Whether you’re dealing with drought, flood, heat or other climate-related stress, the soy checkoff is working behind the scenes to diversify U.S. soybean genetics and increase stress tolerance. We’re looking inside the bean, beyond the bushel and around the world to keep preference for U.S. soy strong. And it’s helping make a valuable impact for soybean farmers like you.

See more ways the soy checkoff is maximizing profit opportunities for soybean farmers at unitedsoybean.org.
Contents | MARCH 2019

VOLUME 1 • NUMBER 3

A PUBLICATION OF THE ILLINOIS SOYBEAN ASSOCIATION

MARCH 2019

The Illinois Soybean Association (ISA) believes in challenging the status quo with innovation to prepare for tomorrow, where local communities and global consumers have better living.

DID YOU KNOW?
The ISA checkoff program has supported the Illinois Pork Producers Association’s Pork Power program for 10 years, donating ground pork to food banks equal to 2.4 million meals for Illinois families. See what ISA is working on with the animal ag industry in this issue’s special insert.

COVER STORY
The Flip Side
Research estimates new technologies could boost yield as much as 70 percent on the same land. But what happens if farmers don’t adopt new technology?

Chickenization
For farmers, vertical integration is either a necessary evil or something they love to hate. Take a look at what may be in store for the soybean industry in the future.

Disconnected
A disparity in broadband service exists in rural areas compared to urban counterparts. But help is on the way. Federal, state and local entities are coming together to address the digital divide.

Jumping the S Curve
By understanding how the “S Curve” works and a sense of where cutting-edge investors and companies are future-focused, soybean producers can maximize technology use.

The Innovation of Innovation
It’s hard to dispute the impact gene editing is having on the plant breeding industry. It’s also difficult to predict just how far-reaching contributions will be to the soybean industry.

DIFFERENCE MAKERS
U.S. Cellular and IoT America
Soybean producers must have access to the technology required to be successful, and these partners are working on a wide array of IoT solutions that can be tailored for exact needs.

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Working with Modern Day Wire and Tape

I am sure there are other producers in Illinois who either remember, or have used, wire or duct tape to fix a problem on the farm. We are creative problem solvers, if nothing else.

The good news is with the expansion of technology and the infusion of investment in farm innovation, we need fewer of these short-term solutions to obtain long-term production success. We see more venture capital dollars moving into the agricultural industry to address everything from plant breeding efficiencies to equipment invention to sustainability challenges.

This issue of Soy Perspectives focuses on innovation. We hear so much about how new technology is changing our landscape, and we will continue to hear more. That is why the Illinois Soybean Association (ISA) board of directors has made the topic a cornerstone priority in 2019.

In an Agrimarketing article, Mike Boehlje with Purdue University’s Center for Food and Ag Business noted, “Science and technology have become a large focal point of the food and agribusiness sectors...Biological manufacturing now allows for enhanced plant and animal growth, and technology has allowed for more precision production practices through field monitoring, measuring and sensing. Not to mention advancements in process control systems, such as reducing plant stress through high-tech irrigation or multiple applications of nitrogen…”

Boehlje adds that digitization has become a disruption within the sector. Where competitive advantage used to be primarily hard assets and physical resources, it is data and information.

So how do we get a handle on this flurry of new innovation and rapid change in our business? By first looking at the flip side. Where would agriculture and our profitability be without new technology? What lessons can we learn and apply to our future success today based on that notion? Our cover story provides some pointers for producers and industry thought leaders.

We also look at the evolution of technology, as new players enter the marketplace. Some will succeed and some will not. Some may follow unique pathways to productivity while others will rely on tried-and-true traditional routes to commercialization. We look in this issue at applying soybean cyst nematode activity to human muscle applications, expanding broadband coverage with options outside fiber optics and explore small, niche companies entering the seed space.

Innovation is more than wire and tape. I encourage readers to browse our revamped website, www.ilsoy.org, for additional insights, along with other ISA priority details for the coming year.

“The good news is with the expansion of technology and the infusion of investment in farm innovation, we need fewer of these short-term solutions to obtain long-term production success.”

LYNN ROHRSCEIB | ISA Chairwoman
Innovation Nation

Let’s Think Differently

> BY MIKE LEVIN, Illinois Soybean Growers director of public policy and regulatory affairs

The essence of innovation is thinking differently. Creating new ideas happens when someone steps outside the usual and into change. Change is constant and the Illinois Soybean Growers (ISG) eagerly embraces it. Especially now when our nation is at an innovation crossroads. Leadership and constituents alike have to think differently and be open to change, including in the following areas:

PROGRESSIVE PRODUCTION PRACTICES

The world population could reach 9.1 billion people in 2050, requiring a 70 percent food production increase, according to the Food and Agriculture Organization of the United Nations. New technologies are critical to meet global demands. Educating decision makers on future ag needs and demonstrating progress can safeguard producer tools.

REINVENTING THE VALUE CHAIN

Margins are thin, requiring producers to constantly evaluate efficiencies and evolve practices. And the model for selling commodities is changing with retail giants like Walmart and Costco investing in their own farms. Bottom line: be open to change and new ways to protect business strategy.

INNOVATIVE INVESTING

With Pitchbook estimating about $2 billion in agtech venture capital investments last year, the Illinois soybean industry has a bright outlook on bringing new technologies to the state. However, Illinois needs a friendly regulatory environment that welcomes business and tech growth. A transparent, easy-to-navigate process could bring modernization and economic momentum to Illinois.

THINKING THROUGH TRADE

Illinois soybeans travel to countries that value our product’s quality, reliability and affordability—a reputation worth about $3.5 billion in annual exports. But, ongoing trade wars require new ways of conducting business to ensure Illinois maintains its lead as the fourth largest soybean producer in the world.

Beyond staying ahead of best practices, a changing value chain, a growing investment culture and an evolving trade landscape, innovation can happen in small ways. Simple acts of advocacy, like sending a letter to your legislator, drive change and force leadership to think beyond the familiar. Voice for Soy, the ISG legislative action network, makes that easy to do. With the new innovative look and usability unveiled earlier this year, there’s no reason not to participate in conversations that elevate the state.
Imagine Ag Without INNOVATION

> BY JOLI A. Hohenstein

When you think of technology and how innovation disrupts agriculture’s traditional methods, no doubt precision ag comes up as one of the first triggers. Some call it the “bells and whistles” designed to add yield, value and efficiency and make it easier to farm productively. In fact, research estimates new technologies could boost yield as much as 70 percent on the same land.

But what happens if farmers don’t adopt new technology? After all, technology adoption rates are under 50 percent by most estimates. Where will agriculture be if innovation and technology are not embraced and updated? Can we keep up with global demand for soybeans without it?

As global demand and the world population grow, protein will play a key part in feeding that new segment, says Russell Walker, Ph.D. and clinical professor at Kellogg School of Management, Evanston, Illinois. “Soybeans are a powerful part of the equation. They're the only way to make amino acid complexes off the land. We're adding three to four billion people by the end of the century. We need protein to do that,” he says.

EMBRACE CHANGE OR GET OUT OF THE WAY

Soybeans are uniquely positioned to grab a piece of the growing protein demand pie if farmers are properly positioned to provide food and feed to the world. “People in developing countries do two things: Get a cell phone. Eat animals,” says Walker. “The new customer will be the emerging middle class. They are seeking out a meat-based diet, but they need a deal.”

Simply put, the world will eat more meat, but the people who become meat eaters are poor by U.S. standards. Walker says efficient production is needed to sell meat at an affordable price. And making that happen means getting even more from the land with technology as that key.

"The world has essentially used up the best land. So, to feed the additional people, we will need to use that land more efficiently and differently. It's a cry for innovation.”

