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People. Policy. Profitability.

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FUTURE SOLUTIONS
TO AG CHALLENGES



SOY FACES

Student Contest Features
Brains and Beans

SOY FORWARD

Soybeans Ready for
Closeup Photos

ISSUE UPDATE

Rise of Anti-Pesticide Petitions

INDUSTRY

PERPSECTIVE

Technology Enables
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The American Soybean Association (ASA) represents U.S. soybean farmers on domestic and international policy issues important to the soybean industry. ASA has 26 affiliated state associations representing 30 states and more than 500,000 soybean farmers.

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ASA leadership corner

A couple of months ago, ASA Vice President Daryl Cates and I represented the organization at the annual Farm Progress Show held this year in Boone, Iowa. When we weren't doing media interviews on soy policy issues or taking advantage of the opportunity to speak to our senators and congressmen there at the show, we were checking out all the cool new "toys" and other innovations our industry partners and others were exhibiting and demonstrating. If the adage "seeing is believing" means anything to you, let me just say, even with "seeing," it can be hard to "believe" how far advances in agriculture technology have come. And that is the subject of this issue of *American Soybean*.

The See & Spray™ sprayer and other tech tools and equipment we saw in Boone were impressive (see the byline from John Deere in the pages ahead), but innovation in agriculture extends beyond on-farm. As the national policy organization advocating exclusively for soy, ASA has had an eye on emerging opportunities for bio-innovations. President Biden recently signed an executive order launching a national biotechnology and biomanufacturing initiative that contains many provisions important to soybean farmers, including actions that will support improved markets for biobased products, create greater access to biotechnology, and encourage research and development supporting the "bioeconomy," which is, simply put, economic

activity derived from biotechnology and biomanufacturing.

There are nearly 1,000 soy biobased products available in today's industrial and consumer markets, but soy growers have the capacity to expand production of new, more sustainable inputs and products. We have supported investments in bioeconomy research and development. This biotech announcement puts in place steps that will help our industry continue to use soybeans to develop innovative, sustainable products that can help lower greenhouse gas emissions and create more jobs (Side note: it also includes measures supporting much-needed regulatory modernization).

Another positive in this area: Recipients of USDA's climate smart agriculture grants were recently announced. The Partnership for Climate-Smart Commodities program is intended to support and expand markets for the country's climate-smart commodities. We were pleased projects targeting soybeans will receive a total of up to \$905,000,000 through the program and will touch all of America's primary soybean-producing states. Also related to conservation, the reconciliation package signed into law this summer includes, in addition to positive provisions supporting biofuels, \$19.5 billion for agricultural conservation. The time is ripe for seeking innovation both in soy uses and in support of conservation efforts that work for farmers producing soybeans.

BradDOYLE



Brad Doyle, ASA President

Innovations in agriculture, both on and off-farm, are almost innumerable. Along with advancements like the technology we saw at Farm Progress, this issue will cover developments in aquaculture that Daryl, other soy organization leaders, and I "saw to believe" during a recent trip to Cambodia, where we witnessed the efforts of ASA's World Initiative for Soy in Human Health, or WISHH, at work in that emerging market. Ag of a nontraditional sort also being advanced through innovation!

There is no way to cover amply all that lies ahead for agriculture, but in the pages to follow we attempt to share a few good examples and, through this issue, celebrate how far we have come and also what lies ahead. These technologies will allow us to do more with less in ways that will continue to be safer and more sustainable—for farm employees, our neighbors, the environment, and our future.

Soy States Like Kentucky Find Clever Ways to Support Innovation

Athira Nair Surendran shows her team's supercapacitor project in action during the board's tour of the Conn Center in August. Photo Credit: Kentucky Soybean Promotion Board



States across the soy region are always looking ahead to innovations, emerging technology, and strategic vision for where the industry can go next. Last year, Kentucky farmers grew more than 103 million bushels of soybeans, and the farmer-leaders who make up the Kentucky Soybean Promotion Board have an eye on new uses for the versatile crop. The board partnered with Dr. Jagannadh Satyavolu, endowed chair in renewable energy research at the Conn Center for Renewable Energy Research in Louisville, to create the Soy Innovation Challenge.

University of Louisville students submitted soy-based product concepts with the potential for commercialization to the board in September 2021. Selected concepts were awarded seed money to develop those ideas over the course of three months. The proposals and prototypes were then presented to the board again in December—and farmer-leaders were impressed with the results! The winner of the

inaugural Soy Innovation Challenge was a team headed by Athira Nair Surendran, whose proposal centered around extracting activated carbon from soybean hulls (normally a low-value byproduct of the soybean crush) for use in a 3-D printed filament for use in supercapacitors (batteries).

The use of soy hulls in this scenario has the potential to turn what was once a low-value byproduct into a revenue stream for the crop, and farmer-leaders entrusted with investing the soy checkoff in Kentucky say they were happy to see the concept turned into a research proposal at the close of the challenge—and tour the Conn Center in person over the summer to see its progress.

Dr. Satyavolu is already hard at work on the second, now annual Soy Innovation Challenge. He has expanded it to include students at Bellarmine University, Sullivan University, and Jefferson Community and Technical College, in addition to those who attend the University of

Louisville. Student teams presented concepts for new uses or integrations of soy components to the board this fall, with seed money awarded to six concepts that will be presented as proposals or prototypes at the December board meeting.

“This is where I think we need to be investing checkoff dollars,” said KSPB Vice-Chairman Barry Alexander, who farms near Cadiz and is one of three Kentucky farmers who represent Kentucky on the United Soybean Board. “We have gotten really good at producing soybeans, and through our checkoff investments, we’ve developed markets for the oil. Now we need to get to work moving the meal that we have. Meal, hulls, and other products of the crush can be used for a number of applications—we just have to invest the money to help scientists figure it out. This Soy Innovation Challenge is probably my favorite thing we have funded since I’ve been on the soybean board because it is designed to grow demand for our crop.”

Board Chairman Larry Thomas agreed: “Turning a byproduct into a profit center is exactly the kind of program we need to invest checkoff dollars into. Cool new uses are great, but new uses that can provide a significant return on investment to the soybean farmers that we represent will get my vote every time.”

Results of the 2022 Soy Innovation Challenge will be featured in the Spring issue of the Kentucky Soybean Sentinel. Read future issues of the ASA magazine and follow ASA on social to discover more ways all of the soy states are seeking innovation.

ASA in action



SOY POLICY



ASA Director Pam Snelson (OK) discusses soy policy issues with Sen. James Lankford during Hill visits in July.

