SEPTEMBER 2025

Illinois Field & Bean

A PUBLICATION OF THE ILLINOIS SOYBEAN ASSOCIATION

G5 or G5^{Plus} Display

Analyze field data with a multilayer view display

StarFire™ 7500 Receiver

Get precise seed placement with SF-RTK accuracy within 2.5 cm

JDLink™ M or R Modem

Stay connected to monitor your operation in real time

John Deere Operations Center™

Seamlessly connect all your in-field data

JOHN DEERE

Precision Essentials Kit

TURN CURRENT MACHINES INTO PRECISION WORKHORSES

Want to pull more value out of your older machines – even non-Deere ones? Precision Essentials bundles everything you need to connect machines, stream field data, and open doors to more guidance and automation. All for one low, upfront cost. Technology that's More Affordable. More Accessible. More Adaptable.

Get precise at JohnDeere.com/Essentials

CONTENTS

September 2025 Volume 5 Issue 11

DEPARTMENTS

Visit us online at www.ilsoy.org/newsroom/illinois-field-bean/.

COVER: Ag keeps getting smarter - and so do soybean farmers! In this issue of ***Illinois Field & Bean***, dive into AI innovations, enhanced connectivity and farm data management best practices. We're talking with NASA, the University of Illinois and the digital team at John Deere to bring you information that equals productivity and profitability.

STAFF CREDITS
Editor in Chief | Betsy Osman
Assistant Editor | Olivia Key
Lead Writer | Ashley Haddon
Staff Contributor | Brynna Sentel
Staff Contributor | Peyton Rinkenberger, Communications Intern
Staff Contributor | Kyley Wolf

OTHER ISA STAFF
Chief Executive Officer | John Lumpe
Director of Illinois Soybean Foundation | Suellen Burns
Executive Employee Relations | Nicole Butler
Director of Government Relations & Strategy | Andrew Larson
Director of Market Development | Todd Main
Director of Marketing Communications | Betsy Osman
Director of Finance | Kati Owen
Director of Agronomy | Abigail Peterson
Director of Operations | Dustin Scott

Illinois Soybean Growers (ISG) is owner of Illinois Field & Bean, a publication for Illinois soybean farmers, designed and written to provide timely and useful industry information. Illinois Field & Bean is published by the Illinois Soybean Association, 1108 Trinity Lane, Bloomington, IL, 61704.

Comments and statewide news articles should be sent to the above address. Advertising space reservations must be made by the first of the month preceding publication. In consideration of the acceptance of advertisement, the agency and the advertiser must, in respect of the contents of the advertisement, indemnify and save the publisher harmless against any expense arising from claims or actions against the publisher because of the publication of the content of the advertisement.

Illinois Field & Bean Magazine may contain information or advertisements for third-party products, services, or companies. Any reference to a specific commercial product, process, service, or manufacturer does not constitute or imply endorsement, recommendation, or favoring by the Illinois Soybean Association.

FOR ADVERTISING INFORMATION OR ADDRESS CORRECTIONS, CONTACT:
Betsy Osman
Editor in Chief
Email: betsy.osman@ilsoy.org

Tech That Earns Its Keep

BRADY HOLST | VICE CHAIRMAN | ILLINOIS SOYBEAN ASSOCIATION

On my farm, technology has to prove its worth. I've tested plenty of tools. Some stick. Others don't. Here's a look at what I've tried and where I see promise.

Artificial intelligence has potential, but it's not ready for most farms yet. I've tested AI-generated prescription maps using yield and soil data. The problem is inconsistency. Run the model twice and you get different results. It makes broad assumptions that it doesn't replicate identically, leading to slightly different results each time. Formatting issues between data platforms don't help, though AI does a decent job working around them. Right now, the biggest challenge is turning all this raw data into something truly actionable.

Still, the possibilities are exciting. If we can bring in more data from sensors, drone imagery and field logs, AI could become a real asset. Imagine a system that not only tracks everything happening in a field but also gives you real-time guidance based on those conditions. That's where I think we're headed. We just need the technology to progress a bit more, and we'll need to provide it with better inputs. Really, the only limiting factor are our ideas and willingness to get AI data interpretations from the computer to the field.

Satellite imagery is further along. I use it regularly. It helps monitor crop health and validate what I see on the ground. Sometimes it catches something before we do. This space is moving fast. More startups are entering thanks to cheaper satellite launches. In 2014, it cost around $100 million to launch a private satellite. Today, it's under $1 million. That means more images, better resolution and faster updates.

The quality and frequency of these images keep improving. This empowers you to see a field from above and track trends you can act on. You can spot where a sprayer skipped or where drainage is causing stress. NASA also has free tools anyone can use. Once you start exploring, you find more value the deeper you go. Patterns emerge that weren't obvious at first. And when combined with other data sources, those images become even more powerful.

One thing I haven't seen enough of yet is autonomy. I'm looking forward to more of it. Autonomous tractors and sprayers would save time and reduce labor. It's not about replacing people, but rather making the most of the time we have. Even something as simple as an autonomous grain cart could free up hours during harvest.

Tech has to work in the real world, not just on paper. It has to fit into daily decisions, work with existing equipment and show a return. Some tools are already pulling their weight. Others still have to earn their keep.

Agriculture Keeps Getting Smarter

JOHN LUMPE | CEO |
ILLINOIS SOYBEAN ASSOCIATION

Farm technology is evolving faster and faster with innovative inputs, new equipment and new data-informed insights for managing your soybean fields. This September issue of ***Illinois Field & Bean*** is all about that change and how ag keeps getting smarter. We're taking a closer look at some of the biggest changes, such as improved connectivity and smarter ways to manage your farm data, all while keeping that data safe and private.

Smart Technology and AI

Illinois soybean farmers know better than anyone that technology upgrades are necessary for smart business. In your own fields, you're using it every day, whether it's your tractors, field sensors or seed genetics. Technology is changing how we plant, harvest and make decisions. It's helping us drive production gains, boost efficiency and better manage our farms for the long run.