Unfortunately, agriculture has a tradition of resisting innovation. “Technology has been disrupting agriculture for thousands of years, the plow, understanding fertilizer chemistry,” says Walker. “People who are adverse today will be run over like people who didn’t need the plow.”

For many farmers, “disruption” is a dirty word. It’s a conundrum, really. Disruption goes hand in hand with change, which can be hard to take for anyone. But industry watchers say disruption by technology has definitively positive effects, especially from precision ag technologies.

Business management technologies can have a supreme impact on today’s farms as well. Yet as many as 70 percent of farmers use paper and pen. Farmers with operations that are still growing in today’s down market climate are those that take business management software seriously.

“They can quantify the cost in every acre,” says Brett Sciotto, president and CEO of Aimpoint Research, a global multidisciplinary market research and competitive intelligence firm with deep roots and experience in agriculture. “They tighten control over the business of farming and improve their use of inputs.”

BECOME A FAST FOLLOWER

Technology adoption equates to increasing efficiency, withstanding downturns in the market, weathering disease crises and being able to operate at a lower cost. “The farmers who are having the most success today tend to be early adopters and innovators,” says Sciotto. “Forty percent of farmers have grown their operations even in the midst of these difficult times. These farmers have characteristics that are different from their peers.”

"The world has essentially used up the best land. So, to feed the additional people, we will need to use that land more efficiently and differently.”

-Russell Walker, Ph.D. and clinical professor at Kellogg School of Management
Aimpoint Research recently completed a segmentation study of American farmers through their Farmer of the Future Initiative. Producers were statistically placed into one of five segments based on their psychographic and attitudinal profiles. Two groups he calls Independent Elites (IE) and the Enterprising Business Builders (EBB) comprise the top 41 percent of American farmers. The IEs are at the top; very successful, very reliable and steadily growing. EBBs are willing to truly be adaptive and innovative, doing anything they can to grow.

“With the aggressiveness of these two categories comes a caution, though,” says Sciotto. “There’s a risk of being on the bleeding edge. You can invest in things that don’t work.”

It’s about balancing risk and reward, not necessarily being a first adopter but in the early majority on the things that show return on investment, he advises.

Different groups adopt technology at different rates, Sciotto explains, but the most successful farmers have the characteristics and business savvy to navigate the complexities of the future. Others will continue to struggle in the increasingly complex environment of agriculture today.

Sciotto says those slow (or non) adopters include Classic Practitioners, who desire to grow but are struggling and don’t feel the future is in their control. Self-Reliant Traditionals hope to save their way to efficiency and have low appreciation for technology, and tend to be skeptical and cautious to the point of being resistant to change. And Leverage Lifestylers are enamored with the farming lifestyle and like new technology to their detriment. They can’t utilize it fully and overextend to get it.

Where should producers start? “Agriculture has a great sense of tradition,” says Sciotto. “That makes agriculture great, but it also means it is slow to adopt sometimes.”

Many operations are proud of their 100-year family tradition. But the business of the industry won’t allow century operations to succeed as is, he cautions. You have to adapt to succeed.

“Embrace new ideas and the next generation farmer earlier. Invest in your own education and awareness,” says Sciotto. “Think about who can help you improve and achieve your goals. Collaboration will be key to success and growth.”
Vertical integration has created new opportunities, added efficiencies and given farmers access to the consumer market at levels they couldn’t accomplish alone. But it has also concentrated ownership, pushed more of the financial risk onto farmers and in extreme cases severely restricted market access, particularly in segments like poultry and hogs.

It’s no mystery, then, why farmers tend to view it as either a necessary evil or as something they love to hate.

Could the crop industry ever get to a point where farmers are totally controlled by integrators, as in the poultry industry, a phenomenon sometimes called “chickenization?”

Chris Hurt, an ag economist at Purdue University, has spent his entire career — nearly 40 years — studying industry structure. He notes there’s always been one big deterrent against grain handlers, processors and marketers owning the farm: crop farming is land extensive rather than land intensive.

“As you get beyond 2,000 or 3,000 acres, or 50 or 60 miles, it’s difficult to concentrate that much production. Too much land is tied up in ownership by different families,” he says. “Having said that, among tenants there has been a movement toward larger size and an effort to overcome some of these distance issues. We could see more of that in the future. If there was a marketing mechanism for land that made it easy for people to bid on what was closest and swap out land farther away, we would probably see that accelerate.”

As farm size grows and numbers decline, it also becomes more feasible for a handful of big companies to offer production contracts to a limited number of preferred suppliers.

“Potatoes are primarily raised in this way, with 25 or 30 producers providing nearly all of what the companies need,” Hurt explains.

CONTRACTUAL WRENCH IN THE WORKS

Admittedly one thing that has thrown a wrench into these trends is the rise of specialty markets, with recent agricultural census data showing increases in the number of very large and very small farms, but a decline among those in between.

Roughly 20 years ago, an early push for more identity preservation led to the presumption that crop supply chains would become increasingly coordinated. That never materialized to the extent many people thought it would, Hurt says. Such a high degree of segregation proved impractical within the limits of existing infrastructure.

“The economic advantage turned out not to exceed the cost,” Hurt says.

Contractual arrangements have also been tempered somewhat by the inevitable churn of a capitalist economy. When highly integrated companies try to gain an advantage by tying up superior genetics through copyrights or patents, for example, their efforts have met with mixed results, Hurt said. At one time, some poultry and pork integrators pursued a strategy of buying up genetics companies. What they learned is smaller, more focused companies often developed better genetics faster.

“As farm size grows and numbers decline, it also becomes more feasible for a handful of big companies to offer production contracts to a limited number of preferred suppliers.”

- Chris Hurt, ag economist at Purdue University
“Ultimately they decided to leave that business to other companies. What they realized is if you are locked into a certain technology and somebody else comes up with something better, you have to be able to shift quickly or you become uncompetitive,” he explains.

Phil Howard, an associate professor of community sustainability at Michigan State University, also notes the tendency for new marketing opportunities to bubble up in unexpected ways. He points to a recent move by WH Group of China, the owner of Smithfield Foods, to buy feed grains directly from farmers, with the goal of cutting out the middleman, reducing costs and sharing back some of the savings with producers.

He also notes that production contracts for crops haven’t functioned in quite the same way as captive supply contracts in cattle or hogs. Pre-arranged livestock delivery obligations often provide packers with enough supply to step out of the negotiated market at certain key periods, whereas the market for grains is too fragmented and diverse to be used in that manner, he says.

Still, Howard doesn’t think farmers should turn a blind eye to consolidation. “For soybeans there are still competing buyers. But as there become fewer buyers, there is more pressure to enter into production contracts to get more stable prices. The problem is the initial favorable terms tend to become less favorable over time,” he says.

FARMERS AS LONG-TIME INTEGRATORS

Farmers have fostered vertical integration by forming cooperatives to gain leverage through collective ownership and control of processing and marketing. As cooperatives grow, one downside is they often come to resemble the same firms they are competing against, finds Howard. Large dairy cooperatives, for example, have been accused of driving down prices to farmers while paying executives millions in salaries and benefits.

“There’s no guarantee a co-op will continue to represent the interests of its farmer-owners, especially as they scale up and more people get involved and there are more layers of bureaucracy,” he notes.

At the same time, co-ops face similar merger and acquisition pressures as the rest of the industry. “It’s a challenge for them to identify niches where they can find value for their farmer-owners and remain competitive with corporations, which public policy currently favors,” he concedes.

Individual co-ops forming larger networks and joint ventures to increase inventory and generate greater bargaining power is a growing trend that Howard is now studying. A classic example is OFARM, which stands for Organic Farmers’ Agency for Relationship Marketing. The umbrella marketing group, based in Minnesota, represents six organic grain and livestock marketing cooperatives that operate in Illinois and 18 other states. Together they account for the largest farmer-controlled block of organic grain in North America, according to USDA.