ASA leadership met with EPA staff during the annual July board meeting in D.C. From left: ASA President Brad Doyle (AR); Anne Overstreet, EPA; Jake Li, EPA; ASA Chairman Kevin Scott (SD), ASA Vice President Daryl Cates (IL); Marietta Echeverria, EPA; Jan Matuszko, EPA; ASA CEO Steve Censky; ASA Director of Government Affairs Kyle Kunkler; ASA Executive Director of Government Affairs Christy Seyfert; and Ed Messina, EPA.



ASA AND EPA

AG VOICES



Congratulations to the 10 students who completed Ag Voices of the Future in Washington, D.C., this July. The program, sponsored by Valent U.S.A. and ASA, educates students on agricultural policy issues. 2022 participants included: Nathan Behrends (IA); Alexis Bodlak (NE); Wendy Burnley (KY); Kaitlyn Cloud (MO); Alex Foret (LA); Chandler Jones (TX); Reagan Kulenkamp (IL); Molly Niewoehner (IA); Abigail Putnam (FL); and Michelle Stangler, (WV).

YOUNG LEADERS



Several members of ASA's 2022 Young Leader Class, sponsored by Corteva Agriscience, headed to Washington, D.C., this summer to participate in a third phase of training. Participants included: Tyler and Keyaira Smith (IN); Jacob Bolson (IA); Adam Phelon (KS); Mary Dybedahl and Paul Mesner (MN); Nathan Legatt (MN); Tyler and Desiree Rezac (NE); and Tanner Hento (SD).

Members of the ASA Action Partnership met in Anchorage, Alaska, in August for dialogue and discussion on the "Global Impact of a Changing Arctic." ASAAP members had the opportunity to experience firsthand the impacts of key issues, from climate to energy, on the Arctic.
Photo Credits: Joseph L. Murphy/United Soybean Board



GLOBAL IMPACT



ASA President Brad Doyle (AR) chats with Senate Ag Committee Chair Debbie Stabenow during a summer farm bill hearing in Arkansas. Doyle testified on behalf of the U.S. soy industry, urging Congress to strengthen the farm safety net and seek additional funding resources from the Budget Committee for the 2023 bill.



REGULATORY



ASA Director Alan Meadows (TN), who serves as chair of ASA's Regulatory Advocacy Team, participated in a forum hosted in July by the Congressional Western Caucus to discuss the importance of modernizing the Endangered Species Act.

PIIE TOUR



Ten ASA and USB leaders participated this September in the inaugural Producer and Industry Information Exchange (PIIE) program in Louisiana. USB and the National Oilseed Processors Association sponsored the program. PIIE tour participants got a firsthand look at southern agriculture while engaging in important discussions about conservation, infrastructure, ag research and farm labor.

ASA *in* action

ASA leaders and staff gathered in Boone, Iowa, for the annual Farm Progress Show at the end of summer. During the show, ASA President Brad Doyle (AR), ASA Vice President Daryl Cates (IL) and ASA CEO Steve Censky met with industry partners and fielded media interviews on top policy issues. Doyle and Cates sat down with House Ag Committee Ranking Member Glenn "GT" Thompson to discuss ASA's Farm Bill 2023 priorities and more. ASA leaders also had the opportunity to chat with USDA Secretary Tom Vilsack and Reps. Mariannette Miller-Meeks and Vicky Hartzler.



FARM PROGRESS



SOIL HEALTH

ASA Executive Committee member Ron Russell (MO) joined USB Director and former ASA president Neal Bredehoeft (MO) to meet with USDA Farm Production and Conservation (FPAC) Under Secretary Robert Bonnie in Kansas City to discuss implementation of the \$95 million Farmers for Soil Health climate smart commodities grant. (From left) Katina Hanson, USDA acting senior advisor for Climate-Smart Commodities; Robert Bonnie, USDA under secretary, FPAC; Neal Bredehoeft, USB director and former ASA president; Ron Russell, ASA Executive Committee member; and Joshlin Yoder, Missouri farmer and NCGA representative. Photo Credit: Joseph L. Murphy/United Soybean Board

ASA Director Jamie Beyer (MN) attended the USSEC S.E. Asia U.S. Agricultural Cooperators Conference in Bangkok, where she delivered a presentation to fellow commodity leaders and international customers. Beyer discussed the role technology has played in enabling women to farm and why U.S. soy is a perfect source of protein, along with addressing challenges like supply chain issues on her family farm. Past ASA President Bill Gordon (MN), who serves as a director on the Minnesota Soybean Growers Association Board, attended the conference as part of the U.S. Soy Excellence Center Steering Committee. Photo Credits: USSEC & Bill Gordon



BANGKOK CONFERENCE



AG COMMUNICATIONS



ASA's seventh class of Agriculture Communications Team members spent a week in August learning how to talk about issues that impact their farms and how to engage with media, consumers, lawmakers and others. Program sponsor Bayer Crop Science shared information on engagement at the local and global level, as well as a glyphosate update. Sponsor United Soybean Board provided a virtual social media training session and updates from the most recent USB board meeting.

CONSERVATION partnerships

ASA/Walton Family Foundation Grants: Enabling New Conservation Efforts

As part of an ongoing partnership with the Walton Family Foundation, ASA awarded farmers grant money to cost-share implementation of new conservation improvements to their operations. Below, see how this year's recipients put the grant to use on their farms. Be sure to visit soygrowers.com to learn more about the projects.

With its ASA/WFF grant, the Murphy family added a rock chute to halt drainage ditch erosion—one more integral step in their successful conservation system on the family's Mississippi farm. The rock chute was designed by the local Natural Resources Conservation Service. Danny Murphy credits the professional design and construction for eliminating maintenance needs for these chutes following installation.



The Isley family used its grant to help purchase a direct-inject system for mounting on the planter and sidedress bar. The system is used to spoon-feed inputs and protect nitrogen according to sub-acre field data on the Isley's Michigan farm.



Using the grant from ASA through its partnership with Walton Family Foundation, Minnesota soybean grower Brian Ryberg added a fertilizer floater to speed post-harvest cover crop application and improve soil health on more acres.



Find full stories on these projects and other ASA conservation information on soygrowers.com under the "Key Issues & Initiatives" tab.

ISSUE update

By Kyle Kunkler, ASA Director
of Government Affairs

Rise of the Anti-Pesticide Petitions



Given recent activist successes, agriculture should prepare for more to come

Petitions in government are nothing new. Since the 1940s, the Administrative Procedures Act has given any “interested person the right to petition for the issuance, amendment, or repeal of a rule,” to which an agency is required to respond, “within a reasonable time.” But couple this with the Food Quality Protection Act, which in 1996 gave any person the opportunity to file a petition “establishing, modifying, or revoking a tolerance for a pesticide,” and you have a recipe for potentially major disruptions to pesticide access.

