily available nitrogen and sulfur promoted root growth and nodulation during a cool, wet spring, which led to a faster-growing, healthier canopy and improved root systems.
- The growers took advantage of the wide application flexibility of AMS, applying it anywhere from pre-plant to four weeks after planting, as well as late season top dress.
- Growers and their agronomists found treated plants had higher pod counts prior to harvest, along with a higher number of internodes and branches and larger and healthier root masses.
- Overall, observations support the idea that supplemental AMS can have a strong ROI.

## Backed by Science

Earlier planting is one recent agronomic trend that promotes higher yields in soybeans by extending the flowering period; however, this also introduces cooler, wetter soil conditions at planting time, which hamper natural nutrient cycling from the soil's organic matter. Without proper plant nutrition, soybean root and nodule development and overall health cannot reach their fullest potential when planted early. Research from Purdue University Associate Professor Shaun Casteel shows that when ammonium sulfate (AMS) is applied early in the season, it provides nitrogen and sulfur nutrients, getting the crop off to a healthy start and setting it up for achieving maximum yields.

“One thing I’ve seen when we get to better, early plant development is that we’ve got good nodulation, because we dig up the roots and we see the nodules,” Casteel says. “Those nodules are the factory where nitrogen fixation happens, so more nodules mean the plant can fix more nitrogen, ultimately increasing plant health. With soybeans planted early in the season, sometimes into cool, wet soils, root and nodule formation are challenged which impacts natural nitrogen fixation early in the plant's development. That’s why an early application of AMS helps soybeans get off to the best start possible.”



Casteel, Purdue University, 2018

Troy Jenkins, agronomist at Ceres Solutions, a leading ag retailer in the upper Midwest, has conducted trials using ammonium sulfate on various crops since 2018. He said this research has helped his team fine-tune its recommendation of AMS for growers planting soybeans prior to May 15 or for those who have the right combination of slower warming, high texture soils.

“Weather has a major impact on how sulfur is released and used by the soybean plant,” Jenkins says. “A cold early season delays biological nitrogen and sulfur release which challenges root and nodule formation.”

Throughout the Ceres Solutions trials, Jenkins added that supplemental ammonium sulfate makes economic sense in most years, especially in early-planted fields and/or those with low organic matter levels. He believes that pound-for-pound, AMS is currently the most efficient sulfur source on the market.

## Innovative Soybean Management Requires Innovative Growers

AdvanSix partnered with five growers and their retailers across the Midwest to learn how they are applying nutrients to high-yielding soybeans and to gain a new understanding of what it takes to maximize soybean production at the farm level. As part of this collaboration, growers conducted split-field trials, where half a field received supplemental ammonium sulfate.

### Grower Insights

#### ***Marc Kaiser***

Location – Carrollton, Missouri

Application rate and timing – Top dress applications at V4, two alternating rates ( 50 lbs./ac and 100 lbs./ac), irrigated

Planting spacing – 15”

Population – 130,000

Pod counts – 78 untreated, 86 treated

Yield results – 81.5 bu/acre untreated, 87.4 bu/acre treated (50 lbs/ac), 89.6 bu/acre treated (100 lbs/ac)

#### **Challenges**

In a three-day period in June, we had a little over 10 inches of rain. In one part of the field, water backed up through creeks and ditches, so we could not replant and could not get rid of water fast enough.

#### **Key Takeaways**

We had over 15 inches of rain early in the growing season, so baseline fertility levels needed to be supplemented around flowering. It was critical to topdress ammonium sulfate in order to feed the growing plants ahead of the key pod set and pod maturity phases. Despite the weather challenges, we achieved yields of nearly 90 bu/acre on early planted fields in the ammonium sulfate-treated zones, surpassing our goal of 85 bu/acre. The ROI of the ammonium sulfate was more than \$80 per acre.



## **Joe Horan**

Location – Rockwell City, Iowa

Application rate and timing – Pre-plant, 100 lbs./ac

Planting spacing – 30”

Population – 139,000

Pod counts – 52 untreated, 57.2 treated

Yield results – 68.7 bu/acre untreated,  
70.4 bu/acre treated

### **Challenges**

Shawn Lawler, CCA for New Coop - We put AMS on the field before we planted, so application went smoothly. We planted in good conditions, too. In a 150-acre field we took 60 acres right down the middle making it an even check all the way across the field. The first couple weeks in June were dry and hot, so the beans just sat there, and we had some trouble killing weeds in some fields. Toward the end of June, we caught some nice rain, and the beans just took off.