“One of the fastest growing organic markets is poultry meat, and that has created huge demand for organic soybeans. Here in the U.S., we do not produce anywhere near what is required, so we import 70 percent of the organic soybeans that are being fed. But it’s not that the beans couldn’t be raised here, it’s just that farmers haven’t been sent a signal that we need the acres.”

- John Bobbe, OFARM’s executive director

One thing he encourages organic farmers to do is invest in on-farm storage. He also reminds them there’s strength in numbers. “To have a say, farmers have to become involved, and they have to be loyal,” he says.

Bobbe does worry that Rural America’s sense of solidarity has changed since he was growing up on a conventional dairy farm in Missouri.

“One of my master’s professors at the University of Missouri, who was among the last in the department to have a farm background, used to say farmers have no instinct for self-preservation,” he recalls. “If they would only act collectively it could work, but because they don’t have that instinct, they end up susceptible to divide and conquer.”
“The Chicago Board of Trade lists a grain price instantly, and, if you’re not up to speed, you lose out,” says Gary Smith, Okaw Farmers Co-op, Lovington, Ill. “The price can change in 30 seconds, and you can be selling grain for less than margin if your internet can’t keep up. Slow internet can cost farmers thousands of dollars when trying to sell their grain.”

The grain elevator where Smith works is one of many businesses in rural Illinois communities that serves farmers who rely on high-speed internet and reliable connectivity. It’s critical for precision ag technology, efficiency and profitable food production. Yet, a disparity in broadband service exists in many rural areas compared to their urban counterparts.

Slow internet problems that frustrate agricultural business people like Smith are nothing new to farmers across Illinois. An Illinois Farm Bureau (IFB) member survey last year composed of 235 respondents from 178 towns, villages and cities, showed 75 percent reporting broadband access at home, and 61 percent with access on the farm. About two-thirds of respondents said the quality of their broadband services negatively impacts their business.

According to the Federal Communications Commission (FCC), 39 percent of rural Americans lack access to high-speed internet compared to only four percent in urban areas. But help is on the way. Federal, state and local entities are coming together to address the digital divide.

Funding the digital divide

Smith points to his community’s service provider, Shawnee Communications, who worked with rural customers and government programs to bring fiber optics broadband to its service areas.

“Speed became much better when we got fiber optics a year ago,” says Smith.

Fiber optics and other high-speed internet choices are expensive to deliver to small towns like Lovington, population approximately 1,100. Matt Johnson, Shawnee Communications vice president of government policy, says USDA funding helped the company upgrade its broadband service from a copper to a fiber optic network.

“It’s faster. It’s more reliable. Fiber optics carry data at the speed of light. Farmers can use their tractor and combine technology to collect and analyze data to make decisions in real time,” says Johnson. Shawnee Communications serves customers in Gallatin, Saline, Pope, Hardin, Johnson and Moultrie counties and surrounding areas. “We also view high-speed broadband as an economic development tool for rural communities.

“We’re using funding opportunities to make improvements in broadband networks that will allow rural communities like Lovington to stay on the map,” he continues. “If rural areas don’t have connectivity, it’s going to become more and more difficult
for small town businesses and communities to grow and support farmers in their efforts to produce food. Agriculture and local communities need a strong support system with accessible high-speed internet for economic development and quality of life. It’s important for business services, education, emergency services healthcare and all the good things that come with connectivity and rural prosperity.”

Various federal loan and grant programs are paving the way for better rural broadband access. In 2018, USDA announced its ReConnect Program offering up to $600 million in loans and grants to help build broadband infrastructure. The initiative will provide approximately $200 million in grants; $200 million for loan and grant combinations; and $200 million for low-interest loans.

Agriculture Secretary Sonny Perdue announced the ReConnect Program saying, “High-speed internet e-Connectivity is a necessity, not an amenity, vital for quality of life and economic opportunity, so we hope rural communities kick off their rural broadband project planning.”

Last year, the FCC Connect America Fund also awarded nearly $1.5 billion to build broadband networks in underserved areas nationwide. About $100 million was allocated for Illinois.

**BUILDING OUT BROADBAND**

State government is also taking action to find solutions for better rural broadband service. In January, the Illinois General Assembly enacted legislation, Public Act 100-0833, aimed at advancing the build-out of broadband networks throughout the state. The law will establish a 27-member advisory council to study and discuss what can be done to expand rural broadband. The Illinois Department of Commerce and Economic Opportunity (DCEO) will oversee the council.

“Certainly, rural broadband has the attention of policy makers at the state and federal levels,” says Randy Nehrt, president, Illinois Telecommunications Association. “Broadband service has become a critical service for people throughout the country, especially for rural areas who need that connectivity.”

“Deploying high-speed internet in rural areas can be difficult because of geography and population density. Broadband networks are expensive to build, especially where there is a long distance from one person to the next. It’s difficult for companies to make the investment profitable through the rates they charge,” explains Nehrt. “The FCC Connect America Fund and USDA loan and grant programs help bring internet to rural areas. The constant evolution in technology will improve connections as well.”

Illinois Telecommunications represents 50 telecommunications companies in Illinois, both rural co-ops and rural corporations that provide broadband services to small communities.

“Like so many industries, agriculture has seen improvement in productivity and efficiency through the use of high-speed internet technology,” says Nehrt. “It makes it easier to communicate to suppliers, monitor market prices, access weather information and all the many ways they access information to make farming decisions.”

Access to rural broadband goes beyond what happens on the farm. “There’s a one-to-one relationship between access to high-speed broadband and economic development in rural communities,” says Jeffrey Connor, chief operating officer, National Rural Electric Cooperative Association (NRECA). He points out that while a lot of time has been spent on the policy side of the issue, “there are still 23 million Americans that don’t have access to broadband internet. The FCC calculates that about 6.3 million of these households are in electric co-op areas.”

Connor thinks society sometimes overlooks the importance of rural communities and agriculture to the prosperity of the country. “Rapidly changing technology depends upon connecting farmers, businesses and communities to feed people around the world,” he says. “It’s going to take a partnership of community advocates, policy makers, federal, state and local funding to make rural broadband technology match that of its urban neighbors.”
It’s easy to make more on your soybeans.

Find the connections you need to see your profits grow. Thankfully, SoybeanPremiums.org already did the hard work of finding them for you. Food-grade, identity-preserved and non-GMO, connect with premium programs and buyers in your area today.
Nielsen data indicates that food sales – including meat – labeled non-GMO grew more than $8 billion from 2012 to 2016. According to Technavio, the global non-GMO animal feed market will experience an estimated 7.51% compounded annual growth rate between 2019 and 2023. Soybean producers have opportunity to grow more non-GMO soybeans for this market segment.

Terms like “plant-based protein,” “no antibiotics ever” and “low carbon footprint” are popping up on menus and in grocery stores more frequently. The appeal of such labels stems in part from common negative assumptions about animal agriculture.

Where do such assumptions about raising and consuming meat, poultry and dairy come from? Are they accurate? And what do current trends mean for soybean markets, since feed represents the single largest demand for soy?

Here’s a look at several current consumer trends and their potential impact on soybean markets.

"AMERICANS ARE EATING LESS MEAT."

Protein consumption actually fluctuates depending on the economy, according to a January 2018 MarketWatch article. Consumer demand is correlated to employment factors and disposable income, and animal protein consumption remains steady.

"NON-GMO IS THE WAY TO GO."

Nielsen data indicates that food sales – including meat – labeled non-GMO grew more than $8 billion from 2012 to 2016. According to Technavio, the global non-GMO animal feed market will experience an estimated 7.51% compounded annual growth rate between 2019 and 2023. Soybean producers have opportunity to grow more non-GMO soybeans for this market segment.
“Plant-based protein” appeared in some form on most lists of food trends to watch in 2019. And food companies continue to invest in “lab-grown” or “cultured” meat. Will the technology behind these efforts supplant traditional meat production?