In 2007, several activist groups filed a petition with EPA to revoke tolerances and cancel uses for chlorpyrifos, an organophosphate insecticide. The groups claimed new studies revealed the pesticide caused previously unknown neurodevelopmental effects and urged the agency to end its agricultural uses. EPA grappled with how to interpret this new data for some time. Frustrated with EPA’s delay, the groups sued the agency for unreasonable delay. The courts ordered EPA to act. In 2017, after

nearly a decade since it was first filed, EPA finally rejected the petition.

Case closed, right? Hardly. This is when things take a turn for the disturbing.

Dissatisfied with EPA’s decision, the same groups opted to go back to court, this time suing to overturn the agency’s denial of the petition. And this time, they got what they were truly seeking. In April 2021, a panel of the Ninth Circuit Court of Appeals overturned EPA’s decision, directing the agency to instead grant the petition and modify tolerances or revoke those it could not find safe. What followed thereafter—EPA’s unlawful revocation of all tolerances despite safety findings by agency career scientists—is a story for a different day. For a moment, consider how remarkable this playbook is. Petition EPA to do something you want. If they delay, sue them. When they finally act, if they do not act as you would like, sue them again. But this time, have a non-expert court second guess the agency’s decision.

It should come as no surprise in late 2021—three months to the day

after EPA announced the chlorpyrifos revocation decision—the same groups filed another petition, this time to revoke tolerances and cancel uses for an additional 15 organophosphate pesticides. It doesn’t stop there. Before the agency are other petitions, such as one to end uses of neonicotinoids. Recently, EPA denied much of a petition to apply duplicative regulation to pesticidal seed treatments. The group filing the petition responded that it would be “exploring all possible next steps... including a lawsuit challenging this decision.”

Agricultural groups should take note. While many, including the American Soybean Association, file comments urging the denial of unscientific petitions, more is needed. We must adopt the same ingenuity as our rivals. ASA is leading a stakeholder working group to determine how we can better defend these tools in court. Future grower access to pesticides will depend on our ability to guard the tools wherever the threats emerge, a goal to which ASA is firmly committed.

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AG TECH ON DECK

Innovation will shape
farms of the future



Vanessa Kummer, pictured here with her husband, Paul, is one of 10 farmers serving on the grower advisory board for Fargo-based Grand Farm, launched in 2019 as a trailblazing research site for emerging technology and best practices in modern agriculture.

By Allison Jenkins

Imagine a farm where autonomous equipment runs itself 24 hours a day, seven days a week. Where fields are managed by the inch, not the acre. Where plants transmit stress signals to growers. Where farmers generate their own fuel and electricity. Where traceability of livestock and grain happens automatically. Where sustainability is not just a buzzword.

This farm of the future isn't here yet, but it's within reach. In fact, all of these concepts have moved past the point of possibility into the realm of reality. They are only a few examples of the ways scientists, agribusinesses, universities,

equipment manufacturers, tech companies and others are working to solve the complex agricultural challenges of today—so producers won't have to face them tomorrow.

That's the hope of Vanessa Kummer, who has farmed with her husband, Paul, for the past 46 years in Colfax, North Dakota, raising soybeans, corn, wheat and sugar beets along with some barley and alfalfa. As they watch their son, Blaine, take over their family operation, the Kummers know it will look nothing like the farm they started with in the mid-1970s.

"We are just hoping that as it moves into the future,

farming gets easier for the next generation," Vanessa Kummer says. "We've always tried to be on the cutting edge and keep track of innovations. Blaine takes that same approach and has been ready to accept and adopt new technologies. I think he will continue to do that. There's no reason to work harder instead of smarter."

Kummer has a unique vantage point to witness advancements in the pipeline that may transform agriculture as she and her family know it. She's one of 10 farmers serving on the grower advisory board for Fargo-based Grand Farm, launched in 2019 as a trailblazing research site for



Technology is taking over the farm, and other autonomous systems aren't far behind. Pictured here is a driverless John Deere tractor, which is expected to hit the market this fall. Photo credit: John Deere

emerging technology and best practices in modern agriculture.

"It's very intriguing to see the things they have already started to look at and test," she says. "And having a farm advisory board is important because they need our input on whether the ideas are usable or not."

Grand Farm has quickly gained traction and funding, including a sizable investment from Microsoft. Currently, the farm's team is working with 55 partners on some 320 projects, ranging from autonomous farm equipment and unmanned aerial systems to plant genetics and data science.

It will soon expand from its original 40-acre site to a state-

of-the-art "Innovation Facility" on 140 acres near Casselton, North Dakota, with groundbreaking planned this fall. The campus will combine an educational center that can host events as well as test plots for research and demonstrations.

"When we first pitched the concept of the Grand Farm, we put together a big, audacious goal—to create the first fully autonomous farm by the year 2025," says Grand Farm Director Brian Carroll. "Once we got into it, we realized the technology is actually out there. It's just a matter of proving it, making it scalable and keeping it economical for farmers. So, autonomy simply became a component of what we're trying to do, which is to advance the whole agricultural supply chain from the field to the consumer."

Carroll said work at the Grand Farm addresses critical agricultural challenges such as feeding the growing population, alleviating the labor shortage and

improving stewardship, among others. These are familiar and worrisome problems for producers and the impetus for research and development efforts at all levels of the industry, from academia to agribusiness.

"If we're going to feed nearly 10 billion people on the planet by 2050, it's going to take a big network of people who are passionate around that goal," Carroll says. "We only have so many growing cycles to become much more efficient and effective, so we're going to have to speed that up through innovation and rapid feedback. Technology is going to help get us there."

Tech takes over tasks

Automation is on the cusp of being an important part of the solution. Once the stuff of science fiction, driverless tractors are already hitting the marketplace, while other autonomous farm equipment isn't far behind.

For example, John Deere expects to begin selling its first

(continued on page 14)



North Dakota State University, Dr. Xin (Rex) Sun demonstrates a weedbot at Grand Farm during the 2022 Autonomous Nation Conference. Photo Credit: Grand Farms

self-operating tractor this fall, and by 2030, the company plans to have a fully autonomous cropping system from planting to harvest. Precision agriculture company Raven already has introduced autonomous grain cart technology and is working on tillage, planting, hay and forage applications. These systems use cameras, GPS, radar and artificial intelligence (AI) to process data and detect obstacles.

“We have a shortage of workers available, and that’s been an issue for a while,” Kummer says. “If you could replace a person or two by having autonomous tractors or equipment, I think that could be very valuable. I would give up my place in a tractor or combine any day of the week!”

