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HOW AG TECHNOLOGY ATTRACTS INTERNATIONAL BUYERS OF U.S. SOY

by Doug Winter, U.S. soybean farmer

Executive Summary

Understanding ag technology's significance in the sustainability of U.S. Soy may lead international customers to continue buying our products. On my southern Illinois farm, we use technology such as yield mapping, GPS, autosteer, variable rate seeding, grid soil sampling and variable rate fertilizing for the added efficiencies they offer. The benefits to the farmer using the technology often flow down to the end user, as farmers' savings add up and buyers get a sustainable product high in quality.

This piece will discuss the technology farmers currently use, how it adds value to their operations and what they can expect to see for future use. It will focus on the practicality of the tech available and what it can mean to an international buyer. The goals include understanding:

- The influence ag technology has on the agricultural industry and international buyers.
- How tech has evolved since its introduction to the industry.
- How it can be a driver for international buyers to put preference towards U.S. Soy.
- The long-term outlook of the newest technology coming to market.

What Is Ag Tech?

Agricultural technology, or ag tech, has been available, in some form, since the early 20th century. Some argue ag tech was born the first time Mendel, the father of modern genetics, conducted genetic experiments on peas in the mid-1800s. Plant breeding is a form of ag tech; it's not all gadgets and sensors.

The Green Revolution with improved irrigation and crop management techniques, the introduction of fertilizer and pesticide technology, advances in machinery, research in plant breeding and precision agriculture practices all fall within the ag tech realm. Ag tech can be described as the use of technology such as global positioning systems, aerial imagery, computers and more to make informed agricultural decisions.

Where Tech Is Now

As with any technology, ag tech is constantly advancing, and tech-savvy farmers are constantly evolving. Many U.S. farmers use some type of technology on their farm, whether it be as simple as autosteer or as complex as aerial imagery. Technology adoption among U.S. farmers has increased significantly in the past few decades. Common forms of ag tech include autosteer, aerial imagery (drones, satellites), yield monitors/yield mapping, grid soil sampling and variable rate seeding/fertilizing.

Aerial Imagery

According to the United Soybean Board, aerial imagery technology has come a long way since it was first introduced to agriculture, and more farmers are adopting it each season. According to a survey of 1094 farmers conducted by Farm Journal Pulse, 33% of farmers said they used drones on their farms in 2017, and 31% said they would consider using drones in 2018.[6] It's clear more farmers are adopting aerial imagery technology, and for good reason.

Aerial imagery provides farmers insights such as:

- Collecting height measurements of crops.
- Detecting nutrient deficiencies.
- Scouting pests.
- Mapping soil types.
- Monitoring water levels throughout fields.

Agronomists, crop consultants and drone pilots use aerial imagery to quickly pinpoint problem areas in a farmer's field and keep track of data from field to field. Variable rate technology is another advantage aerial imagery provides farmers. One blanket rate of a pesticide or fertilizer is likely unnecessary over an entire field. Using aerial imagery to see which areas of the field need attention is an easy and efficient way to save time and money on inputs and labor costs. These cost-savings at the beginning of the process end up saving international buyers as a result. The combination of a quality product at a reasonable price helps keep international buyers interested in U.S. Soy.

Where Tech Is Going

Technology is continually advancing. A computer purchased one week ago is already outdated in the fast-paced world of tech. To stay current on ag tech while also remaining profitable, farmers must determine which tech to implement on their farms. They must choose what will maximize return on investment and increase efficiencies for their operations.

Satellite imagery helps farmers make data-driven decisions, leading to efficient management practices. Consumers and international buyers of U.S. Soy are concerned more than ever about their food and the environment, making sustainability a main goal of modern agriculture. Satellite imagery helps farmers gather data to manage their farms in a sustainable way. Minimizing inputs and maximizing outputs is ideal. Knowing the problem areas of a field from

satellite images, and managing them properly, makes this technology useful. For example, over-irrigating is a common efficiency issue on farms. But with satellite imagery, farmers have soil moisture data and know how much water is needed in specific areas of a field and can irrigate precisely.

Dr. Bruce Erickson, agronomy education distance and outreach director at Purdue University, lists specific pest identification using satellite imagery as an exciting goal for the future. "Incremental advances in this technology are more likely," says Erickson. There is a demand for cutting-edge technology in agriculture, now farmers have seen the potential of ag tech.

Thinking ahead in both short- and long-term forms of technology will lead to better management decisions and positive impact an operation.

Short-term

When mapping short-term goals, farmers must consider what they strive to accomplish within one year of production or sooner. The short-term focus is using existing technology to pinpoint smaller areas (e.g., areas within a field) for more accurate data and increased precision. Variable rate seeding, spraying, grid sampling and capturing aerial imagery will continue to be popular practices. From an ag tech perspective, seeing significant changes from using new technology during just one year is unlikely. Typically, and depending on the technology and farm, farmers who adopt a new technology practice can expect to see changes in about five years.[1] No company is going to release a new form of technology that will boost profitability in one year.

Long-term

The next five to ten years will bring several ground-breaking tech advancements to the industry, as well as updates to existing technology to be used in new ways. Top of mind is artificial intelligence and automation.

There are a few different words used to describe autonomy: autonomous, automated and driverless. These words are not interchangeable. Knowing the minor differences among these terms alleviates confusion. Simply put, autonomous machinery has less human intervention than automated machinery, and driverless requires no human guidance or interaction.

