

# Drones

## Drone and Sensor Options and Costs

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There are many different types of drones, or unmanned aerial vehicles (UAV), and sensors available for use in agriculture. This fact sheet will provide information about these technologies and their relative costs.

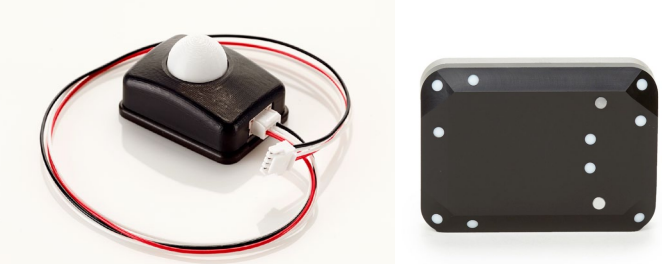



There are two main types of drones available; fixed wing and multi-rotor. In general, fixed wing drones are more expensive but can usually fly faster and have a longer battery life so they can cover more area in less time than a multi-rotor. They are also flown autonomously. A multi-rotor can hover in place and usually requires less area for landing. These drones can be flown autonomously or manually which also allows for video.

Sensors can be used to detect a number of different wavelengths, such as thermal and infrared, and can focus on specific wavelengths, such as blue or red. In general, the more sensors available within a device, the greater the cost. Many drones can have sensors added.

The following tables describe different types of fixed wing and multi-rotor drones and sensors that can be used in the field. The costs shown reflect prices as of May 2020 and are subject to change. Costs may also vary depending upon the vendor. Omission of similar products is not intentional and inclusion of those products shown here is not an endorsement.

Fixed Wing Drones	Product Information and Cost
	<p><b>Name:</b> Sensefly Ebee SQ  <b>Cost:</b> \$10,990</p> <p><b>Product details:</b> Up to 55 minute flight time, includes multispectral camera with four sensors, stock (digital) camera, and incident light sensor. Can handle wind speeds up to 28 mph. Wireless range of 2-5 miles. Covers up to 500 acres per flight at 400 ft altitude.</p>
	<p><b>Name:</b> PrecisionHawk BirdsEyeView FireFLY6 PRO  <b>Cost:</b> \$8,848</p> <p><b>Product details:</b> Up to 59 minute flight time, includes three propellers to provide safer landing and stock (digital) camera. Can handle wind speeds up to 23 mph. Wireless range of 3 miles. Covers up to 600 acres per flight at 400 ft altitude.</p>

Multi-rotor Drones	Product Information and Cost
	<p><b>Name:</b> DJI Matrice Series  <b>Cost:</b> M200 (\$9,500), M210 (\$12,500)</p> <p><b>Product details:</b> Up to 38 minute flight time. Identified price includes stock (digital) camera. The M210 can incorporate two cameras/sensors. Can handle wind speeds up to 27 mph and has a wireless range of 4.3 miles.</p>
	<p><b>Name:</b> DJI Phantom 4 PRO (Version 2)  <b>Cost:</b> \$1,599</p> <p><b>Product details:</b> Up to 30 minute flight time. Includes stock (digital) camera. Can handle wind speeds up to 22 mph and has a wireless range of 5 miles. Covers up to 160 acres per flight at 400 ft altitude.</p>
	<p><b>Name:</b> DJI Mavic Air  <b>Cost:</b> \$599</p> <p><b>Product details:</b> Up to 21 minute flight time. Includes stock (digital) camera. Can handle wind speeds of 18 to 24 mph and has a wireless range of 2.5 miles. This drone is foldable.</p>
	<p><b>Name:</b> DJI Mavic Mini  <b>Cost:</b> \$399</p> <p><b>Product details:</b> Up to 30 minute flight time. Includes stock (digital) camera. Can handle wind speeds up to 29 mph and has a wireless range of 2.5 miles. This drone is foldable and is light enough in weight (&lt;0.55 lbs) that operators do not need to be FAA certified.</p>

Sensors	Product Information and Cost
 <p data-bbox="243 483 349 525">Sentera</p> <p data-bbox="560 483 698 525">Micasense</p>	<p data-bbox="820 210 1477 294"><b>Name:</b> Sentera Incident Light or Micasense Downwelling Sensor</p> <p data-bbox="820 304 1445 346"><b>Cost:</b> \$600 (Sentera) or \$750 (Micasense)</p> <p data-bbox="820 388 1518 577"><b>Product details:</b> These sensors can monitor lighting conditions. They should be used in tandem with other sensors so they can be used to make corrections to images so that a cloudy day vs. a sunny day won't make a difference in the collected data.</p>
	<p data-bbox="820 651 1404 693"><b>Name:</b> Sentera NDVI or NDRE Sensor</p> <p data-bbox="820 703 1015 745"><b>Cost:</b> \$1,999</p> <p data-bbox="820 787 1518 1050"><b>Product details:</b> These sensors can be used along with the stock (digital) camera. NDVI (Normalized Difference Vegetation Index) is a popular index used to identify differences in chlorophyll and canopy coverage at early to mid-growth periods. NDRE (Normalized Difference Red Edge) is recommended for mid- to late growth periods for high biomass crops.</p>
	<p data-bbox="820 1113 1250 1155"><b>Name:</b> Sentera Quad Sensor</p> <p data-bbox="820 1165 1161 1207"><b>Cost:</b> \$4,599 to \$5,463</p> <p data-bbox="820 1249 1461 1396"><b>Product details:</b> This sensor can measure four wavelengths of light at once. The wavelengths are customizable so the user can choose which ones to focus on.</p>
	<p data-bbox="820 1575 1299 1617"><b>Name:</b> Micasense RedEdge MX</p> <p data-bbox="820 1627 1015 1669"><b>Cost:</b> \$5,500</p> <p data-bbox="820 1711 1494 1816"><b>Product details:</b> This sensor captures 5 wavelengths of light (blue, green, red, red edge, and near infrared) at once but is not customizable.</p>

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