Site-specific autonomy is a little more futuristic, but a research team from North Dakota State University—one of Grand Farm’s partners—has successfully

demonstrated a “weedbot” that uses AI to sense and spot-spray weeds. Although this technology is still in the proof-of-concept phase, the researchers envision similar robotic systems to help producers scout crops, detect disease and reduce labor-intensive work.

Drone technology also is poised for a boom in farm usage. Agricultural drones are the fastest-growing segment of the non-military market, expected to generate 100,000 jobs in the U.S. and \$82 billion in economic activity during the next decade, according to a Bank of America Merrill Lynch Global Research report. Currently, unmanned aerial systems conduct imaging, monitoring and small-scale spraying, fertilizing and seeding tasks, but rapid innovation foreshadows tremendous potential for uses not yet imagined.

Plant breeding gets more precise

While drones and autonomous vehicles often generate “gee-whiz” excitement, innovations in plant genetics also will shape the future of farming.

Today’s plant breeding involves sophisticated technologies such as gene editing, which accelerates more predictable crop improvement. This precision breeding enables scientists to make targeted changes within a plant’s DNA to enhance crop performance and introduce desirable traits, such as elite soybean varieties with specific oil compositions, to meet various end-use targets.

It should come as no surprise that the industry’s leading crop science companies are at the forefront of such technology. Bayer’s research and development

teams, for example, are exploring the application of gene editing in the development of seed and microbial products with a focus on plant architecture, disease resistance, stress tolerance, and plant growth and development across the company's row-crop portfolio.

In 2020, Bayer opened its first fully automated greenhouse in Arizona. The indoor, climate-controlled facility allows agronomists to have multiple growing seasons each year and uses advancements in proprietary seed chipping, advanced marker technology, automation and data science to speed new product development.

"We tend to take plant genetics for granted because they have improved so much in the past 50 years, but I think there's still room for more improvement," says Tim Hammerich, host of the "Future of Agriculture" podcast. "Maybe that's genetically modified; maybe it's not. Regardless, I believe we will continue to unlock new possibilities and deliver those genetics in a more precise way."

To illustrate, Hammerich cited



Tim Hammerich, host of the Future of Agriculture podcast.

one recent podcast subject, InnerPlant Inc., based in Davis, California, which is developing genetically engineered crops that can actually "talk" to growers by emitting signals when they are stressed. InnerPlant's sensing and satellite technologies detect these signals and alert growers. The company plans to launch commercially with a soybean product in 2024.

Data drives decisions

Just as advances in plant breeding are limitless, so are opportunities for data analytics. Technology already allows

unprecedented visibility into farming operations, collecting layer upon layer of data. As satellite imagery, sensing technology and agronomic models improve, the ability to deliver precise knowledge of what's happening in specific areas improves as well.

For example, the Israeli company Phytech, which is collaborating with Syngenta, has developed a monitoring system with continuous sensors for plant growth, soil moisture and microclimate. The data generated from the system is then accessible in real time, allowing growers to take action if needed.

Data can even allow farmers to play a role in improving supply chain management. At Grand Farm, Carroll said one of his favorite projects is HarvestTrace, which is evaluating technology that can track soybeans from field to food. The program would harness blockchain concepts to provide production data to the consumer and pass value back to the grower.

"What really gets me excited is that this technology can incentivize the grower to manage the crop in a certain way," Carroll said.

(continued on page 16)

Field signage for the HarvestTrace project, which is evaluating technology that can track soybeans from field to food.



(continued from page 15)

“Our farmers already use the best practices, and to be able to prove and verify those practices could be a real high-value addition for growers.”

Agriculture meets the future

When it comes to imagining the farm of the future, visions vary. Carroll sees an operation that’s more diversified and self-contained with on-farm capabilities for generating inputs such as energy and fertilizer. Kummer says she expects autonomous equipment to become important—but not omnipotent. She’s more excited about advances in plant genetics that could lead to more drought-tolerant, pest-resistant, nutrient-efficient crops. Hammerich thinks the future will bring a fusion of factors, with a focus on more biological diversity.

“I believe we’re headed for a combination of better plant breeding, improved understanding of the soil and advances in precision agriculture,” Hammerich says. “Our ability to understand down to each square inch of what the crop needs is critical, and then we have to deliver those needs at the right place, right time and right amount.”

The sheer volume of innovation in the ag space right now may be overwhelming, but Kummer said choosing what to try on the farm boils down to a simple, old-fashioned formula: Does the technology truly pencil out?

“Amazing things are coming. It’s just a matter of deciding what’s worthwhile and what’s not,” she says. “It may be something that seems really cool and exciting, but cost-effectiveness must be part of the decision. Does it make

economic sense? Farmers still have to be profitable.”

There’s another truth at play in this discussion. No matter how high-tech farming becomes, it’s still powered by people. Carroll said he believes the innovative work happening at Grand Farm and other places can help attract subsequent generations to the industry.

“There’s a bunch of fourth-, fifth- and sixth-graders right now who cannot imagine a career in agriculture. But if they look at it through the lens of technology, science and business, we have the opportunity to bring them in,” Carroll says. “Think about it. Agriculture is one industry that will always be in place. We will always need a food system, and the efficiency of what we do is only going to get more important in the future.”

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INDUSTRY

perspective

By Jon Ebert,
Manager, Public and
Industry Relations
for John Deere

John Deere Technology Enables Sustainable Farming

The global population is expected to grow rapidly, increasing food demand by 50% by 2050. With less available land and skilled labor, and the other unpredictable variables inherent in farming, this is no easy task for the world's farmers. Among their other challenges, farmers everywhere are in a constant battle to keep their fields clean from weeds. Weeds steal nutrients and moisture that crops require to grow. Further, some weeds are developing a tolerance to herbicide and cannot be killed with traditional doses, so growers are investing more money to effectively control weeds.

As if farming couldn't get any more challenging, the current supply chain constraints that are impacting everything from furniture to automobiles have created chemical prices that are double or triple the cost as the same chemical last year. More efficient and cost-effective farming practices are something growers strive to achieve every day. To support this effort, John Deere launched See & Spray™ Ultimate in March of 2022. Farmers can use a John Deere sprayer equipped with this technology to minimize input costs and only spray weeds when they are detected. This works by having cameras on the machine scan the field, while a computer processor identifies the crop, like soy, and sends a signal to the nozzle to spray all unwanted plants.

