State of the Industry: Adoption of Precision Ag Grows as Farm Sizes Grow

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Since the first auto-steer tractor was introduced in the 1990s, precision agriculture has only gained traction amongst farmers for its cost and time savings benefits — and it's a trend that's not likely to slow down anytime soon.

Farms are generally growing in size across the globe. In the U.S., the percent of cropland on farms with at least 2,000 acres was more than double the percent in 1987, from 15% to 36%, according to a 2018 USDA Economic Research Service (ERS) report. And both the Australian Department of Agriculture and Water Resources and the European Environment Agency are reporting a trend of increasing farm sizes while the number of farms decreases, on both continents.

The trend for larger farms is thanks in part to precision technology. The ERS report says that technologies like GPS guidance systems, yield, and soil mapping, and variable-rate technology (VRT) “appear to have spurred further increases in farm size,” as they allow farmers to manage more land.

And as farms continue to grow, so will their use of precision ag. A 2016 ERS report found that larger farms are more likely to adopt these technologies, with some of the highest adoption rates being on farms with more than 3,800 acres. In the paper, “Adoption of Precision Agriculture Technologies in Developed and Developing Countries,” the authors say that “farm size is one of the most crucial factors affecting the precision ag technologies,” and specifically points out that the large farm sizes in the U.S., Australia, and Canada, make the farmers in these countries “more willing and able to adopt new technologies.”

This growth in both farm size and the use of technology will require farms to be more connected and integrated than ever before. Both people and machines will need to be able to communicate with one another effectively so that operations and information on the farm can both run and be shared as seamlessly as possible.

But in order to get where we’re going, we have to understand where we are now, and what challenges are preventing farmers from getting the highest return on investment with their precision technologies.

Adoption Pace of Precision Ag Picks Up

More farms than ever are using precision ag technologies.

In the U.S. in the early 2000s, the adoption rate for precision ag was only up to 22% across major field crops, according to the 2016 ERS report. But by 2010, use of most precision ag had increased.

Data collection was one of the top technologies for growers to adopt. The report found that in 2010:

- Yield monitors that produce data for GPS-based mapping are used on about 50% of all corn and soybean farms.
- Yield mapping on corn and soybean crops grew from less than 10% in 2001-02 to 30% or higher in 2010-12.
- About 25% of corn and soybean farms utilize GPS-based yield mapping.
- More than 20% of corn, soybeans and rice farms are using VRT.

Guidance systems and auto-steer are also on the rise — as of 2013, guidance was used on 45-50% of corn, rice, soybeans, peanuts and spring wheat acres.

The report's findings also showed the larger the farm, the higher the adoption rate. In 2010,

the highest adoption rates were on farms with more than 3,800 acres, with:

- 80% using GPS-based soil or yield mapping
- 84% using guidance systems
- 40% using VRT

The report also notes that VRT adoption is more prevalent on farms with more than 1,700 acres than those with less acreage.

Western Canada has also seen a strong adoption rate of precision ag technologies. A producer survey conducted by Dale Steele for Agriculture and Agri-Food Canada in early 2017 found that of the 261 respondents:

- 98% used GPS guidance, with 79% using GPS auto-steer guidance
- 84% had combine yield monitoring capabilities
- 81% managed their own farm data
- 48% were using prescription maps and/or VRT
- 75% intended to use more precision ag in the future

It's worth noting that the average farm sizes in Manitoba, Alberta and Saskatchewan all grew between 2011 and 2016. According to Canada's 2016 Census of Agriculture, Manitoba had an average farm size of 1,193 acres, Alberta's average was 1,237 acres, and Saskatchewan had the highest average of 1,784 acres.

Australia has also seen a high adoption rate of auto-steer and guidance, with 90% of grain farms utilizing the technology in 2016, according to the paper "Prospects for yield improvement in the Australian wheat industry: a perspective."

Adoption of precision ag hasn't been as fast in all regions, however. According to a 2016 study by the European Parliament, it was estimated that only 25% of EU farms use technologies that include precision ag.

But even though the adoption rate is lower, it is growing. A Farm Practices Survey completed in autumn 2012 in England found that since 2009, adoption of:

- GPS grew from 14% to 22%
- Soil mapping increased from 14% to 20%
- VRT rose 3 percentage points to 16%
- Yield mapping grew 4 points to 11%

Certain precision ag technologies, such as drones, have also seen a slower adoption rate. Anne Effland, senior economist for the USDA's Office of the Chief Economist, says this likely due to the cost and learning curve involved in utilizing the technology most effectively.