Food and agricultural economist Jayson Lusk, Ph.D., head of Agricultural Economics at Purdue University, studies what we eat and why we eat it. “Right now we are seeing many different protein trends, and we don’t yet know what will prevail,” he says. “Economics and consumer acceptance will be key factors in the future of meat alternatives.”

He notes company investments in meat alternatives indicate this market will grow because so many are betting on it. At the same time, consumer research currently shows customer aversion to these products. But both factors could change.

COMPETITIVE ECONOMICS
“Prices signal resource use — nothing is free,” Lusk explains as he compares the production systems for traditional meat and meat alternatives. “In the U.S., we currently have very cost-effective systems to produce pork and poultry. Feed and other resources are inputs for high-quality meat. The feed conversion efficiency of these systems makes it harder for meat alternatives to compete economically.

“Beef is more expensive because it requires more resources, including time, so alternatives may be more competitive in this area,” he continues. “But beef also uses marginal land and converts resources we can’t eat — grass — into something we can.”

Current costs for lab production are astronomical. But, Lusk says that as the technology begins to use more common resources and creates a more efficient system, those prices will drop.

“It’s hard to predict, but given known factors related to product investments and costs, along with consumer preferences, I think meat alternatives could claim up to 15 percent of the protein market in 15 years.”

What does that mean for the feed industry?

“Any replacement of traditional meat production by alternatives impacts the feed industry,” Lusk explains. “If alternatives claim 15 percent of the market, that would be a 15 percent reduction in feed grain demand.”

Nearly 97 percent of the soybean meal used in the U.S. feeds poultry, pigs, cattle, fish, companion animals and more. A soybean meal demand assessment commissioned by the soy checkoff estimated that animal agriculture used 31.2 million tons of soybean meal in 2017. A 15 percent reduction in feed demand would equal a decrease of nearly 4.7 million tons of meal from almost 197 million bushels of soybeans.

OUT-OF-THE-BOX OPPORTUNITIES
The two dominating trends in meat alternatives could create new competition and opportunities for soy protein, notes Lusk.

Plant-based protein garners significant investments and headlines. Consumer preference for soy as a plant-based protein is mixed. Some sources list soy at the top of plant-based proteins, like an April 2018 Medical News Today article.

Other voices in this space debate the merits of soy compared to peas, lentils and other legumes, or specifically promote avoiding soy. Beyond Meat, one well-known brand, currently uses mostly pea protein in its products.

Lusk believes cell-based meat, like that being developed by Impossible Foods’ fermentation process, will take longer to be commercially available, but considerable work is going into reducing costs and improving products.

“Those cells have to eat something,” Lusk says. “Some processes currently use fetal bovine serum, but researchers want to replace that medium with other proteins. We don’t know how that will develop, but soy could have a place there.”

However, he doesn’t envision the disappearance of traditional meat production soon. “While we don’t know the comparative efficiencies of new systems because they use proprietary technologies, we do know that they aren’t yet working to produce T-bones or bacon.”

So, as meat alternatives become more mainstream, they are not yet poised to replace traditional meat production. For soy, traditional feed demand will continue while new opportunities develop.
"BACON MAKES ANYTHING BETTER."

From baconfests and Wendy’s Baconator, to statement tees and lip gloss, bacon has developed a cult following in the U.S. Its popularity has contributed in part to the long-term forecast from the USDA expecting pork production to increase annually for the next decade, though at a slower rate than recent years. Pork production consumes about 7.6 million tons of soybean meal annually.

"POULTRY SHOULD NOT BE RAISED WITH ANTIBIOTICS."

Research shows that specialty production systems, such as using no antibiotics, reduce poultry feed efficiency between 2 and 12 percent. Every 1 percent decrease in feed efficiency for U.S. poultry production as a whole requires an additional 95,000 tons of soybean meal.

"WILD-CAUGHT FISH AND SEAFOOD ARE MORE NATURAL."

Wild-caught fisheries cannot sustain global seafood demands, according to the U.S. Soybean Export Council. By 2030, an additional 41 million tons of fish per year will be needed to maintain current levels of seafood consumption. Responsible fish farming, often labeled “responsibly raised” or “farm-raised,” fills the gap between wild supply and consumer demand with a low ecological footprint, protecting wild stocks. Aquaculture produces seafood higher in omega-3 fatty acids from their feed, according to Johns Hopkins analysis. That diet for many species includes soy, cost-effectively replacing unsustainable fishmeal.

"I’M A _________________."

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Source: Leah McGrath, BuildUP Dieticians

"GRASS-FED BEEF IS ENVIRONMENTALLY RESPONSIBLE."

All beef cattle feed on grass for most of their lives. But currently, pastureland can only support finishing 27 percent of the beef supply, according to Harvard University research. Grain-finished cattle fulfill beef demand more efficiently, prevent overgrazing and consume more than 1.4 million tons of soybean meal.
"LIVESTOCK ARE A PRIMARY SOURCE OF GREENHOUSE GAS EMISSIONS."

One sunny Chicago afternoon, a local sports talk radio host confidently asserted that gas from cows is killing the planet. This offhand comment from a mainstream thought leader outside food demonstrates the reach of the assumption that livestock are a major source of greenhouse gas emissions, producing more pollution than transportation.

According to Frank Mitloehner, Ph.D., professor and air quality extension specialist with the University of California, Davis, this false assumption stems from a 2006 report, “Livestock’s Long Shadow,” from the Food and Agriculture Organization (FAO) of the United Nations, which has since been rejected by its senior author.

“The report asserted that 18 percent of greenhouse gas emissions came from livestock, a higher percentage than transportation,” Mitloehner says. “That raised many questions for me.”

He dug into the report, and uncovered key inconsistencies. “That FAO report used different types of analyses for different industries, meaning they weren’t comparing apples to apples,” he explains. “The livestock data used a lifecycle assessment, accounting for all inputs and emissions from every step in producing a steak or glass of milk. The transportation data only included emissions from vehicle tailpipes. That is not an accurate comparison.”

Mitloehner adds that the way many media and activist groups read that data conflated global and regional numbers, creating further inaccuracies. “In sharing findings from that report, many took global emission totals and applied them to a region or country,” he says. “Assuming that the global total for any emissions category applies to the U.S. creates problems. Transportation is much different in the U.S. than in Europe or developing countries. The same is true for livestock production. The U.S. is the most efficient producer of meat and dairy products in the world.”

He also found that most statements share only gas production (i.e., emissions) from activities such as raising dairy or beef, ignoring the amount of greenhouse gases destroyed through natural processes like oxidation, which are most important.

All this contributes to a skewed environmental livestock story. Misunderstanding the role of feed crops further twists the narrative.

“Livestock effectively use land and feed that people can’t to produce high-value, nutritious food,” Mitloehner says. “And the nutritionally dense feed used in the U.S. contributes to our improved efficiency.”

CORRECTING ANALYSIS

Mitloehner addressed his concerns by working closely with FAO and other organizations to create new global standards to measure and analyze greenhouse gas emissions. According to this protocol, a much different picture of the livestock industry’s contribution to greenhouse gas emissions emerges.

He points to current data for the U.S. from the Environmental Protection Agency (EPA). Burning fossil fuels accounts for about two-thirds of U.S. greenhouse gas emissions. Electricity creates 30 percent of emissions, followed by transportation at 26 percent and industrial production at 21 percent.

“All agriculture, both plants and animals, accounts for about 9 percent of our greenhouse gas emissions, and livestock alone accounts for less than 4 percent of the total,” Mitloehner says. “If everyone in the country was vegan, greenhouse gas emissions would fall only 2.6 percent. Food waste is a much bigger contributor to emissions than farming.”