See & Spray™ Ultimate can save farmers more than two thirds on their non-residual herbicide costs when spraying in corn, soy and cotton. We have also integrated a dual product solution system



John Deere See and Spray™ technology works by having cameras on the machine scan the field, while a computer processor identifies the crop, like soy, and sends a signal to the nozzle to spray all unwanted plants, such as weeds.

that enables farmers to spray two different tank mixes simultaneously using our ExactApply™ nozzle body. A common-use case would be broadcasting a residual herbicide while target spraying non-residual herbicide. John Deere is excited to merge its revolutionary See & Spray™ Ultimate technology and dual product system into one fully integrated sprayer that dealers can sell and support.

In addition to innovating at the intersection of agronomy and computer vision, we are creating advancements in machine learning and computing to address labor challenges in agriculture. To provide a solution, John Deere revealed earlier this year a fully autonomous tractor. The machine combines the 8R tractor, TruSet™-enabled chisel plow, GPS guidance system and advanced computer vision technologies. Designed to allow farmers to till their land autonomously and remotely, the

technology will allow them to focus on their most important tasks.

To continue innovating and solving ag's challenges, Deere has recently expanded its U.S. footprint and technology operations with offices in Chicago, Illinois and Austin, Texas. The new offices will serve as collaboration hubs, allowing Deere to connect and collaborate with regional universities, startups and the technology community.

Technology-enabled products like the John Deere Autonomous 8R Tractor and See & Spray™ Ultimate are just examples of the many ways our company is helping customers meet the world's increasing need for food and fiber.

Editor's Note: We are pleased to have John Deere guest write for our magazine this quarter—our ag technology issue—and look forward to sharing the many innovative ways that not only Deere but so many ag companies and organizations are developing and advancing technology today—and for tomorrow! Check out our ASA social for other examples of nifty innovations.

ASA Leadership & Education Continuum

ASA's leadership training programs provide soybean farmer-leaders with tools and training designed to increase advocacy effectiveness and strengthen relationships with key legislators, regulatory bodies and media. The programs are designed to provide a training path from introductory to advanced leadership development—an education continuum.

5 ASA Board of Directors

Audience: ASA board and executive committee members

Purpose: Provide current ASA leaders with additional training to increase overall effectiveness.

4 Soybean Leadership Academy

Audience: Senior board leaders and staff CEOs; elected officers/board members and managerial/lead staff

Purpose: Provide general sessions and track-based training by top leadership trainers and industry experts.

3 Leadership At Its Best

Audience: State and national soybean association board members

Purpose: Present intermediate leadership, communication, issues and advocacy training.

2 Young Leader Program

Audience: Growers/grower couples interested in leadership

Purpose: Present basic leadership, communication and issues training.

1 Ag Voices of the Future

Audience: College students

Purpose: Provide an introduction to the soybean industry, advocacy and career opportunities related to ag policy.



ASA and BASF offer an annual \$5,000 scholarship to an eligible high school senior planning to pursue a degree in agriculture.

For more information on these ASA programs, visit SoyGrowers.com



Purdue Competition Furthers Brains and Beans

Soybeans are already widely used in food and industrial items, but each year the Purdue University Student Soybean Innovation competition sprouts novel ideas for innovative uses for the versatile soybean.

Sponsored by the Indiana Soybean Alliance, the competition encourages Purdue students to brainstorm and develop a new industrial product using soy. Successful projects go far beyond developing the concept, as teams must create a production timeline, conduct patent searches, develop a market analysis, design packaging, and then market their product.

A soy-based mulch called Smulch took top prize in 2021-2022, while Team Brilliant Bean earned second place honors with its soy-based dry erase board ink. A soy film took third, and a soy coffee filter earned the People's Choice award.

"We were brainstorming a whole bunch of ideas and writing them down on a whiteboard," says Team Brilliant Bean member Charles Sebright, a sophomore majoring in machine systems engineering. "We had something to do with concrete, something to do with a product out of plastic, and then we looked at the whiteboard marker we were holding and wondered if we could make it out of soy. That got us rolling."

Student Soybean Innovation Competition Program Manager Micky Creech says more than 30 teams typically start the competition, but about 12 to 15 teams complete the process and vie for the top prizes of \$5,000, \$10,000, and \$20,000. Teams are supported by faculty and industry



Team Brilliant Bean, including students (from left) Josh Stevenson, Sarah Juffer, Rob Bastain and Charles Sebright, created a soy-based dry erase ink for Purdue University's 2021-22 Student Soybean Innovation Competition. Photo Credit: Purdue University

contacts, but the students drive and pitch their products to judges in a competition similar to the television show Shark Tank.

"We teach a lot about soy and new uses for soy, but we also teach a whole lot about entrepreneurship," Creech says. "There are so many things that already have soy in them. Teams have to come up with a novel idea at the beginning, and a lot of teams struggle with that, but once they do, it's their team, it's their product from conception through completion."

Creech says previous competitions have yielded soy crayons, soy markers and soy candles, all of which are commercially available. Several more past winners are in the process of entering the market.

"It's really about research and development and trying and testing again and again," Sebright explains. "You're going to fail a lot as you keep making your product until eventually something pops out that

works and you've got a product that you can end up marketing."

"One thing that I learned through the course of the competition is that soy as a material is very versatile and there's a lot of things that you can do with it in turn," adds Josh Stephenson, Team Brilliant Bean member and a sophomore majoring in biochemistry. "There are many novel products that can be made out of soy, you just have to research and be a little creative in what you make."

Teams can participate more than once but must develop a new idea each year. If Sebright and Stephenson have their way, Team Brilliant Bean will be back shooting for top prize.

"We have some pretty good ideas right now," Sebright says, "so we're hoping we'll have a good shot at it this year."

Editor's Note: Innovation knows no state bounds when it comes to soy. Read more of this quarter's issue for additional stories on soy's unique uses—or check us out on ASA's social channels.

A close-up photograph of the front wheel and fender of a bright green car. The car is parked on a dark asphalt surface. The wheel is a black multi-spoke alloy wheel with a Goodyear tire. The fender has a black and green graphic element with the number '12' visible. The word '(YOU)' is overlaid in large, bold, green letters across the center of the wheel.

(YOU)

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Moving Soy Forward.
Moving You Forward.



SOY checkoff news

Cover Crops Help Farmer-Leaders Increase Soil Health, Sustainability of Animal Feed and Pig Production

Winter Cover Crop
MIX

14 lbs/A Aroostook Rye
35 lbs/A Rodeo Oats
10 lbs/A Austrian Winter Pea
1 lb/A Sunflower
5 lbs/A Purple Bounty Hairy Vetch
1/2 lb/A Winter Canola
1/2 lb/A Barkant Turnip
1 lb/A Tillage Radish

In farming, it all starts with the soil. Soil health impacts everything from water infiltration and root development to plant health and sustainability. As more consumers base purchasing decisions on a product's sustainability, buyers across supply chains are increasingly sourcing sustainable ingredients that meet consumer preferences.