A survey conducted by Munich Reinsurance America Inc. in 2018 found that while 74% of the 269 farmers who participated in the survey are currently using or considering adopting drones, 76% have concerns with using them. The top concern was privacy issues, along with data security and potential damage or injury caused by the drone.

The survey of Western Canadian producers also found that only 19% looked at in-season crop imagery captured by drones, but notes that the use of them in ag had grown quickly over the previous 3 years.

But of the farmers that are utilizing drones, whether on their own or through an outside company, 83% use them either daily or at least once a week. Crop monitoring is the top reason farmers are already using or are considering using drones, followed by soil and field analysis and health assessment of crops and livestock.

While farmers continue adopting existing technologies, there are new technologies trending on the manufacturing side of agriculture, primarily autonomous vehicles. Several equipment manufacturers have introduced their own autonomous tractor prototypes and implements. It may not be long before these vehicles and robots make their way into the marketplace.

Data, Machine Compatibility Create Challenges

When looking at the financial benefits, it's not surprising to see why adoption of precision technologies has increased. The 2016 ERS report found that corn farmers experience an estimated cost savings of:

- 4.5% with yield maps
- 2.7% with guidance systems
- 3.7-3.9% with variable-rate technology

The 2012 Farm Practices Survey found that 63% of English farmers use precision ag to reduce input costs, while in the Adana province of Turkey, 80% of farmers using auto guidance have experienced time and fuel savings, nearly 51% saw labor savings, about 18% saved on ag inputs and 14.5% saw yields increase, according to the paper "Farmers' Experiences with GNSS-Based Tractor Auto Guidance in Adana Province of Turkey."

But the benefits go beyond the farmer's bottom line. One of the most common comments by farmers who use auto-steer systems is less fatigue compared to when they used to drive their tractors and combines manually. This not only improves their quality of work life but allows them to better concentrate on the tasks being performed by the machinery they're running, and ensure everything is working properly.

Despite the numerous advantages of implementing precision technology, it doesn't come without its challenges.

One of which is taking the farmer's data and boiling it down into useful information. This means the farmer will either need to find the time themselves to go through the data or hire someone to do it for them. And whoever does go through the information needs to understand what the data is telling them. This means being able to follow the trendlines and identifying outliers, then determining what caused those outliers.

Understanding data is not the only challenge. Problems can also pop up in sharing data, especially if there are different systems involved.

For example, Lee Swinson, a peanut farmer in North Carolina, says that to share his sprayer records from one system to another, he has to convert the data on one display before loading it on the other. With peanuts being his most spray-intensive crop — requiring multiple sprayer passes throughout the season — not only does this process eat up valuable time, it also increases the likelihood for human error.

This is typically more of an issue on farms with mixed fleets, where every piece of equipment may be running its own proprietary technology that isn't compatible with other brands. This can not only be an issue in sharing data but in having the equipment communicate with one another, especially with variable-rate application tasks such as sidedressing or planting.

If data storage and sharing relies on the use of thumbdrives, there is always the risk of the operator losing or misplacing the thumbdrive, and subsequently, the data.

The challenges associated with sharing data also increase the odds for inconsistencies. If the data can't be shared easily or there was a mistake made, operators may end up using the wrong guidance lines or prescriptions, or may not even be in the right field if that field is named inconsistently throughout a farm's records.

This can not only lead to lost time and resources, in some situations it can result in serious damage or liabilities, such as applying a pesticide product to the wrong field.

Sometimes these mistakes are not the fault of the data but due to human error, whether it's because of miscommunication, an oversight or even a language barrier if an employee is not fluent in the same language as their manager.

Data syncing problems can also occur. What shows up on the office computer may be outdated than the information displayed on the tractor display and vise versa. This may be a bigger issue for farmers who lack access to reliable cellular service or broadband internet.

According to the FCC's 2016 Broadband Progress Report, 39% of rural Americans lack access to 25 Mbps/3 Mbps internet speeds, the minimum download and uploading processing times the FCC considers to be broadband. In fact, 20% in rural America lack access to even 4 Mbps/1Mbps internet service.

Selection for Future Success

While some of these challenges may be out of a farmer's hands, one thing they can do to help them stay up-to-date with technology is be strategic about the brands they purchase, and ultimately, commit to one.

Although ISOBUS is making it possible for mixed fleets to communicate with each other, deciding on one brand or company ensures they have something they can add capacity to over time, and integrate into without antiquating what they already have. No company will have a completely built-out system at once — it will build out over time.

Which is why farmers should feel confident that the company they choose is an integrator of technology who will find ways of adding new capabilities to the products that already exist on their farm. The key is to set themselves and their equipment up to continue evolving with new technology.