Mitloehner’s globally accepted analysis, based in science and legitimate comparisons, challenges assumptions about the environmental cost of animal agriculture. He explains that production intensity and emissions intensity are inversely related.

“Greater efficiency in livestock production reduces carbon footprint,” he says. “For example, the U.S. produces 60 percent more milk than in 1950 with 16 million fewer cows. That decreases the carbon footprint of a glass of milk by about two-thirds.”

He says that according to the data, U.S. meat, poultry and dairy products have a “low carbon footprint per unit of product.” But this story needs to be told to combat the negative assumption that eating less red meat and dairy could save the planet.

Learn more about livestock and air quality by following Mitloehner on Twitter, @GHGuru.
JUMPING THE S CURVE
Empty Your Closet of Shame by Understanding the Direction of Future Technology

> BY BARB BAYLOR ANDERSON

Soybean producers may or may not be willing to admit they have drones, sensors or other technologies out of commission or collecting dust. But the truth is, most producers have a “closet of shame,” broken, outdated or misunderstood equipment no longer in operation.

But there’s hope. By understanding how the “S Curve” works and a sense of where cutting-edge investors and companies are future-focused, producers can maximize technology use.

“When we speak with farmers, the conversation eventually gets to the ‘closet of shame,’” says Larry Page, principal, Lewis & Clark Partners. “As farmers find technologies that work and drive meaningful improvements, they should share those stories. We engage farmers when we explore technologies and learn as much from them telling us what did not work as what did.”

Lewis & Clark Partners’ fund was created to address consumer preferences driving disruption in the supply chain while new technologies enter the market. Their AgriFood Team has expertise ranging from traits and biotech, to on-farm technologies, processing and supply chain.

“The agrifood sector is undercapitalized. But increased investment in agriculture is bringing software and IoT to the farm, adding safety and security to the food supply chain, and creating layers of data that help food producers gain significant efficiencies,” he says.

“If you look at how technology has been adopted in agriculture compared to other sectors like healthcare or financial services, it has been slow,” adds Matt Plummer, principal with The Yield Lab, an ag tech venture capital firm specializing in investing and developing companies to commercial viability and long-term success. “But with ag companies going through mega mergers, there is big opportunity to use ag tech investment to throw wood on the R&D pipeline.”

WATCH THE S CURVE
Determining where to invest includes gauging technologies along the S Curve — a widely accepted industry model that shows how innovations start out slow at the bottom of the curve, accelerate and slow at the top of the curve. New generations of technology jump to a new curve.

For example, Plummer places at the bottom of the ag tech S Curve such things as artificial intelligence, blockchain and IoT. The middle includes cannabis, probiotics, supply chain digital and payment platforms and spectral imaging. At the top are elements of precision agriculture.

“Recently there have been acquisitions of precision ag companies, not just by large players, but venture-backed companies. This seems to indicate the market is beginning to mature,” he says.

Page believes one of the most mature technologies on the S curve.
Curve is microclimate and weather prediction applications. “So many farmer decisions are driven by weather,” he says. “We feel we are in the slope up in technologies such as drone-based imagery, where the technology exists to get imagery, but the analytics are finally getting to a point where meaningful decisions can be made based on that imagery. But until the analytics catch up, imagery is of limited utility.”

Page believes agriculture is in the early S Curve days with potential long-lasting technologies such as CRISPR, blockchain and LoRaWAN for rural IoT connectivity.

**PASS THE PROFITABILITY TEST**

So where do producers fit into the S Curve conversation? Technology adoption. Research led by Brad Lubben, Extension associate professor and director of the North Central Extension Risk Management Education Center at the University of Nebraska-Lincoln, found adoption versus non-adoption is “positively and significantly” associated with higher profitability. However, he adds there is no way to be certain whether profitability drives adoption or adoption drives profitability. Likely, there is some of both, or at least an endogenous effect.

“Producers definitely look for improved profitability or efficiency from new technology. Whether it increases productivity, reduces resource use, eases operator burden, it is all focused on improving the bottom line,” he says. “Innovators and early adopters try new technology with just the hope of improved profitability. Later adopters are likely to wait to see evidence.”

Economics also plays a role. “It was easier to adopt new technology on the hope of improved profitability when crop returns were higher,” he adds. “With tight margins now, any investments are likely to be analyzed much more closely for demonstrated improvements in profitability.”

**EMPTY THE CLOSET**

Producers can keep technology out of the scrap heap by becoming students of the S Curve.

“Farmers should get involved with innovative events or conferences,” says Plummer. “Go learn what’s opportunity to help solve problems. This gives you an ability to consult at a deeper level with retailers and agronomists. For groups like ours to accelerate technologies, we need support from groups like ISA to tinker with and optimize technologies and business models.”

Page share similar thoughts. “We make better decisions when we engage groups like ISA. Whether informally or more formally as members of our advisory board or attendees at our annual summit, voices from groups like ISA that represent farmers provide us with perspective of the most important influences in our portfolio companies’ success: end users and beneficiaries of technologies,” he says. “We encourage farmers interested in our advisory board to contact us.”

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Implications for Illinois soybean producers seeking effective ways to battle one of their top pest nemeses, the soybean cyst nematode (SCN), are huge. But from a human health standpoint, what crop disease researchers are learning could hold exciting possibilities in laying the groundwork for providing medical doctors with the ability to reverse or delay human neurodegeneration.

“Nematodes can be pests in production agriculture, and learning more about them is beneficial. In time, this type of research could contribute to the development of innovations that help us to heal, fuel and feed the world,” says Karen Batra, managing director of agriculture and environmental committee of the Biotechnology Innovation Organization (BIO).

While BIO is not associated with this study, Batra refers to a University of Illinois team’s recent findings regarding SCN. Lead researcher Nathan Schroeder with the Department of Crop Sciences and his team have painstakingly documented how muscle and neurons degenerate in both male and female SCN during their juvenile feeding stage. As nematodes enter adulthood, males regain mobility and seek out females, which remain immobile, to breed.

Schroeder says learning to manipulate the movement-- or non-movement-- of male SCN could be the key to groundbreaking crop pest management and human health advances.

“Among nematodes, the SCN is somewhat unusual. It goes into a sedentary stage and stops moving,” explains Schroeder. “Most nematodes do not do this. They move throughout their lives. We are trying to understand what stops them from moving and design some sort of target that does not affect the nematodes that are actually beneficial to soil health.”

Schroeder has determined lack of movement is based on changes to SCN neurons and muscles. In the sedentary stage, neurons and muscles degenerate. Males regrow neuromuscular tissue.

“From the biomedical perspective, perhaps we can use the mechanisms SCN uses to solve human health issues such as muscular degeneration or neurological degeneration,” he says.

Schroeder and his team are continuing to study the various development stages of the male SCN. The researchers are seeking clues as to exactly how the parasite achieves its morphological transformation, while examining proteins unique to the male SCN generated during remodeling.

“Until now, crop scientists had understood very little about a key aspect of the SCN life cycle critical to the microscopic parasite’s survival,” says Schroeder. “Our team of researchers is one step closer to being able to understand how the SCN can undergo apparent neurodegeneration and later reverse the development, ensuring its survival and continued progeniture.

“We are excited about the prospect of gaining greater insight into the basic biology and genetics of nematodes—the parasitic, crop-destruction ones, specifically—to benefit human medicine and agriculture,” Schroeder says.

Applying Nathan Schroeder, University of Illinois Department of Crop lead researcher, team’s findings to human neurodegenerative disease may still be a long way off, but the research could lead to important practical outcomes for soybean pest management as well. SCN is among the worst soybean pests in the United States and the world, causing more than a billion dollars in yield loss annually.

