

Why drones may become as important to Iowa farmers as tractors

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(Photo: Michael Zamora/The Register)

SCRANTON, Ia. — From the shade of his back deck, Randy Christensen can check on his cows and calves a mile away.

He can zip above his cornfields to assess the health of his family's sprawling 1,500 acres of cropland, and get a live, bird's-eye view of his soybeans.

Chores that not so long ago would have required a trip on a pickup truck or four-wheeler, Christensen now assigns to his \$3,000 drone — which he expects will soon become commonplace on Iowa farms.

"It's going to make us lazy," he joked. "In our business, they're almost becoming a necessary tool."

With better and cheaper models hitting shelves, a growing number of Iowa farmers like Christensen say drones are helping them assess the performance of vast acres of crops throughout the growing season.

While still not widespread, acceptance is growing. In Iowa, agriculture is listed second behind aerial photography as the top reason for drone operators requesting federal flight exemptions, according to an Association for Unmanned Vehicle Systems International [database](http://www.auvsi.org/advocacy/exemptions70) (<http://www.auvsi.org/advocacy/exemptions70>).

Drone enthusiasts expect the machines eventually could be the next technological leap for farms: Saving farmers time and money and helping improve yields.

Christensen, 33, likens his drone to the auto-steer capabilities of modern tractors, combines and sprayers. Many farmers balked at the technology initially, but it's become commonplace on the farm.

"Guys are going to buck the trend for a long ways," he said. "And then once you get it, you don't know how you lived without it."

'You could see as far as you wanted to walk'

The power of drones, Christensen says, is that they help him identify larger patterns and investigate specific crop problems.

They also help him see more of a field in less time.

"You could see as far as you wanted to walk," he said, "and when you're walking through there and the tassel's a foot above your head, you only see what's right in front of you."

But drones have their limitations.

Iowa State University Extension Agronomist Mark Licht said the eagle-eye view from drones can pick up on problems with tile lines, tractor compaction or fertility misapplications.



Andrew Lauver certified services agent with DuPont Pioneer flies his DJI Phantom III to check crops Wednesday, July 5, 2017 near Ralston, Iowa. (Photo: Rodney White/The Register)

But many of those issues can't be corrected during the growing season. And even when assessing crop health, drones aren't always much help in divulging root causes.

"The imagery helps identify 'good' areas and 'bad' areas," Licht said, "but at this point doesn't necessarily tell what is causing the 'bad' areas to be bad."

For now, he expects ag retailers and crop consultants to use drones more widely than individual farmers.

'It will be here sooner, rather than later'

Many farmers are buying the same drones that consumers pick up from big-box retailers.

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"It's basically what you go to Walmart and buy yourself," said Jeremy Groeteke, senior manager of digitization at DuPont Pioneer in Johnston.

But researchers at DuPont Pioneer have altered and built more sophisticated drones that can do more than shoot pictures and video.

Their models have special sensors that can measure plant height, count the number of plant stands in a given space and pick up color variations not visible to the human eye.

Those drones mostly are used to monitor test fields in the company's internal plant breeding programs.

But Groeteke says early signs point to real potential for widespread use of these machines on individual farms.

Drones with more complex sensors can collect and analyze data, rather than simply spitting out images or video frames.

Eventually, Groeteke believes data from drones can be combined with weather readings, information on plant genetics and soil data to give a more complete picture of crop health and challenges.

While the high-powered drones aren't widely available, Groeteke said they are getting closer to widespread commercial viability.

"It will be here sooner, rather than later," he said.

Even so, the value of drones is already becoming more evident: About 20 percent of Pioneer's 300 independent crop consultants, called crop services agents, have purchased drones to help scout customers' fields.

7 photos: Drone farming in Iowa

In Groeteke's native Nebraska, farmers use drones to remotely check the performance of giant pivot irrigation heads.

And some ranchers in Nebraska rely on them to check on cows and calves across sprawling pastures.

While some farmers may hesitate to adopt the new technology, he says they are naturally inclined to trial and error.

"It's not so much even the technology," he said. "It's new practices, new seeds, new chemistry, whatever it is. Growers constantly look to improve operation."

'Nearly every farmer' will have a drone

For now, two distinct classes of drones are flying over America's farms, said Phil Ellerbroek, director of global sales for RoboFlight and Agpixel, a Johnston company that uses unmanned and manned aircraft to collect and analyzing agricultural data.

There are the commercially available drones that farmers buy at the store, which can be had for as little as a few hundred dollars.

Then there are the high-tech models used largely by big ag companies and university researchers that can cost tens of thousands each.