The idea of AI implementation can sound intimidating. But in truth it's becoming a practical tool for Illinois agriculture. In its simplest terms, AI is about computers, sensors and other data-generating devices that help us sort through mountains of information. It could be software that helps you pick the best time to plant or apply inputs, or a tractor or agricultural drone that knows your field and makes spot adjustments on the go.

This month's cover story on pages 6-9 takes a deep dive into how farm equipment companies are putting AI to work.

Farm Data: From Collection to Decisions

With new tech comes more data. Every growing season, you're gathering numbers on yield, inputs, storage and more. But what do you do with it all? In a story highlighting data management strategies on pages 14-17, we lay out best practices for putting all that information to work for you, making sure it is helping you plan, save money and improve your operation over time.

Another story on pages 10-13 explores how NASA scientists are using satellite technology to monitor crop conditions and help you make informed production decisions. It's another example of how the future of soybean farming is being shaped by new ways of looking at our land from hundreds of miles above.

On a more down-to-earth level, drones are quickly becoming a must-have tool. In "Eyes in the Sky," ISA Vice Chairman Brady Holst shares how drones are changing the way he manages his farm, from scouting fields and applying fertilizer to keeping an eye on crop health more efficiently than ever before.

Meet Your New Illinois Soybean Board Leaders

Change is about more than advances in technology, and ISA leadership is no exception. I'm proud to introduce the newest faces of leadership on the Illinois Soybean Board of Directors:

- Chairman, Bryan Severs, District 7 Director
- Vice Chairman, Brady Holst, At-Large Director
- Treasurer, Tim Scates, At-Large Director
- Secretary, Scott Gaffner, At-Large Director
- Assistant Secretary/Treasurer, Jeff O'Connor, At-Large Director
- Government Relations Committee Chair, Rob Shaffer, District 6 Director
- Market Development Committee Chair, Brock Willard, District 12 Director
- Soybean Production Committee Chair, Heath Houck, District 13 Director

We are thrilled to welcome new Board Directors Weston Olson, District 4; and Tim Clark, District 8.

These leaders bring fresh energy, strong voices and a deep commitment to Illinois agriculture. Just like the Board Directors who served before them, all of these leaders understand that growing soybeans in Illinois is about staying informed and staying ahead of the trends, standing up for our farms and supporting one another.

Thank you for everything you do, day in and day out. If you ever have questions, ideas or a perspective to share, please reach out to me directly at ***john.lumpe@ilsoy.org***. My door is always open, and my time is always yours.

Funded by the Illinois Soybean Checkoff

Feeding 10 Billion:

How Ag Companies are Using AI to Prepare for 2050

By 2050, the world will need to feed 10 billion people — and soybean farmers will be central to that mission. Meeting this demand with fewer inputs, tighter margins and a shrinking labor force requires a fundamental shift in how farming decisions are made and executed. For Illinois soybean producers, that shift is already underway, powered by artificial intelligence (AI).

"This is a defining moment in agriculture," says Ryan Stien, go-to-market manager for digital agriculture at John Deere. "AI enables farmers to make precise, timely and profitable decisions at scale."

Unlike past waves of ag tech, AI does more than merely record what's happening in the field. It also analyzes and responds in real time, learning and improving with every pass.

From After-the-Fact to Real-Time Farming

The shift from reactive to predictive agriculture marks one of the most meaningful evolutions in how work gets done on the farm.

"Instead of a farmer looking at historical data after a job is done, farmers are acting on live data while the job is happening," Stien explains.

That capability stems from more than two decades of investment in digital tools, sensor technology and machine learning systems. What started with GPS-based precision guidance and remote monitoring has become a fully connected data ecosystem that spans machines, fields and cloud platforms.

Today's smart equipment not only performs tasks but evaluates how to perform them better.

"Equipment is not just executing tasks but continuously learning and improving how tasks are performed," Stien says. It's doing so with a level of accuracy that allows decisions to be made at the plant level.

Laying the Groundwork for Smarter Systems

The rapid evolution of AI in agriculture didn't happen overnight. "Several milestones have paved the way," Stien says.

He points to early breakthroughs such as sub-inch GPS guidance and real-time data flow between machines and digital platforms. These tools created the foundation for today's intelligent systems.

Mobile-accessible field management tools further expanded farmers' abilities to control operations offsite. "The launch and evolution of the Operations Center turns field data into strategic decision-making, helping farmers manage their entire operation from their phone or laptop," Stien notes, referencing John Deere's platform for farmers.

The estimated-time-remaining feature is particularly popular within the Operations Center. It uses AI to calculate how long machines will take to finish their current pass, helping farmers schedule labor, prepare grain-handling needs and even reassign machines mid-day to stay efficient.

Add in machine-mounted sensors and camera vision capable of analyzing everything from seed depth to spray pressure and the result is a smart system that executes and evaluates in real time.

Smarter Spraying, Autonomous Decisions

Today, AI is embedded across the farming workflow to assist in a variety of production activities.

John Deere's See & Spray™ technology is a targeted input

(See Feeding 10 Billion, page 8)

Mobile-accessible field management tools have enabled Illinois farmers to manage their entire operation from their phone or laptop, paving the way for emerging AI technologies capable of real-time data analysis and predictive decision-making. Photo credit: John Deere

Feeding 10 Billion

(continued from page 7)

application system that pairs computer vision with AI to identify individual weeds and apply herbicide only where needed. "Last year, we saw a 59% reduction in nonresidual herbicide use compared with conventional spraying," Stien says.

Autonomy is another fast-moving front. Tractors equipped with perception systems use camera arrays and real-time analytics to detect obstacles, assess terrain and make basic operational decisions like turning or stopping. "AI models analyze every frame in milliseconds to navigate fields autonomously," Stien explains.

With the second-generation autonomy precision upgrade kits, select tractor models can be upgraded to operate autonomously. These systems include 16 cameras and real-time AI processing that give the machine 360-degree visibility and the ability to self-navigate in row-crop environments. These capabilities are available for John Deere's model year 2022 and newer 9R/9RX tractors, its model year 2020.5 and newer 8R and 8RX tractors, plus select tillage tools from 2017 on.

Taken together, these innovations and others like them represent a broader shift away from tool-driven farming and toward intelligence-driven systems.