Schroeder says exploiting this mechanism, which appears to be unique to soybean cyst and root knot nematode, another finding in the study, could be very good news for the soybean industry.

“They may be tiny, but these are animals and they are complex organisms,” he says.

“Current control strategy is based on resistance. But the same source of resistance has been used for 30 years and nematodes are evolving around it,” Schroeder adds. “Now that we know how males rebuild their muscular system, we hope we figure out how to stop them in their tracks.”
As the process of innovation itself continues to innovate, the need to be nimble and stay aware has never been greater.

While the term, game-changer, is often overused, it’s hard to dispute the impact gene editing is already having on the plant breeding industry—and difficult to predict just how far-reaching its ultimate contributions will be to the soybean industry and all of agriculture.

Gene editing technology, which uses a scientific advancement known by the acronym, CRISPR, offers more than just the latest, most-talked-about advances in plant breeding. It also holds the promise of shortening the time between idea and market, allowing seed, ingredient and food companies to accelerate research and innovate on decentralized platforms. By presenting opportunities for plant breeding companies of all sizes, it could lead to wider seed trait selection and more producer options.

Until recently, the cost and timeline of traditional trait development was a barrier for smaller companies and crop applications. “On average, it takes 15 years and $150 million to develop a GMO product,” Michael Lassner, chief science officer at biotech startup Amfora, says. “By streamlining the process, gene editing allows companies to bring innovations to bear on a greater number of crops and more problems.”

Curtis Wiltse, research manager at Beck’s Superior Hybrids, echoes this sentiment. “The rate of innovation today is so great, no one really knows what will happen in five years other than it’ll be exciting. There will be a lot of opportunities for growers who are willing to step out and do things a little differently. The best thing any of us can do is be nimble and stay aware,” he says.

SCIENCE THAT’S CHANGING THE GAME

While it’s easy to get confused by complex concepts like Clustered Regularly Interspaced Short Palindromic Repeats, or CRISPR, the basic concept behind this new science is as simple to understand as the term used to describe it: editing.

Think of this sentence as a DNA sequence. To improve it, an editor would simply identify the unnecessary letter in the word, this, and remove it.

Tools like CRISPR give gene editors a similar ability to quickly improve a living organism’s genetic code by identifying and editing the content found there. This technology has profound implications across a wide range of applications, from the treatment of human diseases to agricultural innovations.

“When it comes to soybeans, it’s editing for things like healthier oils and disease resistance,” says Bernice Slutsky, senior vice president, domestic and international policy, American Seed Trade Association (ASTA). “The real value in this technology is it allows breeders to do many of the things they could maybe do in the past, but they’re now able to do it a lot less laboriously.”

DECENTRALIZING THE PLATFORMS FOR INNOVATION

Compared to past technologies, the relative simplicity of working with CRISPR makes it easier for seed companies of any size to outsource all or part of their research and development needs. Companies like Benson Hill Biosystems are offering decentralized platforms to help make it happen.

“What gets me excited is that we’re not just talking about enabling innovation for companies that have some form of it already in house, we’re also talking about bringing innovation to companies that don’t have that capability today,” says Matthew Crisp, CEO of Benson Hill Biosystems. “Our platform empowers companies anywhere along the food-agri value chain to leverage the natural genetic diversity within crops to develop both consumer and farmer-facing benefits.”

The company’s Crop OS Edit platform enables Benson Hill’s partners to leverage computational data analytics to identify specific sites that make the most sense to edit. It also includes the biological tools necessary to go inside the cell and precisely, predictably make only ideal edits.

“For soybeans, it might be identifying a high-yielding variety and simply tweaking the genes that already exist instead of spending 10 or 20 years on the introgression of various genes,” says Crisp. “In many ways, it’s just a version of accelerated breeding that’s enabled by tools like CRISPR; a tool that shows you exactly where to go and exactly what changes need to be made.”

FLIPPING THE CARBOHYDRATE-PROTEIN SWITCH

Startup company Amfora is using gene editing technologies to significantly increase soybean protein content without yield drag concerns that often come with traditional breeding methods. The four-year-old company is developing a platform of technologies to meet the growing demand for high-protein foods while enhancing sustainability.

“One of the genes we’re working on is a ‘switch’ that controls the partitioning between proteins and carbohydrates,” says Amfora’s
Lassner, whose resume includes more than 30 years of work in the plant breeding field at both small companies and larger ones like Pioneer Hi-Bred International, where he helped lead their trait discovery work.

“At Amfora, we are developing the ability to modulate this switch, turning it down or up as needed,” Lassner explains. “If it’s turned down, you get more carbohydrates and if it’s turned up, you get more protein. In the past, traditional breeding efforts to increase yields tended to bring protein content down. Gene editing addresses this.”

By the early 2020s, Amfora hopes to bring two applications of this edited switch to market: a broadly licensed offering that would help any seed company increase protein content by approximately 10 percent, and an aquaculture product that could displace fish meal and other expensive feed alternatives with an ultra-high-protein soybean meal alternative.

NEED FOR DIALOGUE

Obviously, any new technology — especially one that accelerates the research and development process as gene editing does — comes with an associated need to ensure everyone, including government regulators and consumers, fully understands its purpose and promise.

Slutsky underscores the need for groups like ASTA to be disciplined in their approach. “Plant breeding innovation is a key focus area at ASTA,” she says. “Over the past few years, it became clear gene editing would be extremely helpful to breeders of all kinds of crops, from small startups to the very largest organizations to university breeders. To address this, we’ve focused our energies on three bucket areas: policy, stakeholder engagement and communication.”

On the policy front, ASTA strives to promote science-based oversight and international harmonization that ensures safety without creating barriers to entry for smaller companies and crop applications.

To address the need for engaging stakeholders and communicating clearly, ASTA recently partnered with the Biotechnology Innovation Organization (BIO) in a joint venture called Innovature, which will “explore and contextualize gene editing advancements and promote dialogue and clarity on agriculture innovation under development.”

“Innovature and its microsite, Innovature.com, are really a platform for dialogue,” says Bethany Shively, vice president, strategic communications at ASTA. “Since we want this to be a discussion, we’re bringing in outside voices and a wide variety of views. We know that consumers want to know about their food, and they should. We’re also continuing to work to put a face on plant breeding, and the critical real-life benefits it provides for all of us.” •
White Paper Outlines Timely Container Transportation Opportunity

A 40-foot steel box may hold the key to global success for soybean exports as the U.S.-China tariff tiff has ISA and its transportation partners looking for solutions to step up sales. A white paper recently completed by the ISA checkoff program outlines the benefits of container shipping and identifies some of the innovative shipping opportunities being tested in the marketplace.

Investment in new marine technology and port infrastructure could help evolve container transportation and provide more sales diversification. Find the report “Soybeans at an Unprecedented Crossroads” in the Commerce Section of www.ilsoy.org.

World Agri-Tech Innovation Summit Features New Technology

The ISA checkoff program is a gold sponsor for the World Agri-Tech Innovation Summit being held in San Francisco, March 19-20. In its fifth year, the summit is an international conference, networking and deal-making event for agribusinesses, solution providers, entrepreneurs and investors.

These stakeholders share a goal of accelerating commercialization of advanced ag technologies by generating global partnerships and collaborations. The event this month will focus on predictive agriculture, automation, robotics, AI backed genomics and biological discovery platforms, as well as explore business models and partnerships needed to scale new technologies and transform the food supply chain into a more sustainable, affordable and nutritious system for the future. To learn more about the event, visit www.worldagritechusa.com.

Illinois Producer Participates in Trade Exchange in Spain

United Soybean Board (USB) chairman Lewis Bainbridge and American Soybean Board (ASA) and USSEC director Stan Born from Illinois traveled to Barcelona, Spain, to take part in the EU / Middle East North Africa (MENA) Regional Trade Exchange.