### **Key Takeaways**

Our trial field was new to us this year, so we were unfamiliar with its soybean yield potential and had limited visibility to its drainage, fertilizer and management practice history. However, we were able to obtain a few key insights by participating in the ammonium sulfate field trial. We learned that our treated zone held onto moisture longer (healthier plants). We also noticed that a couple soil types in the trial field, more productive clay loam soils, had a more significant response to the ammonium sulfate compared to other soil types.



## **Washburns**

Location – Union City, Michigan

Application rate and timing – Pre-plant, 100 lbs./ac

Planting spacing – 20”

Population – 160,000

Yield results – 78.18 bu/ac untreated,  
78.03 bu/ac treated

## **Challenges**

Bryan Washburn - We had a nice, dry window for spreading this spring, so everything went very smoothly. All our acres were spread and planted in a very timely fashion. There were a few frost events, but they did not seem to affect any of our fields as plants were not out of the ground yet. The excessive rain throughout the summer made the correct timing of the herbicide and fungicide applications difficult.

## **Key Takeaways**

With the cool spring, significant rainfall in early summer (17 inches in one month) and the higher texture soils in our test field (1.7% OM and 5.97 CEC averages) it's safe to assume the sulfate leached from the soil. Most of the sulfur was lost during the heavy rainfall in June, prior to the plant fully utilizing it. These compounding weather and agronomic factors likely mitigated the opportunity for the sulfur to boost plant health and the yield improvements that come with it later in the season. In years like this one, split or top-dress AMS applications can help maximize nutrient availability and uptake throughout the season.



## **Cervenkas**

Location – Francesville, Indiana

Application rate and timing – Pre-plant, 100 lbs./ac

Planting spacing – 15”

Population – 145,000

Pod counts – 36 untreated, 57 treated

Yield results – 64.96 bu/ac treated, 60.88 bu/ac untreated

### **Challenges**

Riley Tiede - Our biggest challenge was the late-April frost that hit some of our beans that had already emerged.

### **Key Takeaways**

Bart Leman, Account Relations Manager for Ceres Solutions - The coloring of the plants all season seemed greener and healthier in the treated areas. Also, during harvest, I could see the line between untreated and treated areas. During harvest, we saw an average increase of 4 bu/ac on the AMS treated acres in comparison to the untreated acres.



## **Keith Schrader**

Location – Nerstrand, Minnesota

Application rate and timing – 110 lbs/acre broadcast after planting, 110 lbs/acre at R1 top dress

Planting spacing – 15” and 30”

Population – 120,000-160,000

Pod counts – 40 untreated, 50 treated

Yield results – Field 1: 81.5 bu/acre untreated,  
82.4 bu/acre treated  
Field 2: 63.3 bu/acre untreated,  
63.8 bu/acre treated



## **Challenges**

After successfully planting most of our beans in late April, we had a very cool and dry May followed by record heat, in the 90s, in June, so our crops experienced a blend of stresses last season. We feel this is where the benefits of ammonium sulfate really showed up.

## **Key Takeaways**

We tested two different fields and learned that zones in one field where ammonium sulfate was applied early yielded 3.5 bu/acre more than untreated areas. And after looking at yield differences by soil type in that same field, we noticed that the silt loam soils in the ammonium sulfate-treated zones saw an increase of 10 bu/acre. It has been interesting to see the role soil type potentially plays in yield outcome when AMS is used.



## Key Takeaways and Insights from AdvanSix

Mike Hamilton, AdvanSix Vice President of Plant Nutrients, says he's looking forward to the continued development of the Supplement Your Soybean program over the next few years.

"We like the concept of on-farm research, and we know our innovative growers and their advisors are science-driven and always pushing the yield envelope. Field trials are an excellent way to learn and gather insights to benefit everyone," he continued.

"The first year of our program was successful, and we are looking forward to applying the insights and learnings we've gained to build the program for growers, retailers and everyone interested in improving their ROI with AMS," Hamilton says. "We started the trials with a clean slate for yield results, and thanks to our grower partners, we now have a baseline and benchmarks as the program continues. It was also gratifying to see that these results coincide with the university research we've sponsored and further support our belief that supplemental ammonium sulfate nutrition can make a big impact on soybeans."