AI in the Cab and in the Cloud

For many Illinois soybean farmers, AI is already at work on their operation, even if it's not labeled that way. Simple features such as machine alerts rely on predictive algorithms and live machine data to optimize operations. "Many farmers are already using AI, whether they realize it or not," Stien says.

JDLink® connectivity already provides automatic data flow between connected machines and the Operations Center. Sensors and computer vision empower machines to understand the environment, including fine layers of detail such as seed depth and nozzle pressure.

In the next one to two years, Stien expects AI to further enhance how farmers manage variability in the field. AI systems are poised to deliver sub-inch execution with less human oversight in areas such as autonomous tillage, seed placement, sprayer nozzle adjustment and combine calibration.

Off the field, those same tools support better management and logistics planning. "AI supports better decision-making and planning, helping farmers analyze outcomes and coordinate labor and machine use more effectively," he adds.

JDLink connectivity keeps data flowing between connected machines and John Deere's Operations Center. Photo credit: John Deere

Who's Making the Decisions?

One of the biggest questions AI raises is not just how work gets done, but by whom. Will farmers remain in the driver's seat, or will machines permanently take the wheel? The reality, in Stien's view, will be more collaborative than some might expect.

"Traditionally, a farmer would rely on personal experience and gut instinct to make thousands of decisions across the growing season," Stien says. "AI now gives farmers the ability to pair that intuition with real-time, machine-generated insights that are faster and often predictive."

Whether through alerts on a mobile dashboard or automation in-cab, today's AI-enhanced ag ecosystem offers farmers more options for how they manage their operations, not fewer. "We believe AI should amplify the farmer's knowledge and decision-making, not override it," he says.

For farmers just beginning to explore AI-enabled tools, the entry point is often digital field management platforms. "A great first step is to start with the Operations Center — a free tool that serves as the digital gateway to managing your operation," Stien says.

That familiarity can help build comfort with layering on more advanced tools, whether sensor-guided steering, automated turning capabilities or smart spraying systems. Local equipment dealers can also play a key role in helping producers match tech options to their unique operational needs.

Looking Ahead: The 2030 Farm and Beyond

Stien sees the next five years as a period in which current AI trends will only accelerate. There will be more autonomy, more predictive insights and more integration across systems. That also means a greater need for data fluency on the farm.

"We still need people who understand agronomy and machinery," Stien says. "But we also need people who can interpret data and fine-tune decisions across the farming operation."

With every new insight, farmers are gaining the tools to make better decisions that are faster, more efficient and more sustainable.

As global demand for staple crops such as soybeans increases, AI offers a way to produce more with less land, less labor and fewer inputs.

"AI gives farmers the ability to manage their operations at a plant level, optimizing decisions across every acre, every pass and every machine," Stien says. "AI doesn't change the spirit of farming; it supercharges it. With the combination of next-generation technology and the deep generational know-how of farmers, the future of agriculture is incredibly bright."

AI-enabled See & Spray™ technology allows farmers to identify and spray individual weeds, ensuring they apply herbicide only where needed. Photo credit: John Deere

Funded by the Illinois Soybean Checkoff

Why the 'Space Race' Matters to Illinois Soybean Production

NASA team leads innovative crop research from 438 miles up

A decade ago, there were about 1,000 satellites orbiting Earth. Today, there are more than 12,000. Every day, those satellites generate mountains of data and imagery that companies and government entities deploy for a range of functions across agriculture and other sectors.

The interests of U.S. farmers, namely their vital role in national security, were major drivers of the National Aeronautics and Space Administration's (NASA's) expansion to include satellite-based observations of Earth more than 50 years ago. And some of the first companies to commercialize government satellite data — more than 30 years ago — were in agriculture.

Precision agriculture data and platforms built upon satellite Earth Observation (EO) imagery have for years enabled Illinois soybean farmers to make informed decisions to monitor field and crop conditions and accelerate crop yield and quality. And for functions such as advanced crop monitoring and water management, this high-tech, 438-mile-high component of soybean production is just getting started.

A Look Back on NASA's Satellite Ties to the Farm

A huge milestone in U.S. ag history happened July 23, 1972, paving the way for today's precision ag toolbox for Illinois soybean farmers. That's when Landsat 1, inspired by the NASA charge of "exploration, innovation and research," was launched from a California Air Force base. It was the first in a series of nine satellites in the Landsat program to enter orbit. Today, those satellites generate images that can be transformed into maps that show details such as field nutrient density and provide guidance on farm practices such as precision fertilizer applications.

"In 1972, we couldn't visit the Soviet Union to conduct crop scouting, so we needed an information source that could support American farmers in being globally competitive," said Alyssa Whitcraft, Ph.D., Executive Director of NASA Acres, whose charge is to leverage NASA satellites for the benefit of U.S. farmers, ranchers and agrifood system decision-makers. "Landsat 9 was launched in 2021 and today, we collaborate with space agencies around the world as well as at home with the National Oceanic and Atmospheric Administration (NOAA) and the U.S. Geological Survey (USGS) to make satellite data more readily accessible to agriculture."

The satellite sector exemplifies the evolution of technology. Over the past 50 years, and especially over the past 10 years, technology has advanced massively both in terms of the image quality satellites

(See Why the 'Space Race' matters to Illinois soybean production, page 12)

Why the 'Space Race' matters to Illinois soybean production

(continued from page 11)

generate and their capacity for processing, storing and leveraging the huge amounts of data they generate.

"We're in a much better position to go from large-scale monitoring and trying to just see what's happening in another place in the world with production to actually serving farmers on their land. We have the right data characteristics and the ability to process that much data now, so that's really where NASA Acres came from when we started in 2023," Whitcraft said. "We are making that leap to take advantage of all of these years of innovation and this huge deluge of very high-quality data and start to work with farmers to directly support their decision-making and integration with the data they may already be collecting on farms."

Today's Advanced Satellite Capabilities and What They Mean to Farmers

As NASA satellite technology has evolved, it has advanced capabilities for farmers in two main ways. Especially in the past 10 years, Whitcraft said, image resolution (how detailed a satellite image can be) and the application of higher-quality imagery in indexes that monitor data points such as vegetative conditions have both made a "quantum leap" forward. That has enabled farmers to make informed decisions to better manage issues such as crop nutrition weed and insect pressures, and moisture extremes.