Many farms across the U.S. are multigenerational operations, grounded in decades of natural resources conservation. As front-line environmental stewards, each successive generation wants to leave the land better than they found it.

That prevailing environmental ethic across the U.S. farming community is a great match for a forward-thinking, farmer-led initiative recently announced by the United Soybean Board, National Pork Board and National Corn Growers Association called Farmers for Soil Health.

The initiative complements the sustainability goals of the three commodity organizations.

Plus, the products are deeply interconnected; most farmers who grow soybeans also grow corn, and soybean meal and corn are staple feedstuffs for hogs.

Partnering in this initiative returns value to U.S. corn and soybean farmers and pork producers while collectively working to reach goals established by each of the organizations.

This farmer-funded program also has support from national organizations like the U.S. Department of Agriculture's Natural Resources Conservation Service to advance soil health practices—especially through farmer adoption of cover crops—on corn and soybean acres across the U.S.

Farmer-leaders from corn, soy and pork are advocates for cover crops because of the value they bring to their own farms.

"I started using cover crops on my farm 10 years ago, and I have witnessed my soil health make steady improvements," says Ralph Lott, who serves as Chair of the

soy checkoff and farms in Seneca Falls, New York. "A healthy soil profile leads to more robust root development and, consequently, improves a plant's ability to more efficiently take up water and all other nutrients."

After struggling with not getting enough cover growth in the fall, Lott adjusted his management to broadcast wheat over 1,700 acres of soybeans during the R7 growth stage or halfway through leaf drop. This strategy has allowed for a successful cover crop even with a shorter growing season in the Northeast.

"There was a learning curve, but today we put six different cover crops after wheat, including tillage radish, two types of clovers, sunflower buckwheat and Sudan grass, all planted together in 30-inch rows with special plates in the corn planter," says Lott.

On his farm in Edison, Ohio, John Linder, chair of the Corn Board of the National Corn Growers Association, also uses

(continued on page 22)

(continued from page 21)

and advocates for cover crops. “On our family’s operation, utilizing cover crops delivers a heightened efficiency in soil-to-plant conversion cycles—not only during the crop growing season but all year long. Farmers who adopt cover crops reap the benefit of improving their operation’s overall soil health and can garner the added rewards of weed suppression, improved water quality, increased carbon capture and habitat for pollinators and other beneficial wildlife.”

The Soil Health Institute estimates if cover crops increase gradually, eventually meeting Farmers for Soil Health initiative’s goal of 30 million acres by 2030, it would:

- Increase carbon sequestered in soils by about 7 million metric tons.
- Reduce erosion by 105 metric tons.
- Reduce nitrogen loss to groundwater by 272 million pounds.

Those benefits add up to an increasingly important selling point for pork: sustainability. Steve Rommereim, past president of the National Pork Board and pork producer from Alcester, South Dakota, endorses the initiative not only for its benefits to fellow pork producers, but also because of the agronomic benefits cover crops offer.

“I have personally used cover crops on my farm and have seen their value in improving the soil structure and reducing erosion. I’m also a hog farmer, and I appreciate the pork industry continuing down the path of continuous improvement,” says Rommereim. “This initiative has a dual goal of reducing the overall environmental

footprint of corn, soy and pork while improving the soil health of corn and soybean farms across the U.S.”

To meet its goals, Farmers for Soil Health will provide financial and technical assistance, education programs in targeted states, and a nationwide measurement,

reporting and verification platform for conservation practices, including the use of cover crops.

“As these three commodity groups look to meet their sustainability goals, we must consider the latest technology might also include nature’s technology—the biological life activities in the soil itself. By utilizing cover crops, we enable the benefits of that technology year-round,” concludes Linder.

Source: United Soybean Board

Five Things to Know About the Future of Soybeans

Nearly one-third of the soybeans in the global market last year were grown by U.S. soybean farmers. Customers around the world look to the U.S. to provide a reliable supply of high-quality soybeans and soybean products for their growing needs.

To ensure the U.S. soybean industry retains access to a quickly changing, consumer-driven market, five state soy checkoff groups jointly funded a program to share critical market information to help soybean farmers make decisions that will increase opportunities for future success. State organizations in Illinois, Indiana, Iowa, Missouri and Ohio joined forces to conduct the “Future State of Soy” exercise that identified the most impactful trends for soy in the coming years.

“We uncovered five major trends that will impact the global soy market and U.S. soybean farmers in particular,” says Steve Pitstick, chair of the Illinois Soybean Association. “These trends help uncover how the global demand for soybeans will change over the course of the next several decades, giving farmers valuable insight now to make decisions that will better position them for the future.”

The **five trends identified** in the Future State of Soy exercise include:

- 1** A rising focus on high-quality soybean oil and meal.
- 2** Changes in fuel demand, including alternative fuels and emerging fuel uses.
- 3** The rising need for both animal and plant protein given a growing global population.
- 4** The increasing global competition for soy and how infrastructure can provide an impactful advantage.
- 5** Emerging and diversified revenue streams that will offer farmers more opportunities.

“We know that every farmer and every farm is unique,” says Pitstick. “Identifying these trends helps farmers determine if their farm is set up to take advantage of one trend over another, or if it can support a multitude of changes to take advantage of several trends. The ultimate purpose for this exercise is to help farmers navigate changes now so they are set up for the future of this industry. Proactively addressing how the market is shifting means we won’t be left scrambling to meet market demands later, which will keep U.S. soy in high demand around the world.”

Source: United Soybean Board



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WISHH works with international associations to build lasting potential for **U.S. soy** trade.



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WISHH is a program of the American Soybean Association and is funded in part by the United Soybean Board and state soybean board checkoff programs.

Soy Grower Trade Team Sees How ASA/WISHH's Custom Solutions Create Customers for U.S. Soy

Six U.S. soybean growers report promising signs of progress after traveling with ASA's World Initiative for Soy in Human Health Program to Cambodia, where WISHH leads trade and development for U.S. soy.

"I think it's very exciting to see a young, thriving economy that has the potential to consume more of our U.S. soy through proteins," said ASA President Brad Doyle of Arkansas. "We had very fascinating conversations with members of both aquaculture and livestock raisers associations here in-country. One of the strengths of coming over here is farmers talking to potential and current buyers. We share our story of how we raise our crop, our planting intentions. They love to hear that story."