But Ellerbroek said the gap between the two is quickly shrinking.

A drone Ellerbroek meticulously assembled and soldered five years ago might have cost \$15,000.

He said you can buy roughly the same thing now for \$750 to \$1,000 at Best Buy and Amazon.

"So yes, it's becoming more and more affordable," he said. "I envision that if not now, in the very near future, nearly every farmer of any type of scale will have one of these drones, even if it's just for general photos and videos."

Ellerbroek's firm works primarily with ag companies and academics. Their drones stitch together multiple images into one high-resolution image of a field.

By using both images and data, the drones can pick up on plant stress weeks before the naked eye, he said. Sensors measure plant color, which during photosynthesis indicates health.

"The human eye sees 16 energy levels of green, where the drone sees like 20,000," he said. "And it sees it two weeks earlier than the human eye."

How Iowans are using drones

Number of FAA exemptions in Iowa for drone use by intended use in 2016:



Source: Federal Aviation Administration

Drones doing manual labor?

Like other technological advancements, the high-tech drones will likely be adopted by the farmers with the biggest operations first, said David Miller, director of research at the Iowa Farm Bureau Federation.

Smaller players will likely rely on co-ops and crop consultants who can fly over 10,000 or 20,000 acres across several farms.

Those same economies of scale are why he hires his local co-op to apply fertilizer with a variable-rate sprayer, rather than investing in his own at his 500-acre farm south of Des Moines.

"It isn't so much whether you own the technology," he said, "as it is, 'Do you have access to it?'"

Miller said researchers in Arizona have started testing the use of drones on cotton plants to apply insecticide only to portions of a field showing damage from insects, drastically reducing the chemicals needed.

He said drones may eventually be able to do the same thing with fertilizer in soybean and corn fields: Apply nitrogen only to the exact areas where sensors detect a need.

"I think it's going to move to that," he said. "But we need both more development on the sensor technology, the speed at which the analysis can happen and more ability to carry payload."

'Nothing's better than going out and looking at the crop'

Hal Tucker just purchased a drone for his Storm Lake-based independent crop consulting business, Tucker Consulting.

He thinks the machines have promise, but he's skeptical about how much they'll substantively change farming.

"It just helps you in certain situations," he said. "It's not a substitute for scouting by ground."

Recently, he was looking for rootworm beetles, a task he said is better suited for professionals than his drone.

"Nothing's better than going out and looking at the crop," Tucker said. "Even if you do have a drone, you still need to go out there and figure out what's happening in areas that are a concern."

There could be problems with nitrogen levels. Or water. Or insects.

"You've got to be able to separate those out," Tucker said. "Going out there and looking at the field is the best way to do it."

He's not complete skeptic. After all, he did fork over several thousand dollars to buy his own drone.

"There's no way I can scout a 200-acre field as good as if I flew over it," he said.

Drones will soon be 'a total expectation'

Andrew Lauver, a certified services agent with DuPont Pioneer, said he purchased a drone to provide more value to his 34 customers.

He uses his small white aircraft to help monitor nitrogen and fertility levels in their fields throughout the growing season by keeping watch over plant growth.

But he knows that eventually farmers will be able to do that themselves as they buy their own models.

"At some point, me saying 'I'll come fly your fields won't have as much value," he said.

Drones allow farmers to make more mid-season decisions, he said, whether it's replanting early in the season or applying fertilizer throughout the season.

They can replicate some of the analytics provided by yield monitors in combines, but at a much earlier point in the season.

By closely monitoring individual sections of fields, Lauver believes drones can help prevent nutrient runoff on farms, a major environmental concern in Iowa that contributes to the state's poor water quality.

"We don't want to put on more nitrogen than we need," he said. "We want to have just enough."

Aside from his crop-consulting business, 26-year-old Lauver said his drone has already paid for itself through higher yields on his family's 500-acre Rockwell City farm.

"I couldn't tell you it returned (exactly) \$10.50 per acre," he said, "But it's returned the cost I've paid for it. And there's not a lot of overhead costs."

For now, Lauver plans to continue offering drone scouting as a free bonus for his customers. He thinks he'll eventually start training other farmers to fly drones.

"Even five years from now, if you don't have technology like drones to deploy, I think it would be a hindrance to business," Lauver said. "It will be a total expectation."

How the government regulates drones

The Federal Aviation Administration requires that drones used for commercial purposes to be registered, with pilots securing certification, paying licensure fees and following rules regulating the safe operations of drones.

Experts say drones used for crop scouting or other agricultural tasks likely require commercial licensure to meet FAA standards, though some operators purchase off-the-shelf drones to avoid the regulatory hoops.

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