That all happens through three key characteristics of satellite sensors, or cameras. Together, they tell the story of crop health based on how light interacts with a farmer's plants. Those resolution types are spectral (which Whitcraftt likens to the number of individual colors included in a box of crayons), spatial and temporal (how often the satellite captures an image). They all play into satellites' increasingly detailed view of the condition of plants, such as soybeans in a field, based on a range of measurements taken from space. A drought-stressed soybean plant, for example, will interact with light differently and give off a different color signature than one with adequate moisture.

The more "crayons" a satellite has, the more nuances it can see in the degree of a crop's drought stress. And the more often satellite passes capture images, the richer the view they provide on how much drought stress a crop is undergoing. As resolution continues to improve, satellite imagery can now give soybean farmers a new view of potential crop stressors, enabling quick, informed agronomic action.

"Plants experiencing disease stress will show up in the light spectrum differently than healthy plants, so we have to design sensors to be really sensitive to those types of changes," Whitcraft said. "NASA satellite imagery can show large-scale crop progress and productivity all the way

down to less than a quarter-acre at key vegetative and reproductive growth stages. We also have exciting work that is showing how satellites can predict soybean quality — things like oil, protein and starch content."

These advances are products of NASA Acres collaboration with Kaiyu Guan at the University of Illinois; Katie Gold at Cornell University; Whitcraft; Ritvik Sahajpal, Natacha Kalecinski and Guanyuan Shuai at the University of Maryland; and a team led by Ignacio Ciampitti at Purdue University and Susan Metzger at Kansas State University.

Why NASA Satellite Data Is so Valuable to Farmers

The value of massive amounts of data to farmers grows exponentially when it's viewed in a historical context with NASA's best-in-class, highly accurate and precise satellites. That's when crop modeling becomes possible based on farmers' abilities to compare apples to apples for each crop year for a decade or more.

"I can compare data collected against the same time of year for the past 10 years and know because of NASA image quality that I am comparing apples to apples (sometimes literally) because the data are so consistent with one another over time and space," Whitcraft said. "This also means that when we have real-world data from a farmer or from national statistics, we can 'teach' the images what 60-bushel soybeans look like versus 56-bushel soybeans, and you can start to predict yield because you'll have those high-quality, comparable images again this year. That's the incredible and unique legacy of NASA data."

"And the more locations we have, the better our predictive capacity becomes because you can start to unpack why yields are what they are," Whitcraft added. "That's really exciting for helping farmers prioritize their management activities to maximize the 'bang for their buck' and their profitability."

Partnering to Create More Value for Soybean Farmers

Collaboration is a big part of the work that Whitcraft and her team at NASA Acres do to help farmers. Partnering with researchers and faculty at a network of land-grant universities, including the University of Illinois, the NASA Acres team develops research that helps evolve how NASA satellite data can create new value at the farm level.

NASA Acres research projects all harness Earth Observation data to address critical agricultural challenges and foster profitable, sustainable management. One recent project on nitrogen management via satellite is led by Guan, a University of Illinois Agroecosystem Sensing and Modeling Professor who also serves as NASA Acres' Chief Scientist. The project underway in Iowa, Illinois and Indiana this year will ultimately yield a "framework to integrate satellite Earth observations" to "support efficient fertilization management" through precise monitoring of nitrogen application rates, type, time and location, according to the NASA Acres website.

"These studies provide farmers with data-driven insights and innovative tools to optimize their operations, conserve resources, mitigate risks and adapt to environmental challenges," Whitcraft said. "They ultimately lead to more productive, sustainable and resilient agricultural systems, exactly our vision for U.S. agriculture."

If you're interested in working with NASA Acres, start by contacting the team at ***nasaacres.org.***

Dr. David Bullock, University of Illinois professor and principal investigator of the Data Intensive Farm Management Project, helps farmers turn field data into actionable insights that improve decision-making, efficiency and profitability.

Farm Data Management for Illinois Farmers

By Peyton Rinkenberger, Communications Intern, Illinois Soybean Association

Each growing season, farmers generate endless amounts of data – from yield maps and planting rates to equipment hours and grain storage levels. Although these datasets and trials contain powerful potential to improve decision-making and profitability, they won't help your bottom line if left on your monitor or notebook.

As a professor at the University of Illinois and the Principal Investigator of the Data Intensive Farm Management (DIFM) Project, David Bullock, Ph.D., works with farmers to turn numbers into on-farm results by using GPS-reliant precision agriculture technology to conduct large-scale agronomic field trials to generate data on yield, input management and field characteristics. Through his research, Bullock has realized that the problem doesn't come from a lack of data. Farmers have

told him, "I've got all this data, and I don't know what to do with it." What Bullock believes is that farmers need to know why they are generating data to know how to figure out what data they should generate. That way, they'll have real objectives that will allow them to capture high-quality data for the right reasons.

Knowing Why You're Collecting Data

Before investing any time or money into technology, one of the most crucial steps of successful data management is to define your "why." Why does this data need to be collected? What decisions will it inform?

"Some farmers just ignore it," Bullock notes. "They'll say, 'Yeah, it's on my hard drive but it just stays on there.' That's fine, maybe that's all you want to do."

In some cases, farmers collect data simply because their equipment allows it or automatically gathers it. For some, this might be enough. But for those farmers who want to farm more data-intensively, purposeful management is key. As Bullock further explains, "What's important is the kinds of data you're getting — not just amass data — but amass data for reasons and have focused reasons to understand why you want the data and have some idea of what to do with it." With different products coming out, and constant change, Bullock understands farmers' frustrations. "So often people get excited thinking about ag data, and I think farmers get frustrated because it's like, OK, what next? Like when yield maps first came out, everybody was really excited. Farmers were able to see how much yield they were getting in different parts of their field. But it wasn't long before they were saying, 'OK, that's a pretty yield map. What am I supposed to do with it?'" Without a focused reason or "why" attached to the trials and tests farmers are conducting, a yield map becomes nothing more than a pretty visual.