Cambodia is home to 16.7 million people and growing feed and aquaculture industries that recognize U.S. soy is high quality protein. "As we transition many fish farms from the homemade non-soy diet to a majority soy diet, it's going to be huge business for them, too," adds Doyle.

WISHH's June 2022 trade team also included then-WISHH Chair Gerry Hayden from Kentucky, ASA Vice President Daryl Cates from Illinois, ASA Director and WISHH Vice Chair Morey Hill from Iowa, WISHH Treasurer Bob Haselwood of Kansas and USB Director Greg Greving of Nebraska.

Here are five signs of progress spotted by the six soybean growers.



Illinois soybean grower Daryl Cates meets with the village leader who conducted WISHH feeding trials in his ponds to evaluate whether Cambodia's popular snakehead fish, a carnivore, would eat soy-based pellet feeds. The trials resulted in the respected official recommending the adoption of soy-based fish feeds to get faster fish growth. Photo credit: Joseph L. Murphy, United Soybean Board

1. Feed mill expanded by U.S. soy customer

By leveraging soybean checkoff resources with USDA Foreign Agricultural Service funding, WISHH is able to work with fish farmers, processors and others, including a Cambodian feed mill that installed the first aquaculture line of feeds in the Southeast Asian country. The company has purchased U.S. soybean meal and is an important part of WISHH and the Cambodian government's strategy to help Cambodian farmers use soy-based pellet feeds rather than their traditional, pond-polluting homemade feeds that are low in protein. Welders were at work when

the trade team visited the feed mill, which through a multi-million-dollar investment is expanding to also make swine, duck and other feeds.

Outside the mill, farmers and truckers formed lines to load the soy-based feeds sold throughout the country. "I think the most important thing WISHH is doing is creating soy meal demand," said Hayden. "How are we doing that? We're teaching Cambodian fish farmers how to be more efficient, how to use floating soy meal pellets, and to increase their efficiencies and shorten their production time."

"You might think of Cambodia as being a small market, but you know these smaller markets add together," said Haselwood. (continued on page 26)

(continued from page 25)

2. Fourth generation in-pond raceway systems now available

“One of the biggest improvements I’ve seen since our January 2020 Cambodia trip was adoption of the in-pond raceway systems,” said Hill, who visited the fabrication center that is now making and marketing the fourth-generation models. “Use of these systems can grow exponentially now that the raceways are manufactured locally by a very well-respected company that is using local labor, local materials and giving back to the community.”

Missouri Soybean Merchandising Council funds supported WISHH introducing the first in-pond raceway systems in Cambodia in 2020. WISHH’s aquaculture advisor in Cambodia designed these unique floating systems to help Cambodian farmers overcome their fish production challenges, which include heavy rains and extreme dry seasons.

“The most important takeaway from my time in Cambodia is things that work in Vietnam, Thailand and China don’t necessarily work here,” said Leonard Rodgers, Ph.D., WISHH’s aquaculture advisor in Cambodia.

In-pond raceway systems also help farmers manage fish in Cambodia, where they traditionally use homemade feeds with rice bran as the main ingredient. “It’s low in protein so you have to feed a lot of it to put muscle on the fish,” said Rodgers.

“An in-pond-raceway helps the farmers monitor their biggest cost outlay, which is feed,” Rodgers stressed. “Cambodian fish farmers’ feed costs usually constitute 70-90% of their production costs.”

3. Oxygen added to fishponds adds profit for farmers

Nebraska soybean checkoff funding allowed WISHH to work on technology that increases the oxygen available to pond-raised fish



An ASA/WISHH project partner in Cambodia shares with U.S. soybean growers how WISHH is helping the business improve food safety and innovate for new fish-based products. From Left; ASA Vice President Daryl Cates, ASA Director Morey Hill, ASA President Brad Doyle and WISHH Treasurer Bob Haselwood. Photo credit: WISHH

based on Cambodia’s unique needs. In 2022, WISHH began piloting the custom aeration systems.

“The aerators are doing what they are designed to do and are increasing production for the fish farms,” said Greving, who while in Cambodia spoke at an WISHH/USB-sponsored conference on sustainable intensification in agriculture.

“Aeration is an important challenge to overcome in Cambodia,” says Rodgers. “In a normal pond, only the top meter of water carries much oxygen. Thunderstorms and windstorms can invert the pond so the good oxygen-carrying water on top gets pushed to the bottom of the pond and away from the fish.

“If you don’t have at least one part-per-million of oxygen in the water, fish can’t oxidize the ammonia from their waste and decaying feed,” added Rodgers. “You’re dealing with a whole ecosystem, and you need oxygen to keep that ecosystem in balance so you can produce fish.”

4. Carnivorous snakehead fish trained to eat soy feeds

WISHH’s early results show promise that the popular carnivorous snakehead fish can be trained to eat soy-based feeds, a project supported by Illinois soy checkoff investments.

“It’s been a win-win with

Cambodian fish farmers being able to use soy protein pellets,” said Cates. “Their farmers saw the snakehead are gaining weight faster with soy protein feeds. And the farmers are able to harvest the fish faster.”

Switching snakehead to eat soy-based feeds offers groundbreaking opportunities for sustainability in Cambodian aquaculture, where the snakehead prey on local fish stocks. WISHH is sharing the Illinois soy checkoff research with the Cambodian government, which is concerned traditional feeding practices have negative effects on water quality and more.

5. Aqua association grows to 600-plus members

As a program of ASA, WISHH has association development in its DNA. WISHH tapped the farmers in the trade team to join an idea exchange with a livestock raisers association and the Cambodian Aquaculturist Association that WISHH helped launch and grow to 600 members in less than two years.

“The new aquaculture association here in Cambodia is definitely creating interest and enthusiasm,” said Hill. “They just need a little more direction and guidance on how to make their association work here at their newer level.”

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After ASA's summer Hill visits, Rep. David Kustoff posted a photo with Tennessee soy leaders.



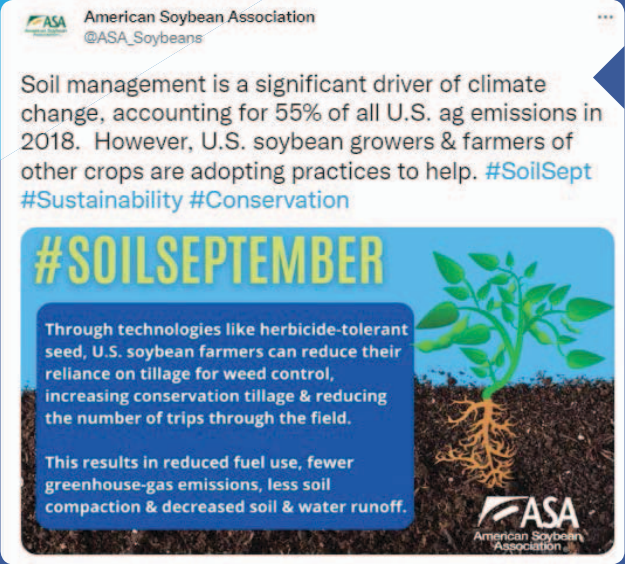
Not all advocacy happens on the Hill: Sometimes lawmakers get to the soy fields! Spotted on Twitter: ASA Director Jim Kukowski (MN) and Minnesota Soybean Growers Association Director Rose Wendinger visited with Rep. Angie Craig during an event in Northfield.

