

Unmanned Aerial Vehicles: The Sky is the Limit!

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With Certified Crop Advisers

Unmanned aerial vehicles (UAVs), often called drones, are a hot topic in the agricultural industry. Drones, fitted with a wide range of camera and lens types, have the potential to revolutionize business as usual by bringing detailed, timely, and unique crop data to the producer.

Some producers already use UAVs fitted with cameras to check distant watering sites, track their livestock, and check for pests, crop deficiencies, field moisture levels or document crop failures. The sky is truly the limit for aerial technology!

What is a drone?

In Federal Aviation Administration (FAA) terminology, an unmanned aircraft system (UAS) – generally equivalent to a drone or UAV – is an aircraft without a human pilot onboard; either an operator on the ground controls it, or it is auto-piloted by an onboard computer system. The FAA sets specific regulations regarding the weight of aircraft and camera, plus rules governing the on-ground pilot's maneuvers and locations. *Note that the FAA requires operators flying for work-related purposes to obtain a certificate to fly a UAV.*

Two basic types of UAVs are commercially available to the producer, either fixed-wing (e.g. small airplane) or multi-rotor (e.g. quadcopter). Fixed-wing UAVs have longer flight times and bigger payload capacities but are usually more expensive. Multi-rotor types generally have shorter flight times, lighter payloads, are more maneuverable and are generally less expensive.

Aerial imagery

For many agricultural uses, the utility is not the drone itself but the aerial photographs it can provide. Aerial imagery is a powerful tool allowing producers to see patterns that aren't visible from the ground, at the time and place of their choosing.

Cameras mounted on a drone can be fitted with special lenses that see things the human eye can't. Using multispectral and hyper-spectral lenses, cameras can capture data in infrared, ultraviolet, and very narrow visible light bands. Videos, single photos, multi-spectral images such as near-infrared or thermal, or combinations of these, are all possible.

Many plants show signs of stress and growth in bands that are invisible to the naked eye, while others show signs of growth in very narrow visible light bands, so the special lenses provide information that is otherwise difficult to get. A producer can obtain evidence of water stress, chlorophyll production (photosynthesis), weed distribution, nutrient deficiencies and disease hot spots.

A camera connected to a GPS system can take "geo-tagged" images referenced to specific field locations. This allows for comparing images taken at different times as the growing season progresses.

As with any technology, cost and complexity vary greatly. Special lenses that capture non-visible light add to the price. And because of the large amounts of data collected, the more complex systems require special software designed to analyze and process the raw data before they can provide usable images. Most set-ups will come with the necessary software, for additional cost.

Some might ask, "Why not just use satellite imagery?"

UAVs have several clear advantages over satellites. First, a typical satellite image resolution of 50 feet is quite coarse compared to UAV images. That means everything within a 50-foot by 50-foot area is represented by one pixel (one color). Conversely, the area represented by one pixel in a UAV image can be on the order of a few inches. UAV images can monitor individual plants if needed.

Additional advantages of UAVs include being able to fly them according to the producer's timetable, not the satellite's passing, and avoiding atmospheric interference such as cloud cover, which often affects satellite imagery.

Will one work for you?

To summarize, the advantages of UAVs are clear – they can fly according to your own timing and weather, record the precise level of detail you need, and allow you to track a host of pertinent crop data. They provide an opportunity to make management decisions immediately and with precision that is well below the width of a seeder or sprayer. This approach, often called precision agriculture or "data-driven" agriculture, offers significant cost-saving benefits.

However, many questions must be answered as you determine whether a UAV system is right for you. How many acres do you need to photograph in a day? How often? What types of imagery would be best for your operation? What kind of resolution will your management decisions require?

Your answers will determine what type of equipment will be needed and whether purchasing or outsourcing is more cost-effective. Producers often have enough going on that many might want to outsource this task.

There are commercial options for UAV services. However, when considering outsourcing, keep in mind that some amount of agronomic expertise is still likely needed for interpreting the information collected.

For Markus Braaten, Certified Crop Adviser based in Kalispell, the crux of the matter is this: What questions do you want to answer with aerial imagery, and is UAV technology the best way to answer those questions? Consider how you would expect to use this technology, what value it would bring to you as a producer. You will need to determine whether its benefits would justify the cost.

UAVs are an emerging technology in the agricultural industry. Their use is not yet commonplace, and issues of privacy have been raised regarding detailed aerial imagery.

Discussion continues on what is acceptable use and how UAVs fit into a producer's toolbox. Like any new technology, UAVs will continue to get easier and cheaper to use and more prevalent in the industry. Their impact in the agricultural sector will very likely grow.

If you would like to discuss the pros and cons of UAVs for your business, seek out a reliable resource such as a Certified Crop Adviser in your area.

For more information on certified crop advisers, or to find one near you, go to <http://www.certifiedcropadviser.org>.

For accompanying sidebar:

FAA Rules

The rules for operating an unmanned aircraft depend on why you want to fly. The FAA says when you fly a drone in the United States, it is your responsibility to understand and abide by the rules.

The rules for operating an unmanned aircraft

Fly for Fun

Fly for Work

Pilot Requirements	No pilot requirements	<ul style="list-style-type: none"> Must have Remote Pilot Airman Certificate Must be 16 years old Must pass TSA vetting
Aircraft Requirements	Must be registered if over 0.55 lbs.	<ul style="list-style-type: none"> Must be less than 55 lbs. Must be registered if over 0.55 lbs. (online) Must undergo pre-flight check to ensure UAS is in condition for safe operation
Operating Rules	<ul style="list-style-type: none"> Must ALWAYS yield right of way to manned aircraft Must keep the aircraft in sight (visual line-of-sight) UAS must be under 55 lbs. Must follow community-based safety guidelines Must notify airport and air traffic control tower before flying within 5 miles of an airport 	<ul style="list-style-type: none"> Must keep the aircraft in sight (visual line-of-sight) Must fly under 400 feet Must fly during the day Must fly at or below 100 mph Must yield right of way to manned aircraft Must NOT fly over people Must NOT fly from a moving vehicle
Example Applications	Educational or recreational flying only	<ul style="list-style-type: none"> Flying for commercial use (e.g. providing aerial surveying or photography services) Flying incidental to a business (e.g. doing roof inspections or real estate photography)

https://www.faa.gov/uas/media/Part_107_Summary.pdf and <https://www.faa.gov/uas/> are websites for more information on UAS/UAV regulations.

The New Small UAS Rule (Part 107), including all pilot and operating rules, went into effect as of 12:01 a.m. EDT on Aug. 29, 2016.