Drones give farmers an eye in the sky to check on crop progress

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Drones -- unmanned aerial vehicles -- scout wheat on the university's South Farms. Credit: L. Brian Stauffer

This growing season, crop researchers at the University of Illinois are experimenting with the use of drones – unmanned aerial vehicles – on the university's South Farms.

Dennis Bowman, a crop sciences educator with U. of I. Extension, is

using two drones to take aerial pictures of crops growing in research plots on the farms. He presented his findings to farmers and other researchers at the 2014 Ford / Iroquois County Agronomy Day meeting.

Bowman intentionally made mistakes on one test plot – "areas where we didn't apply enough nitrogen fertilizer, where we simulated mistakes in the applicator, where we shut the boom off for a short period of time or plugged it up and ran for a while," Bowman said. "As the crop gets up and going, we'll fly over it and see if we can detect those areas sooner than we could visually from the ground.

"We're also looking at doing some scans over our herbicide studies to see if the drone photography can help us identify where crops are stressed by postemergence herbicide applications."

For farmers, aerial photographs taken by drones offer a quick and easy way to check on the progress of crops and determine where they may need to replant or direct pesticide applications.

"I spent two summers as a commercial crop scout before I went into Extension, and walking through tasseling corn in the heat of summer is not a pleasant task," Bowman said. "The odds of actually getting to the far end of that field on foot to see what's going on are pretty slim. To get a bird's-eye view of your crop, the drones offer a handy way to do it."

Both drones Bowman is using are multirotor helicopters, or quadricopters. Bowman bought the first drone last fall. It's a remote-controlled Phantom, manufactured by the company DJI. This spring, he bought a second aircraft, an A.R. Drone 2.0 with GPS produced by the French wireless electronics manufacturer Parrot.

Using rechargeable lithium polymer batteries, each drone can make flights of about 10 to 15 minutes. The computers in the drones are

similar to those used in smartphones.

The Phantom, which cost about $500, was a ready-to-fly model equipped with a mount for a GoPro camera. With the addition of the mount, a camera and a gimbal to keep the camera level, Bowman's total investment was about $1,000.

When the Phantom is turned on, its computer starts the GPS, and the flight control system runs through a one- to two-minute process of locating and locking on to GPS satellites to establish the drone's home position. If launched properly by allowing the flight control system to orient itself with the satellites, the Phantom drone will return to within 1 meter of its home position when the operator turns the transmitter off.

The Parrot drone, which cost about $250, can be controlled with a smartphone or tablet using Apple or Android operating systems and Wi-Fi signals. The Parrot came with a protective polystyrene hull for use indoors, and Bowman has demonstrated it during meetings with area farmers.

"When I'm running the Parrot drone during a conference, I pick somebody that looks scared when I pull it out, and I take the iPad over to them and tell them I'm going to have them launch it for me," Bowman said. "You press the screen where it says 'take off' and the drone pops up 3 feet in the air, hovers and waits for you to take over flying it."

"Standard pictures and video taken with drones can tell us a lot," Bowman said. "But what we're looking to give us even more information is multispectral cameras that can give us imagery in other wavelengths, such as near-infrared, to help us identify areas of crop stress. It probably isn't going to tell us what the problem is, but it will tell us where problems are so that we can target our scouting in those specific areas and determine what might be occurring."

Bowman has a Canon Powershot SX260 camera that has been modified and equipped with an upgraded lens for infrared photography, which will help the researchers identify plants in the South Farms' plots that appear to be absorbing or reflecting light differently, an indication that the plants are under some type of stress, such as pests, disease or nutrient deficiencies.

The drones also may be deployed in the battle against Palmer amaranth, an invasive weed that is spreading across the Midwest and has been found on the South Farms. Palmer amaranth is becoming increasingly resistant to herbicides and spreads so prolifically that it could drastically reduce farmers' yield potential in affected fields.

"Before the soybean rows close, or if we get a different spectrum response from some of these weeds as they break through the canopy, we may see some of those weeds show up in the imagery as well to identify where there are hot spots and problems," Bowman said.

Commercial use of unmanned aerial vehicles in U.S. airspace was banned by the Federal Aviation Administration in 2007, although growing numbers of hobbyists have been toying with the use of drones, particularly for aerial photography.

However, facing mounting pressure from agribusiness, retail and other industries, the FAA is expected to release new policies by 2015 that will enable businesses to integrate drones into their operations. The agriculture industry is expected to be one of the largest market segments for drone usage.

"If the FAA rules come through, and the price of the technology comes down, it doesn't seem all that far-fetched to me to think that not too far in the future a farmer will get up in the morning, hit a button and launch a couple drones that fly out over his farms and collect imagery that's sent

wirelessly to his office," Bowman said. "And one of the first things he could do at the beginning of the day is sit down and scan his fields to see if anything has happened that needs his attention."

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