

# SELECTING THE RIGHT SENSOR

Deveron deploys a variety of sensors and unmanned aerial vehicles (UAVs) to fit the requirements of different agricultural applications. The factors that affect the types of sensors and UAVs used for a mission include the degree of fine detail requested, acreage, and environmental restrictions.

The two UAVs operated by Deveron are the Sensefly eBee and the DJI Matrice 100. These fixed-wing and multirotor platforms, respectively, allow us to operate even when take-off and landing zones are restricted by obstacles. The following sections provide an overview of the sensors outfitted on these UAVs.

## FIXED-WING SENSORS

Our Sensefly eBee UAVs are equipped with any of the following three sensors. These devices designed in coordination with the mission planning and post-processing software developers to avoid any connectivity or processing issues. The three sensors cover the visual and near infrared wavebands, and thermal infrared.



### SENSEFLY THERMOMAP

- The Thermomap is a thermal infrared sensor
- Thermal sensor sensitive from ~900-1300nm
- Output: Temperature map sensitive to range of -40 °C to 160 °C
- Applications:
  - Disease risk detection
  - Irrigation management



Image: sensefly.com



## SENSEFLY S.O.D.A.

The Sensor Optimized for Drone Application (S.O.D.A.) is a high-resolution RGB imager used to produce digital surface models (DSMs) and visual-colour orthomosaics. This action camera-sized imager contains a 1-inch sensor comparable to those found in much larger DSLR cameras. Compared to cropped-sensor cameras, the S.O.D.A. allows us to fly higher, longer, and with reduced data overhead all without sacrificing spatial resolution. At an altitude of 100m, the spatial resolution is 2.5cm/pixel compared to the Canon S110's 3.7cm/pixel.



S.O.D.A.	
No. of images	667
Total flight time	28 min.
No. of flights	1-2

Canon S110	
No. of images	1046
Total flight time	37 min.
No. of flights	2-3

### FEATURES

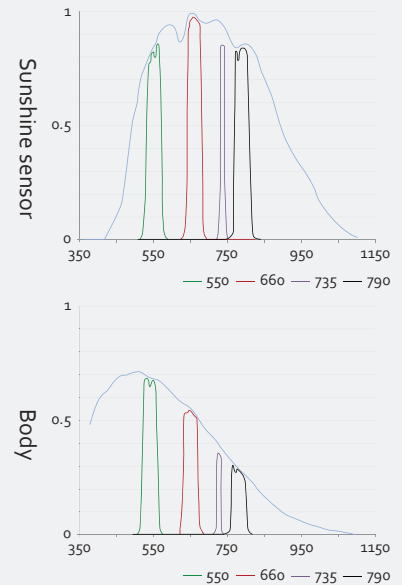
- 2.5cm/pixel at 100m AGL
- Outputs: DSM, high resolution orthomosaic, point cloud
- Applications:
  - Drainage management via digital surface models (DSMs)
  - Identification of tile drainage lines from timed/targeted orthomosaics
  - Crop height and canopy modelling
  - Plant counting and horticultural yield estimates

## PARROT SEQUOIA

The Parrot Sequoia is a narrowband multispectral sensor used for reflectance mapping. The 4 singleband sensors cover the red, green, near infrared, and red edge spectra, and its integrated sunlight sensor and calibration panel enable time series analyses of crop fields. We can calculate any vegetation index that uses these wavebands, including the Normalized Difference Vegetation Index (NDVI) and the Normalized Difference Red Edge index (NDRE).

### FEATURES

- 7.5 cm/pixel at 80m AGL
- 10-bit RAW imagery (\*.TIF)
- Outputs: Reflectance maps, vegetation indices
- Applications:
  - Variable rate prescriptions for fertilizer, fungicide, or seeding rate of subsequent crops
  - Target crop scouting and soil sampling
  - Identifying poor crop emergence or survival
  - High-throughput phenotyping in breeding programs



## MULTIROTOR SENSORS

The Matrice 100 multirotor UAVs are equipped with both a multispectral sensor and high resolution RGB camera for simultaneous data collection. Since multirotors offer vertical take-off and landing (VTOL), Deveron employs these UAVs in tight environments such as orchards or vineyards or where height restrictions exist, such as near hydro lines.



### MICASENSE REEDGE3

The Micasense RedEdge3 is a narrowband multispectral sensor similar to the Sequoia. The waveband definitions are slightly different, and this sensor adds the blue band for complete coverage of the visible spectrum. The RedEdge3 also offers improved spatial resolution, which makes it ideal for scientific research, or horticultural crop monitoring.

### FEATURES

- 5.5 cm/pixel at 80m AGL
- 12-bit RAW imagery (\*.TIF)
- Outputs: Reflectance maps, vegetation indices, RGB composites
- Applications:
  - Variable rate prescriptions for fertilizer, fungicide in small-acre, high-value crops
  - High-throughput small-plot research: breeding, crop protection, agronomy

## DJI ZENMUSE X3/X5

The X3 camera comes integrated with the Matrice 100 and provides high resolution RGB imagery captured at the same instance as the Micasense. Visual colour maps help to make sense of multispectral imagery because they are easier for the human eye to interpret. Like the SODA, this sensor can generate high resolution surface models, and its fine detail is useful for Object-Based Image Analysis of crop fields and research plots.



### FEATURES

- 2.5 cm/pixel at 80m AGL
- RAW (\*.DNG) or JPEG
- Outputs: DSM, high resolution orthomosaic, point cloud
- Applications:
  - Low-altitude (<70m) flight
  - Ultra high resolution (<2cm/pixel) imagery
  - Object-Based Image Analysis and machine vision