Integrating On-Farm Trials

As Bullock describes, one of the most powerful and simplest ways farmers can obtain useful data is by conducting on-farm trials using the equipment technology that is

(See Farm Data Management for Illinois Farmers, page 16)

Farm Data Management for Illinois Farmers

(continued from page 15)

already available to them. DIFM allows farmers to create checkerboard trials in different fields to test various input rates in a rigorous fashion, allowing farmers to assess real performance differences.

By entering basic information about the equipment, type of seed and field measurements, farmers can create trials in just a few minutes. Bullock notes, "What once took people a lot of time, they can now do at the push of a button. All of a sudden, you've got data you can work with. It's not hard to learn, and it's not hard to do. And that's why farmers really love it."

By using DIFM, Bullock explains, farmers might generate a report that examines crop yield response based on seed selection: "It's looking for things that will make a difference. It's looking for what can we measure on this field. Like terrain and slope that might make a difference and cause seed rate to be optimal in different places. It's looking through all of this data and using statistical ways to figure out what matters. And at the very least, this tells farmers, 'If the weather is the same again next year, we think this is what you should do.' Now farmers will say 'Yeah, but the weather is not going to be the same.' But we're doing this for the long run, we're envisioning a world in which your crop consultant works with you, and you do this for 30 years."

On-farm trials, when designed with intention, can provide personalized answers to some of the most challenging questions growers face.

The Cost of Ignoring Data

Although integrating data management practices onto the farm might feel overwhelming or daunting, ignoring this data holds serious risk in the current competitive environment. Bullock touches on this risk by saying, "A lot of farmers went out of business in the 1970s. You don't want to say that about yourself in the 2020s. It's a competitive world out there. You've got to be ready. You're going to have to work hard and think about what you are doing, and that's what the successful farmers will do." In other words, making decisions based on data is no longer optional. Data has become the backbone of staying competitive, sustainable and profitable in a tightening agricultural economy. But how do farmers navigate this? Bullock says, "For DIFM, the desire is to create a decision tool that farmers can sit down with and talk to each other about. You have to find the right people to work with. It's all about people in the end, and you may even want to work with the Data Intensive Farm Management Project."

The Future: Probabilities and Confidence

Looking toward the future, Bullock sees a world in which farm data management decisions are driven by data and can integrate probabilities. "Farmers are gamblers, there's no way around it. So, we are trying to make them better gamblers," he says. "We want to give them a tool that talks about odds. You know, for example, we think if you put this much nitrogen down under these weather conditions, there's a 70% chance of this outcome. And that way farmers can start making decisions with probabilities, which is what they want to do anyways." For too long, farmers have had to rely on gut instinct when making decisions. However, Bullock notes, "We are in a place where we can be in a data-rich environment, especially with precision agriculture," and farmers will remain the decision-makers in this environment, but with the ability to predict outcomes with more confidence.

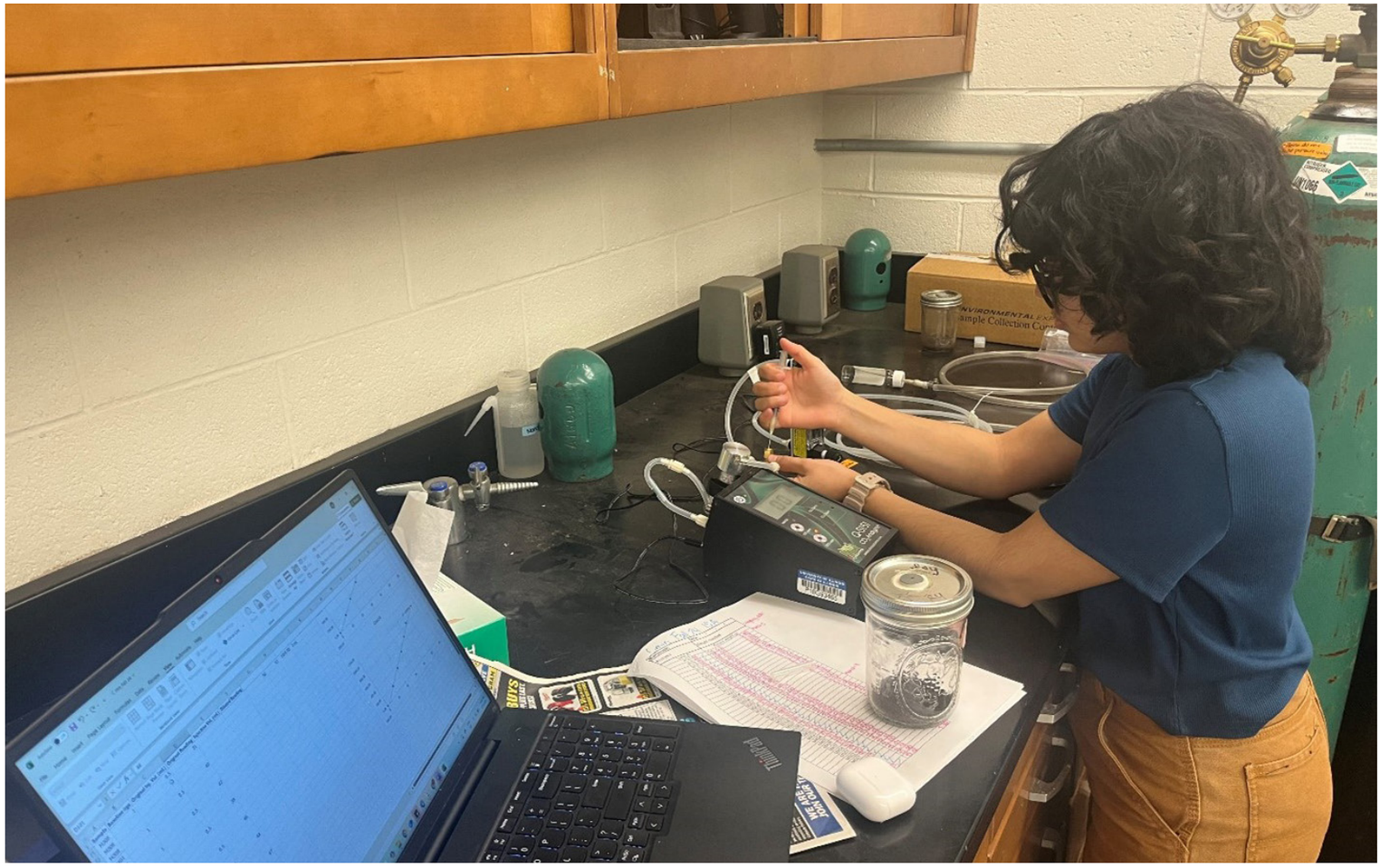
Conclusion

Today, farmers have access to more data than any generation before them. However, this advantage doesn't come from the quantity of data, it comes from trusting it and knowing what to do with it.