The event provided a vital opportunity to connect top purchasers with U.S. exporters and U.S. farmer leaders with the goal of promoting U.S. soy, developing or further enhancing relationships, and leading to a preference for U.S. soy, while increasing purchases. The EU/MENA region represents the second largest global export soy market, trailing only China. Modeled after successful U.S. soy buyers’ conferences, activities included time to forge strong relationships between buyers and sellers.

ISA to Fill Six District Seats This Year

ISA board seats representing districts 3, 4, 6, 8, 15 and 18 are up for election this year. John Longley (District 3), Sharon Covert, (District 4), Dale Asher (District 8) and Daryl Cates (District 15) will all term off the board during ISA’s July 2019 meeting in Champaign, Ill. Jim Martin (District 6) and Rick Rubenacker (District 18) are eligible for re-election.

- District 3: Henderson, Henry, Mercer, Rock Island, Stark, Warren and Whiteside
- District 4: Bureau, Grundy, Kendall and LaSalle counties
- District 6: Livingston, McLean and Woodford counties
- District 8: Adams, Brown, Hancock, McDonough and Schuyler counties
- District 15: Clinton, Madison, Monroe and St. Clair counties
- District 18: Alexander, Franklin, Gallatin, Hamilton, Hardin, Johnson, Massac, Pope, Pulaski, Saline, Union and Williamson counties

The ISA board is comprised of 18 district directors and six at-large directors. Eligibility to serve requires candidates be Illinois residents of legal voting age that contribute to the soybean checkoff. District candidates must be residents in the district sought to represent.

Board members serve a term of three years, and are eligible for up to two terms. The average board member devotes 30 days per year attending functions representing ISA. Official notice for district director positions will be announced by the Illinois Department of Agriculture and ISA in early April. Contact Dustin Scott at scottd@ilsoy.org or any current ISA director for more information or if you know someone interested in serving.

Calendar of Events

ILSoyAdvisor Webinar (soil health/aggregation)
> March 13 · Visit ILSoyAdvisor.com for details.

World Agri-Tech Innovation Summit
> March 19-20 · San Francisco, CA
Illinois soybeans are a powerful commodity driving powerful commerce with a footprint covering roughly a quarter of the state. Illinois soybeans are found in everything from salad dressings and soy lattes to clean biodiesel and sustainable printer ink. They feed animals and humans across the U.S. and around the world. And they play a critical role for more than 43,000 Illinois farmers who consistently lead the nation in soybean production, year after year.

The Illinois Soybean Association (ISA) checkoff program, supported and funded by Illinois soybean farmers, collaborates on projects focused on market development, research, promotion, education and issues analysis. With these essential funds, ISA collaborates with groups that can positively impact opportunities for soybeans — including stakeholders, influencers and customers like you — to address five key drivers:

1. **ECONOMIC GROWTH:** A soybean may be small, but its impact is massive. Soybeans provide $28.3 billion in sales and 114,500 Illinois jobs. While soybeans are raised in Illinois, they are crushed, processed and put to work around the world. Manufacturers mill animal feeds, refineries pump out biodiesel, processors deliver soybean oil, and on and on.

2. **QUALITY PRODUCTS:** ISA leads the charge toward practical incorporation of sustainable, soy-based products, such as vegetable oil, printer ink, paint, and feed for poultry, pigs and more. Not only does this fully renewable commodity reduce the reliance on finite resources, it builds an ironclad connection between industry and Illinois soybean farmers.

3. **SUSTAINABILITY:** Illinois farmers harness the best farming practices and use the latest technologies to take better care of the land and grow a healthier crop. ISA helps both partners and farmers understand and apply the critical concept of sustainability across soybean production, processing and end use.

4. **EFFICIENT DELIVERY:** Millions of bushels of Illinois soybeans are harvested annually, but they can only be effective when delivered to the right places. ISA works closely with partners at local, state and national levels to improve our aging infrastructure and get the goods to customers everywhere.

5. **SOCIAL RESPONSIBILITY:** We support local and national communities, providing students with scholarships, books and educational lesson plans. ISA works with local food banks and other organizations to provide hunger relief in our communities.

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*Economic Contribution of the Illinois Soybean Industry study, Informa Economics, 2017, funded by the ISA checkoff program*
Digital Farming is Jumpstarting This Century’s Ag Revolution

> BY STEVE CUBBAGE

One of the most nostalgic reminders of my family’s agriculture roots is a vintage family picture of my great-grandfather and great-uncle standing in front of a horse-drawn wagon full of hand-picked field corn. They were proud of their day’s work.

There have been a lot of days and a lot of crops in the books since that photograph was taken. Our farm has changed. Farming has changed. And if I ever need reminded of just how much, I pull out that old photo and look at my great-grandfather’s hands. They’re covered with heavy corn husking gloves used to fill that wagon with sheer sweat and determination — a wagon that today could be filled in less than a minute by today’s mechanical super harvesters.

Agriculture has gone through its fair share of revolutions during the past century. The mechanical revolution turned oat-eating work horses into iron horses. The Green Revolution gave us hybrid seed and herbicides. The biotech revolution gave us Roundup Ready everything.

What’s the next big revolution? We are already living it. The problem is it is happening so fast and so chaotically that nobody seems to realize it is a revolution. It started nearly a generation ago in the early to mid-1990s as precision agriculture. Today, it is dubbed digital farming.

Today’s digital farming is more than yield monitors and variable rate, and more than tractors that drive themselves and three-ring binders full of “pretty” field maps. Precision agriculture has evolved from novelty to necessity. If it is not your new normal, you are behind, plain and simple.

The range and scope of technology available today is staggering, even compared to five years ago, let alone 25 years ago. Farms are being converted from analog to digital before your very eyes. You hear the terms Big Data, the cloud, the Internet of Things and artificial intelligence. All these things are real and already part of today’s agriculture.

Companies like Smart Ag are using the first fruits of artificial intelligence technologies to turn existing auto-steer tech into driverless tractors hooked to grain carts that synchronize with your combine. Such technology addresses real problems like finding qualified operators during crunch time. Then there is technology like DTN’s Spensa, an insect trap gone high-tech equipped with onboard cameras and cellular modems to transmit pest activity in a given area to your farm’s personal online, web-based dashboard. Think of it as Doppler radar for bugs.

Seeing and understanding what’s going on in your fields has changed. Imagery in agriculture has been totally disrupted, whether via drones, planes or satellites. Your fields are being watched more than the Kardashians. Satellite companies like Planet make crop imagery practical; timely, affordable and deliverable direct to you by miniaturizing and equipping with off-the-shelf electronics launching dozens of images at one time. Simply game-changing technology.

Do you have a digital strategy to implement, but more importantly utilize, the data you glean from all this technology? Data deciphered should drive your decisions.

It still takes a farmer to really understand his or her own farm. But to understand your fields, you not only walk them like my great-grandfather, you see them in a way he could only imagine.

Steve Cubbage is owner of Record Harvest, an independent precision agriculture services and consulting firm based out of Nevada, Missouri. His firm has been helping farmers deploy the latest technology and turn data into knowledge for more than 20 years.
Grocery store aisles are filled with countless food choices — and claims. Food packages and company websites highlight health benefits, sustainability goals, production practices and more. “Consumers want to know more about their food, and many food companies have set sustainability goals,” says Dave Stanko, head of Agrible for Nutrien Ag Solutions. Agrible provides downstream sustainability analytics throughout the supply chain.

For example, Hellmann’s asserts that 100 percent of their oils for Hellmann’s Real Mayonnaise is sourced responsibly, claiming online that the company works with producers to improve the sustainability of their farms in areas of land use, soil carbon, water quality, energy use and more.