The Ag Bioeconomy Coalition, which ASA and other leading industry associations launched this summer, shared support for the coalition from Sen. Tina Smith on Twitter.



Follow the American Soybean Association on:

 @ASA_Soybeans



ASA launched the **#SoilSept** social media campaign on Twitter and Facebook to further educate the public on soil's essential role in ag and how U.S. farmers are implementing sustainable practices on their farms. The United Soybean Board, USDA Farm Production and Conservation, National Council of Farmer Cooperatives, and Farmers for a Sustainable Future joined ASA to amplify the September campaign.



Over the summer, Andrew Lauver and his daughter, Doris, shared the progression of soybean growth in Iowa.



SOY FORWARD

Soybeans are Ready for their Closeup By Randy Barrett

Scientists develop artificial intelligence to help farmers with crop management

Unhappy soybean plants wilt, so scientists are developing artificial intelligence to track the behavior on site and save farmers time on making crop management decisions.

Experts at the USDA Agricultural Research Service have spent the past few years training cameras on soybean, corn and cotton plants to judge their level of moisture stress. It's a big jump from the age-old practice of bending down and inspecting individual plants. The key to avoiding that particular exercise is the use of AI, or artificial intelligence. In popular culture, the technology spurs nightmares of a world ruled by machines—but the reality is far more humane, and helpful, for humans.

For a camera to be able to recognize different stages of plant stress, it must first be trained on hundreds of images. Each photo is manually classified by a scientist on a scale of 0 to 5 for wilt. That repository is then referenced by the AI program as the system works to match in-situ plant behavior caught by the camera.

"The goal is to have cameras and AI detection operating on farms so growers can do long-term decision making," says Anna Locke, a research plant physiologist at ARS. "It's also a useful tool for soybean breeders who have to evaluate the stress level in thousands of plots."

Right now, the system has an 80% accuracy rate. While that



Cameras mounted in the field. Left: Pole camera in corn plot. Middle: Set of cameras tested in the field. Right: Pole camera in soybean field

might seem sub-optimal, Locke is pleased. "We think for practical purposes it's pretty good."

The AI technology is early in development, but it offers a leap beyond the current use of soil sensors, says Steven Mirsky a research ecologist at ARS' Sustainable Agriculture Research Laboratory in Beltsville, Maryland. "They do a good job but are expensive, and they only measure a point in time." He emphasizes the plant is the best indicator of stress—not the soil. The StressCam can watch plant behavior and trigger irrigation, as well as help breeders see which varieties are drought-resistant.

Mirsky co-leads the Precision Sustainable Agriculture project, an interdisciplinary team of universities, government agencies, private businesses and farmers working to develop new technologies for improved decision making and long-term planning.

The StressCam system uses a low-cost RGB camera that creates images to replicate human vision,

capturing light in red, green and blue wavelengths (RGB) for accurate color representation. Both the hardware and the software for the StressCam have been made publicly available by PSA through GitHUB. Mirsky wants private industry to pick up the open-source technology and run with it: "We've de-risked it. It's a level playing field."

Farmer Andrew Nelson raises wheat, lentils and peas in Farmington, Washington, and has been one of the first to use the StressCam. He says the system works, but the challenge has been connectivity to the camera. "Cell reception is terrible here," Nelson says. Once this kind of technology is more robust, he wants to be able to do an online virtual drive-by of his whole farm every day.

In the future, Mirsky sees the creation of larger AI image repositories that could be used for a wide variety of crops. Multi-camera mounts could check for biomass—and you could put one on a tractor and map a field in real time.

Do you know the function of SoyPAC?



SoyPAC is an important national soy advocacy tool.

The ASA SoyPAC is the only political action committee representing the interests of solely soybean growers. SoyPAC provides ASA with resources that help support legislators who champion soybean farmer priorities.

The list of issues affecting agriculture and soybeans is long and diverse. ASA staff work year-round to respond to these issues.

**For more than 100 years, ASA has led efforts to
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Learn more about how SoyPAC advances ASA's mission
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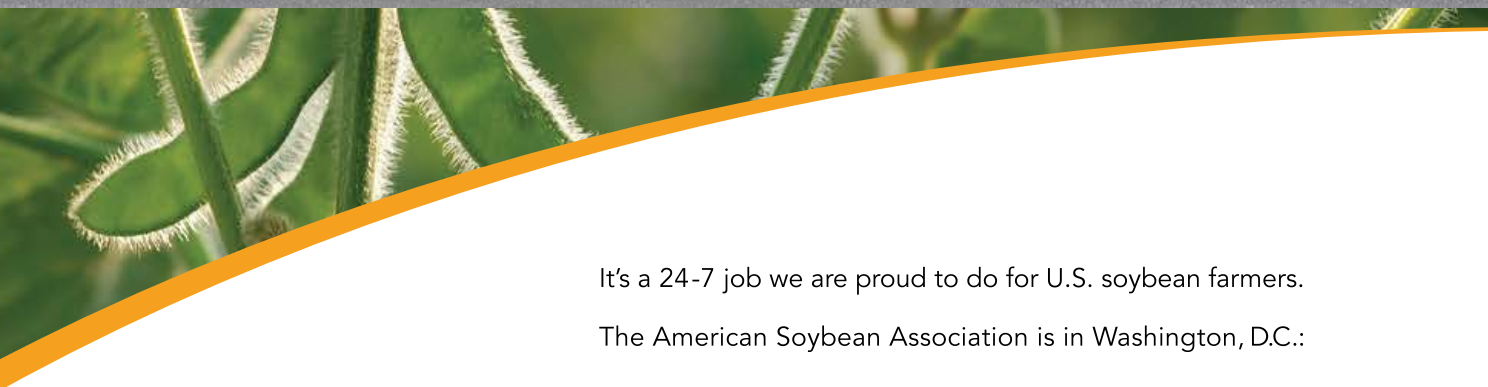


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