Bullock believes this advantage will be key for the future of agriculture. "I think we're really getting a foothold on some new stuff – some revolutionary agronomic research," he says. "It's going to change how farmers farm. I think farmers are going to begin farming more data-intensively. And they're going to trust what they see because the data is coming from their own field, and they're going to be involved in the research."

By embracing purposeful data practices now, farmers can build stronger confidence heading into the next season. "There's a new world coming in agriculture research," Bullock adds. "Farmers won't just be farming grain. They'll also be creating information about how to farm grain better, and that's always been the goal."

Dr. David Bullock (right) sat down with Communications Intern Peyton Rinkenberger and walked through the DIFM program to highlight all of the program's capabilities.



Research technician Grecia Romero uses an infrared gas analyzer unit to measure the concentration of carbon dioxide released from soil samples to estimate soil mineralizable carbon.

Is Your Soil Breathing? What CO2 Can Tell Us About Soil Health

By Andrew Margenot, Ph.D. and Heidi Allen, University of Illinois Urbana-Champaign

Over the past decade, the agriculture sector has seen growing interest in soil health, including research on conservation programs and, more recently, commercial soil testing. Although the value of soil health, however it's defined, is often intuitive – especially to producers – the best method for measuring it remains under debate. Questions persist about cost-effectiveness, interpretability and sensitivity to management practices that should build soil health.

Funded by the Illinois Soybean Association (ISA) checkoff program, my team of researchers at the University of Illinois has been evaluating a range of soil health tests based on three criteria: cost-effectiveness, interpretability and sensitivity to management practices. To do this, three sites (Monmouth, Urbana and Ewing) were chosen to reflect the north-to-south soil and climate gradients of Illinois. These sites feature replicated plots with multiple crop rotations (corn-soybean, corn-wheat/soybean) tillage (chisel versus no-till), and cover cropping (cereal rye or none) in all possible combinations. The trials span four growing seasons ('23-'26), beginning in fall 2022 with winter wheat and cover crop planting.

They're focusing on one of the most widely used soil health tests: respiration, also known as mineralizable carbon or CO_2 burst. The idea is simple: a soil sample is placed in a sealed container and moistened. As soil microbes "wake up" and feed on organic matter, they release carbon dioxide (CO_2). The amount of CO_2 produced is measured. More CO_2 means more microbial activity, which is generally interpreted as greater soil health. Among all soil health tests recognized by the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS), offered by labs and studied by researchers, respiration is one of the oldest and most commonly used methods.

Results from the first two seasons of soil respiration testing in this ISA checkoff-funded project have offered valuable insights. They show how well respiration reflects – or doesn't reflect – management practices such as tillage, cover cropping and crop rotation, as well as

the timing of soil sampling and regional differences across southern, central and northern Illinois. It's important to note that for these tests to be useful in tracking changes from soil health practices, they ideally should show a response within two seasons.

Insight #1: In soils with high organic matter (OM) in locations such as central and northern Illinois, tillage, cover crops and crop rotation had no effect on soil respiration in the first two years. This suggests it might be better to wait at least two years after making a practice change before testing for soil respiration.

Insight #2: At Ewing and Urbana, double cropping of wheat and soybeans led to 40% and 34% higher respiration in the following corn crop, respectively. This suggests that crop rotation might boost microbial activity more than tillage or cover cropping in the first two years after a practice change.

Insight #3: At the low OM site, the timing of soil sampling had as much, or even more, impact on soil respiration than tillage, cover crops or crop rotation. Even after accounting for the previous crop, respiration was 44% to 66% higher in soils sampled in the spring compared to the fall, depending on the crop harvested beforehand.

Insight #4: In southern Illinois, sampling after soybeans in corn-soybean rotations didn't affect soil respiration. The same was true for any crop at the high OM sites in central and northern Illinois. This suggests that in low OM soils (such as those in southern Illinois), you might have more flexibility when you sample after soybeans. And in higher OM soils, timing seems to matter less overall. Keep in mind, no effects of tillage, cover crops or rotation were seen at these high OM sites during the first two years.

For more updates on this ISA checkoff-funded research, visit the Research section on ***FieldAdvisor.org.***

Funded by the Illinois Soybean Checkoff

Eyes in the Sky

Farming has always been a race against time as weather, pests and disease don't wait for a time that's convenient for you. Over the years, agricultural innovators have worked relentlessly to develop technology that provides tailored and timely solutions for each field.

That's where agricultural drones buzz into action. These innovative tools help producers adapt faster, work smarter and maximize every inch of their fields.

Agriculture was first introduced to aerial technology through the use of airplanes and satellite imagery. These early innovations gave farmers a new perspective by allowing them to analyze their crops from a bird's-eye view. They opened the door for drones, which offer an enhanced level of flexibility, efficiency and precision.

In the 2010s, drone manufacturer DJI began producing user-friendly drone models that were affordable and easy to operate. Drones were primarily used for detailed aerial imagery, which allowed farmers to survey land, monitor crop growth and identify field issues.

Now, new manufacturers have entered the scene with drones adapted and outfitted to apply fertilizers and pesticides, manage irrigation and collect data. Drones are transforming modern farming, according to Brady Holst, Illinois Soybean Association (ISA) Vice Chairman and At-Large Director. He was an early adopter of drone technology. Holst operates a soybean-and-corn row-crop farm with his dad and brother in Augusta, Ill.

Holst is an agricultural innovator at heart. Before returning to the family farm, he graduated college with an engineering degree and worked in product development and aftermarket agriculture.