How do they know? “Companies need data to back up their claims and show progress toward their goals,” says Stanko. “And that data starts at the farm and field level. Data provide insights for farm efficiency and improvements. Data help the supply chain understand what matters to consumers and give perspective on how to tell our stories.”

Stanko believes all producers should track detailed farm-level data. Although in-depth collection is associated with specialty markets, opportunities will grow with supply chain innovations.

Indigo Ag, based in Boston, is building a system that relies on digital technologies. “As we expand our offerings across the agricultural value chain, we will continue to connect farmers directly to the buyers of their crops, improving grower profitability, environmental sustainability and consumer health,” says David Perry, Indigo president and CEO. He adds gathering and verifying farm-level data is critical to the Indigo approach for several crops, including soybeans.

Calyxt, a consumer-centric food and ag company in Minneapolis, doubled contract acres for their high oleic soybeans from 2018 to 2019. The company’s model provides full ingredient traceability to the county grown, with future potential to extend to the grower level.

That requires data entry and management. “Data help tell the story food companies want to share with their customers,” Stanko says. “Increasingly, data will provide growers access to certain markets. So, producers should be getting in the habit of collecting detailed data now.”

He acknowledges many producers don’t see a direct financial incentive in gathering such details. But preparing for the future is critical to maintaining profitability as margins continue to narrow. “Several software platforms are currently available, and they will get easier to use over time,” Stanko continues. “Challenges exist due to lack of connectivity between platforms, but that will change. The key is developing a habit of recording details, because they matter in this economy.”

Those details can make or break profitability, notes Stanko. After all, four feed grain producers were sued for selling products falsely labeled as organic. Though this represents a specialty market, the case sets a notable precedent for supply chain claims. Accurate data protect against potential fines and penalties as claims become even more common. “Producers understand the importance of data for farm decisions,” Stanko says. “But anticipating what the supply chain will need positions them to take advantage of future opportunities – which are actually very close.”

> By Laura Temple

Data: A Gateway to Future Market Access

**DATA TRACKING**

- Assess current data being gathered.
- Identify data collection gaps.
- Select an easy-to-manage software solution that will fill those gaps.
- Monitor the market for solutions to improve connectivity between data sources.
WHAT CHALLENGES AND OPPORTUNITIES WILL YOU ADDRESS?

We know that the needs of farmers are constantly evolving, so we need to be technology experts for them. Working with companies such as IoT America who specialize in specific agricultural solutions allows us to provide a wide breadth of offerings and ongoing support, so customers feel confident in their investment. We will work to ensure that our associates always have the most up-to-date information, so they can offer customers the cutting-edge technology that they need to be efficient and successful, while being cost-effective.

WHAT DO YOU SEE FOR THE FUTURE OF THIS TECHNOLOGY AND HOW WILL YOU ADDRESS THAT IN A WAY TO ASSIST FARMERS IN THEIR PRODUCTION ROLE?

The IoT space is constantly growing, and some experts say that introduction of 5G will allow virtually anything — some say up to a trillion devices in the next decade — to connect to cellular networks. We want to help the farming industry embrace this technology and see how it can revolutionize everyday tasks. We will continue to look for innovative ways to ensure our ag customers have access to the technology they need to have flourishing and profitable production.

WHAT TIPS DO YOU HAVE FOR FARMERS TO BE SUCCESSFUL IN THIS TECHNOLOGY ARENA?

Start with making a list of your biggest pain points and most time-consuming tasks, then engage in a conversation with a wireless expert to identify potential solutions for your business. Focus on the critical few first. We think it’s important to start small and grow into additional solutions as you see the benefit and ROI from some of the initial solutions you implement. ■

WHAT IS THE VALUE IN HELPING CONNECT RURAL AMERICA?

We want to ensure that farms of all sizes and functions — no matter where they are located — have access to the technology they need to be successful. Farming is vital to our economy, and our agricultural customers shouldn’t have to worry about wireless connection. We started in rural communities, so we know what it takes to build and maintain a network that keeps them connected. But beyond the network, they also need to have access to the technology they need to be successful with a wide array of IoT solutions that can be tailored for their exact needs.

WHY IS U.S. CELLULAR TEAMING UP WITH IOT AMERICA?

We strive to work with companies who share our commitment to an excellent customer experience. IoT America offers unique IoT applications and solutions that can enhance any ag operation. We have been building a suite of IoT solutions for several years and are diversifying our IoT portfolio and expanding our partner ecosystem to meet evolving customer needs.

EXPLAIN WHAT WILL BE AVAILABLE AND WHY?

We want our agricultural customers to have access to the latest IoT technology that can simplify their operations and cost-efficiently grow their business. Working with IoT America allows us to add several new ag solutions to help farmers and ranchers deliver higher yields and create efficiencies in their day-to-day operations. Whether a farm needs tracking devices on herds or tanks, facility monitoring or anything in between, U.S. Cellular agricultural customers have a cost-effective way to reduce the complexity of evolving their farm into a tech-forward business.

Jim Anetsberger is vice president of business strategy at U.S. Cellular, a full-service wireless carrier providing national network coverage and industry-leading innovations. The Chicago-based carrier offers a wide range of communication services that enhance consumers’ lives, increase the competitiveness of local businesses and improve the efficiency of government operations.
Disruptive Insights

“Without change there is no innovation, creativity, or incentive for improvement. Those who initiate change will have a better opportunity to manage the change that is inevitable.”

WILLIAM POLLARD | 1880s author

“We can help poor farmers sustainably increase their productivity so they can feed themselves and their families. By doing so, they will contribute to global food security. But that will happen only if we prioritize agricultural innovation…The world faces a clear choice. If we invest relatively modest amounts, many more poor farmers will be able to feed their families. If we don’t, one in seven people will continue living needlessly on the edge of starvation.”

BILL GATES | 2012 Annual Letter, Bill and Melinda Gates Foundation

“We are seeking to develop solutions that can be easily, cheaply and sustainably replicated across countries and regions. We need to increase our understanding of the innovation drivers and processes. We also need to look for concrete solutions, identify priority interventions and develop strategies to scale up successful experiences.”

JOSÉ GRAZIANO DA SILVA | UN Food and Agriculture Organization’s Director-General, November 21, 2018

“Goldman Sachs estimates precision farming — the combination of agriculture and technology — could be a $240 billion market by 2050. Automation will be a key piece of the puzzle. Market tracker Euromonitor says the intersection of robotics, artificial intelligence, analytics and machines for precision farming is one of the industry’s top business opportunities.

‘I think that this is the next great wave of agricultural productivity,’ says William Blair analyst Lawrence De Maria. ‘The implementation of precision agriculture with automation will drive yields and reduce input costs for growers. It could rival the Green Revolution and mechanization as great drivers of agricultural productivity.’

INVESTOR’S BUSINESS DAILY | August 10, 2018

“For today American agriculture is in the grip of a technological revolution as vast and as rapid as any in history. It is a revolution, which has made the American farmer the most efficient in history. It has made his productivity the marvel and envy of every nation…Experts from all over the world come to see our farms, to study our techniques, and learn our methods. And the farm technology we have developed here in the United States holds out hope to the world for the first time that no man, woman or child on earth needs to go hungry again.”

JOHN. F. KENNEDY | September 22, 1960

“The farm of the future, I think, could be very, very different from the farm of today. There is no doubt that there will be more automation on the farm. There will be many, many more sensors measuring all sorts of different elements of how to manage a crop on a farm…I have no doubt that these [digital] technologies are fundamentally going to change the way that we use our natural resources to produce food. Even today, I am sure we can’t even articulate where these technologies will end up 10 years from now.”

MIKE STERN | head of The Climate Corporation, as quoted by CNBC, August 22, 2018
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