Unmanned aerial vehicles advance agriculture

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Unmanned aerial vehicles (UAVs), more commonly referred to as drones in a majority of media outlets, have played an important role in U.S. military operations. These sophisticated flying machines have proven their utility in this arena, albeit at a huge price. Now the UAV industry is looking to expand into the civilian world, and the agricultural sector is expected to play a large role in this expansion.

Currently, the Federal Aviation Administration (FAA) is determining how unmanned aircraft systems (UAS) might be safely integrated into the national airspace system. The FAA uses the acronym “UAS” to include the UAV and all the associated support equipment, such as control stations, data links, telemetry, communications and navigation equipment. Often the image that comes to mind when thinking about UAVs or drones is something like the iconic Predator with its nearly 60-foot wingspan and a loaded weight of more than 1 ton. This type of UAV will occupy the same airspace routinely used by general and commercial aviation.

The challenge the FAA has in figuring out how to safely integrate these large UAVs into the national airspace is not trivial. However, agriculture can benefit from UAVs much smaller than the Predator. A system with a takeoff weight less than 55 pounds is classified as a small UAS by the FAA, and the agency has made it a priority to propose new rules governing their use. These UAVs are more of the scale and type that are legally flown now at elevations of 400 feet above ground level and lower by hobbyists for recreational purposes. Many of these UAVs, like the one pictured, can be easily disassembled and transported in a case the size of a large briefcase.

Like other classes of aircraft, small UAVs can be fixed wing or rotary wing. The fixed-wing aircraft tend to be more stable and require less power to stay aloft than the rotary-wing craft, but they are also less agile. Many UAVs use an autopilot system to sense their position and altitude, and make necessary corrections to stay upright and on path. Once this type...
of UAV is airborne, the operator has little or nothing to do with the flight. Flight plans are typically designed using software on a laptop computer, and the flight path is communicated over a data link to the UAV. When the flight is complete, the UAV returns to a spot the operator has designated for safe landing. Some rotary-wing aircraft can return to the very same spot where they began flight. Initially, UAVs will be useful for agriculture because of their ability to deploy meaningful sensors, making it easy for users to observe resources from a vantage point not previously feasible.

In some ways, UAV technology is positioned where personal computer technology was in the late 1970s. Computers at that time were large and very expensive, but they had proven useful in government and business. The personal computer was mainly of interest to hobbyists and produced few real-world benefits. Many believed the personal computer would remain a curiosity of this small group of enthusiasts. At that time, it would have been hard to believe that one day many families would own multiple computers or even imagine the now ubiquitous smartphones and tablets. The high cost and difficulty of using a personal computer in the 1970s were big adoption hurdles.

For the UAV today, the hurdles are regulatory (though for the small UAS, these should be overcome soon), cost and the lack of simple tools that can use sensor data to help producers make decisions. In crops such as corn and soybean, a number of tools are already available, and the development of similar tools for rangelands and forage crops will follow. If UAVs follow a similar path as the PC, low cost and useful tools will come – perhaps in ways we can’t even imagine now.