With his deep interest in technology, Holst was eager to learn about drones when his dad introduced two DJI T30s to their farm in 2020. It didn't take long for the benefits to show.

"The drones helped a lot the first year we had them," Holst says. "We ended up spraying all our corn acres with them because it was really wet during our fungicide window. If we didn't have the drones, we

(See Eyes in the Sky, page 22)

Brady Holst, Illinois Soybean Association Vice Chairman and early adopter of drone technology, uses aerial tools on his family's Augusta farm to improve efficiency, apply inputs and monitor crop health.

Eyes in the Sky

(continued from page 21)

would've applied the fungicide with a plane. They basically paid for themselves in Year One."

Holst said that they've continued to spray fungicide on corn and wheat. With tall crops, rough field terrain and several tree lines to navigate around, it's not always feasible to use a traditional sprayer. Plus, fungicide is sprayed during a narrow window of time. If conditions aren't conducive for a ground sprayer, drones can spray more easily than a crop duster and still get the fungicide applied during the proper time.

"The drones work well for smaller fields, as we don't have to run over as much corn," Holst says. "There are a lot of corners of our fields that you can actually see on the yield maps where the fungicide doesn't get put on as well. The drones can go right up to the tree edges and get the hard-to-reach places. In fields like that, they're a huge advantage over crop dusters."

Since they have the technology, Holst and his family use drones to effectively manage other facets of the farm, including their test plots.

Holst said he prefers using drones to spray smaller strips on his test plots, compared to the larger passes a ground sprayer would take. Drones make it easy to swap chemicals, so he can test which products work best on his crops.

"If we used the full-size sprayer on our test plots, we would have to fill up a lot more gallons and spray larger strips," Holst says. "It's easy to do a lot of strips in a day because you must refill the drone every four acres. You can switch products quickly and run multiple products in a single day."

Holst and his family were self-taught drone operators. When they started implementing the technology on their farm, there were not many training resources available. Drone use is all about balancing battery life and inputs, Holst said, which presented a steep learning curve.

"Drones are quite a bit different than all the other machinery that's out there because they have a higher level of autonomy compared to auto steer and similar technologies," Holst says. "It definitely takes time to get comfortable with them."

When Holst started using drones on his operation a few years ago, not many farmers were implementing the technology. With expanded resources, cost-effective options and access to service providers, drones are only becoming more popular.

For those looking to implement drone technology on their farm, Holst recommends connecting with an experienced operator.

"It's helpful to learn from someone who's run drones for longer," Holst says. "You would learn more tips and better strategies for how to lay out your fields, as opposed to finding out through trial and error."

Drones are revolutionizing American agriculture one field at a time. The technology mitigates longstanding issues and allows farmers to run more efficient, full-coverage operations. For Holst, drones are only the beginning of the story.

"There's real value in keeping up with modern technologies," says Holst. "You've got to stay ahead of the game to keep the farm going."

An aerial view shows Holst walking through one of his soybean fields, where drone technology is transforming how farmers scout crops, apply inputs and make data-driven management decisions.

THE POWER OF YOUR SOY INVESTMENT

UNITED SOYBEAN BOARD™

Global demand. Local return. The value of your state and national soy checkoff is stronger than ever. In the last 5 years, your investments have...

CREATED JOBS AND GROWN THE ECONOMY

$9.8B
added to the U.S. GDP

~$1B
generated in tax revenue in 2023 alone
$36M county | $244M state | $655M federal

30,932
U.S. jobs created

***$2.6B**
in U.S. employment income

DRIVEN DEMAND FOR U.S. SOY

***1.8B bushels**

or 18% increase in U.S. soybean exports
Increase in meal exports by 5.2M short tons and oil exports by 3.4B pounds

1B bushels
or 9% increase in domestic demand
Increase in meal demand by 10M short tons and oil demand by 4.6B pounds

DELIVERED VALUE TO YOUR FARM

$12.30
return for every $1 invested

AT LEAST 4.5-TO-1 RETURN ACROSS FOUR CATEGORIES:

1. *Export market development*
2. *Domestic demand-enhancing research*
3. *On-farm production research*
4. *Soybean promotion*

Learn more at unitedsoybean.org

*Export initiatives supported by United Soybean Board, Qualified State Soybean Boards, the U.S. Soybean Export Council and USDA Foreign Agricultural Service. Source: Kaiser, H.M. 2024. An Economic Analysis of the United Soybean Board and Qualified State Soybean Boards' Demand- and Supply-Enhancing Programs. Cornell University.

Prioritize Grain Bin Safety This Harvest

Towering grain bins are a familiar sight across the Midwest, but they can conceal a deadly risk. Each year, farmers are injured or killed in grain bin entrapments. With harvest approaching, farmers are urged to take life-saving precautions to protect themselves and others.

A Silent and Swift Danger

Grain bin accidents can happen in seconds. A farmer entering a bin to check moisture or break up clumps might not realize the grain has crusted or bridged. When it collapses, the farmer can be buried in flowing grain, which acts like quicksand. In only four to five seconds, a person can become trapped. In less than 20 seconds, they can be engulfed.

According to Purdue University's Agricultural Confined Space-related Injuries and Fatalities report, in 2024 there were 34 grain-related entrapments in the U.S., 14 of which were fatal. This represents a 25% increase from the previous year.

Safety Tips to Save Lives

Having a proactive action plan is crucial to preventing bin accidents. "Farmers are aware of the danger but are in a hurry, especially before and during harvest. And that is when tragedy can strike," says Dan Neenan, Director for the National Education Center for Agricultural Safety (NECAS), which offers safety training for farms, fire departments and businesses.

"We are producing, storing and moving more grain than any other time in U.S. history. Unfortunately, we are seeing

more grain engulfment and farm injuries and fatalities," he says.

Every farm should have a plan that includes proactive safety practices:

- Aim for zero entry into the bin.
- No one under 18 should be allowed in a bin.
- Train farm workers on bin hazards and emergency procedures.
- Post warning signs at entry points and restrict access to bins and piles.
- Work from outside the bin and above the highest point of grain.
- If entry is necessary, use a safety harness secured to an external anchor point.
- A spotter should always be present to monitor ropes.
- Lockout/tagout power to augers and sweepers before entering the bin.
- Check bins for proper oxygen and air-quality levels.