Thinking about the state of autonomy in agriculture often leads to comparisons with the auto industry. Like the automotive industry, agriculture has different levels of autonomy. One of the leaders in the agricultural autonomy space, Case IH, categorizes autonomy into five levels:

1. Guidance — autosteer capabilities.
2. Coordination and Optimization — data compatibility among vehicles in fields.
3. Operator-Assisted Autonomy — operator is in-vehicle, monitoring manual and automatic instrument adjustments. This is the level of most U.S. farmers today.
4. Supervised Autonomy — nearby supervision of multiple unmanned vehicles.
5. Full Autonomy — operator is not needed, and minimal supervision is required.

Researching, testing and perfecting the technology needed for fully autonomous equipment is no quick task. Decades of trial, error, designing and modifying goes into developing new equipment. The finished product must be as bug-free as possible and useful to farmers. They say good things take time, and if it's anything like autosteer, autonomous machinery will be worth the wait.

The thought of full autonomy may excite some efficiency-seeking farmers while worrying other farm workers. For the farm owners, having the ability to control equipment without being right there in the field and having only two or three hired operators is appealing. The labor shortage in agriculture may have met its match with these innovations. The question is what happens to those existing farm workers who depend on the labor demand from farmers.

The risks of having large machinery without a visible operator may seem high, which is why regulators may have trouble giving autonomy the go-ahead for widespread adoption.[2] Similar to the auto industry, critics think of several ways things can go wrong with autonomous machines, while not considering all the benefits that could lead to increased efficiency and accuracy. The reality is autonomous technology will likely arrive on the farm by retrofitting machinery farmers already own. We'll begin to see more operations become autonomous before we see driverless machines in fields.

Another long-term tech advancement is real-time optimization. This practice eliminates the need for manual calibration. The benefits of this practice include fewer operator errors and data mistakes from mis-calibrating equipment.

Numerous startups and major companies are currently building and testing various forms of robots with plans to release the technology in the next decade. These forms of ag tech mean less hands-on scouting and management, and fewer boots in the field.

Practical Applications and Implications of Tech in Agriculture

Ag tech's impact on society can already be observed and measured. Increased sustainability in the form of fewer resources used, more efficient and increased production and the idea of "only applying what you need" has led to cost savings for farmers, who are using less to do more.

The rural-urban connection

Tech giant Amazon recently made headlines when the company released a job posting for an agricultural technical professional.[3] The job description details the position, the first of its kind, as work for the Amazon Web Services Solutions Architecture team. Qualified candidates would possess a technical background and ability to think strategically and long-term about global business needs. This is a breakthrough for the rural-urban divide existing in agriculture. Consumers and forward-thinking organizations are pushing for more transparency in agricultural practices. Having ag experts working alongside professionals in e-commerce, cloud computing and artificial intelligence is a big step towards a more sustainable future — not only the U.S. but the world.

The U.S. Sustainability Alliance at www.thesustainabilityalliance.us

Barriers to Tech Adoption

Ag tech has made many advancements in recent decades, but the journey has not been without challenges. As with nearly any innovation, there are groups who oppose and those who can't get their hands on it fast enough. Many things must be considered before a new technology comes to market. Safety and regulatory issues often go hand in hand in this aspect. There will always be the laggards, just as there will always be the innovators.

When thinking of mass adoption as a barrier, the industry must consider the diversity among soybean farmers and the vast geography soybean farmers cover. Rural connectivity can be one hurdle for farmers wishing to adopt more technology, and the recent administration is pushing for change.[3]

Opportunities for International Customers

International buyers of U.S. Soy are looking for a quality product at a reasonable price with a reliable supply. For years the U.S. has been No. 1 in customer service, consistently giving buyers what they ask for.[5] Along with the reliance on a quality product, international buyers can have peace of mind, knowing they are getting truly sustainably grown U.S. soybeans. U.S. soybean farmers grow a top-quality product which is produced efficiently and safely. U.S. Soy has proven better nutritional quality with the following attributes:

- Superior amino acid profile and amino acid digestibility.
- Increased metabolizable energy.
- Lower fiber content.
- Higher total phosphorus.[5]

Conclusion

Ag tech is a fast-moving machine, with no signs of slowing. Technology adoption among farmers isn't slowing either. Staying on top as a soybean farmer means staying current on the ag technology available. Identifying what's out there and what will add benefit to an operation is what U.S. soybean farmers must continue to examine.

Keep in mind that while technology changes overnight, farmers cannot constantly add or change their tech to keep pace with the industry. There will be a lag in adoption, but not a decrease. Farmers must consider what the best fit for their operation is. Technology is not one-size-fits-all. It's dynamic, and it's progressive.

For farmers to tackle every possible technology option available all at once is expensive and unrealistic. Agriculture is a story of evolution when considering the developments in equipment, seed, crop protection and fertilizer applications farmers use to maximize profit opportunities and production efficiencies for their operations. The emergence of precision technology and digital agriculture data are part of this evolution and will continue playing a greater role in the farming and agricultural industry.

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Doug Winter and his wife, Nancy, a certified public accountant, grow soybeans, corn, wheat, and grain sorghum on their farm in Mill Shoals, Illinois. They have two grown children, Charisse and Neil. Doug serves as a director for both the U.S. Soybean Export Council (USSEC) and the United Soybean Board (USB).

Note from the Editor:

The U.S. Sustainability Alliance (USSA) comprising of American farmers, fishermen and foresters was formed with the recognition that sustainability is not an arbitrary threshold, but rather a commitment to continuous improvement and innovation. A goal of the Alliance is to share U.S. stewardship and sustainability practices with colleagues and counterparts across the world for greater mutual understanding of resource management practices.