If an emergency occurs, six safety tips are crucial for survival.

1. If you or another person is trapped, stay calm.
2. Call 911. Provide details including the bin's address.
3. Use a hat to cover mouth and nose. Assume a fetal position to shield the face and create an air pocket.
4. Prepare for emergency responders to arrive. If in a remote area, send someone to meet them.
5. If the victim is below the grain, turn on the aeration system to increase air flow and aid survival.
6. If the victim's head is above the grain, do not enter the bin or turn on the aeration fan. Talk to the victim and keep them still.

More U.S. rural fire departments are being trained on grain entrapment and equipped with rescue tubes and augers. Neenan adds, "This can be challenging, however, since rural rescue crews are often voluntary with limited funding."

In-Bin Tech Prevents Accidents

Technology makes a preventative difference in saving lives.

A digital grain storage monitoring system such as AGI BinManager allows farmers to remotely track and manage conditions inside bins, ensuring "zero entry." The system prevents dangerous grain crusting by monitoring real-time moisture and temperature levels and automatically operating fans and aeration systems as needed.

Ryan Thompson, AGI strategic accounts manager, says this results in safer, more efficient grain storage and removes any reason for farmers to enter a bin.

"All too often, grain is loaded into the bin either too dry or wet and faces the risk of spoiling during storage," he says. "That is when unsafe conditions begin. We want to prevent farmers from going into the bin."

AGI BinManager has the unique ability to allow farmers to condition their crops, prevent spoilage and bring them to a profitable targeted moisture level – all from a cellphone or computer. "In the end that means zero entry for safety to people, enhanced product quality and a higher return on investment for the farm," adds Thompson.

Be Safer with Free Bin Assessment

To help farmers explore safer, smarter grain storage solutions, AGI offers free bin assessments that provide personalized recommendations to improve storage management, enhance safety and maximize grain quality. To sign up, visit: ***https://www.aggrowth.com/en-us/farm-brands-overview/Bin-Monitoring/binmanager#-Book-a-safe-storage-assessment%E2%80%8B]***

Ryan Thompson, AGI Strategic Accounts Manager

Dan Neenan, Director for the National Education Center for Agricultural Safety (NECAS)

Where do we go from here? Does the fix to 45Z protect the biodiesel industry?

ANDREW LARSON | DIRECTOR OF GOVERNMENT RELATIONS & STRATEGY | ILLINOIS SOYBEAN ASSOCIATION

This summer, when Congress passed the "One Big Beatiful Bill," or the reconcilliation package, it made attempts to fix the controversial 45Z tax credit. In previous issues of ***Illinois Field & Bean*** you have read articles that discuss some of the specific impacts of waste feedstocks including how used cooking oil has displaced soybean oil as a feedstock into some domestic biofuels markets. The fixes achieved to 45Z will help curb this expansion of waste feedstocks and efforts to weigh the scale in their favor. However, as we zoom out in the aftermath of the legislation, we remain concerned that the actions taken so far will maintain a cloud of uncertainty over demand for soybean oil biomass-based diesel.

In the policy world, one of my chief complaints is when we focus on the specific trees, we miss the whole forest. Our goal is and always will be to create the most advantageous market to sell soybeans by generating demand, supporting production and managing our regulatory environment. It is no secret that biofuels are a topic that has received tons of attention and much analysis over the past few years. We hear terms such as biofuels, RFS, 45Z, CCS, SAF, RD, clean fuels, LCFS, CFS, RVO and more as a regular refrain as part of what we need to focus on. It is, though, important to step back and see the entire forest, not just individual trees.

Since 2003 and the passage of the state sales tax exemption on biodiesel blends of greater than 10%, Illinois has been a leader in using traditional fatty acid methel eshter (FAME) biodiesel. This product is straightforward to produce, and plants such as the one that Incobrasa Industries operates next to its soybean crush plant, can take soybean oil and have it ready to hit the retail fuel market. These biodiesel plants are a mainstay of soybean oil demand in Illinois. Thanks to the state sales tax exemption combined with federal incentives from the Renewable Fuel Standard and tax credits, Illinois uses more than 100 million gallons of B100 biodiesel each year. Although that fuel comes from other feedstocks, including distillers corn oil, more than 100 million bushels of Illinois soybeans are used to produce the oil annually.

In 2022, Illinois Soybean Growers (ISG) worked to pass an increase in our state sales tax exemption amount that will generate demand for about 400 million gallons of biodiesel annually in Illinois. Next year, that increase will be fully in effect at B19 and higher blends. Yet at the same time, 45Z will come into effect. 45Z replaces the old 40A, known as the Blenders Tax Credit, which gave a $1-per-gallon incentive to every gallon of B100 blended into the fuel supply nationwide. To the Illinois biodiesel industry, that was worth over $300 million annually. Final rules will be developed later this year by the U.S. Treasury Department. Estimates are that soybean-based fuels will receive, at best, about half of the previous credit from 40A.

The new 45Z has fewer complex components than it did when passed by Congress as part of the Inflation Reduction Act (IRA) in 2022. However, it still has many new processes and business practices that will change how the biofuels industry operates. ISG remains committed to ensuring that the strong demand we have for biodiesel in Illinois remains and that we have the most effective policies and tax credits in place to help us see the forest through the trees to generate demand and usage of soybean-based biofuels in Illinois. Even with the new version of 45Z passing, a short-term extension of the 40A Blenders Tax Credit remains ISG's top legislative priority in Washington for the remainder of 2025. Please stay at-the-ready to voice your support to legislators in support of demand for Illinois soybeans.

YEARS

A QUARTER CENTURY OF IMPACT

Thanks to Your Support of WISHH,
U.S. Soy Protein Goes Global

ASA American Soybean Association®

WISHH 25 YEARS

SOY CHECKOFF™

wishh.org

Sent to you compliments of:

Illinois Soybean Association
1108 Trinity Lane
Bloomington, IL. 61704

NONPROFIT
U.S. POSTAGE
PAID
ILLINOIS SOYBEAN
GROWERS