eBee

senseFly

The
**precision
agriculture**
drone

Collect actionable data throughout the year

SPRING	SUMMER	AUTUMN	WINTER
Tasks	**Tasks**	**Tasks**	**Tasks**
• Prepare machinery • Apply fertiliser/manure • Apply herbicide • Till, prepare seedbed • Plant seed	• Apply herbicide • Apply fertiliser • Apply fungicide • Apply insecticide • Irrigation management	• Harvest crop • Manage & till residue • Apply fertiliser, manure • Land improvements	• Machinery purchases • Input purchases • Insurance purchase/claims
Drone usage	**Drone usage**	**Drone usage**	**Drone usage**
• Early analysis of soils, tillage, tile & drainage • Topographic survey (production of digital elevation model)	• Stand count & gap analysis • Irrigation management • Observation of growth variability • Assess & observe nitrogen needs • Crop stage monitoring for timing of applications	• Pre-harvest: dry down & stand consistency observation • Post-harvest: analysis of soils, tillage and topography	• Assessment of input & machinery performance

↻ **Year round**

| | Post rain: tile drainage system analysis | Post storm: determine wind/hail/flood damage | Post-event: insurance claim documentation |

(Example usage above based on wheat crop in mid-West, U.S.)

A new level of crop insight, made easy

There is a lot of hype today about drones changing the face of farming. But very few systems are sophisticated and reliable enough to bring about such change.

Trusted by ag professionals across the globe, the eBee Ag leads the pack. This automated, intelligent and safe tool enables professionals like agronomists, crop consultants, farmers and researchers to gain a whole new level of crop insight. Reliably. Time and time again. And covering a larger area than a multi-rotor drone can achieve.

The process is simple: just define the region you want to scout, click to upload this data, then throw the eBee Ag into the air. It flies, captures high-resolution aerial images and lands by itself. Then transform these shots into an info-packed index map of your crops. It's this map that shows which sections of a crop are on track and which are struggling—in other words, the actionable data you need.

Following your analysis it's time to take action, using this index map to produce a custom application map. This cost-saving prescription, compatible with most tractor monitors and farm management information systems, is key to efficient crop management, boosting yields and increasing net profit.

The data quality is excellent, the platform proven. All that's missing is you.

01   02   03   04   05
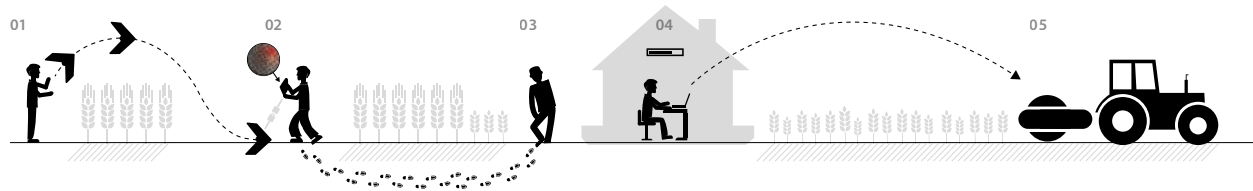
01. Fly
Import or create your map, then use eMotion to plan & manage your flight

02. Create a quick NDVI
A few minutes of processing for instant in-field analysis

03. Scout the area
Confirm your index map's findings via ground truthing

04. Create prescription
Generate a full index map, perform any further analysis & create an exportable prescription

05. Data to tractor
Put this prescription to work —optimising application to boost yields & net profit

> " There are lots of $5,000 UAVs available, but they're basically fancy remote-controlled helicopters. With the eBee Ag you get the complete solution—take a couple of minutes to plan a mission, launch it by hand (no catapults!), and the eBee does the rest. It flies, takes images, figures out the wind and lands right where you want it to. There's nothing more portable, powerful and easy to use. "

Todd Golly, Partner, Golly Farms, USA

4 reasons to choose the eBee Ag

Simplicity

The eBee Ag sets the standard for easy operation. Just define the field or region you want to scout using its eMotion software and throw the eBee into the air. It flies, captures images and lands automatically—no piloting skills required!

Efficiency

Thanks to its fixed-wing design and carefully optimised cruising speed, the eBee Ag can photograph up to hundreds of acres/hectares of crop in a single flight—more coverage than multi-rotor platforms can achieve.

Trust

Thousands of eBee operators around the world have recorded a total of 220,000 successful flights to date. This reliability is made possible by the eBee's lightweight yet durable construction and its cutting-edge onboard artificial intelligence. Backed by the highest quality global support.

Versatility

The eBee Ag features a full suite of camera options to suit every agricultural application—from NIR to RGB, red-edge, thermal and Sequoia's groundbreaking multispectral performance.

Plan your flight

The eBee Ag sets the standard for easy flight planning and management thanks to its acclaimed eMotion software.

Just import or create your preferred background map. Then use this to define the area you want to scout—one field, several fields, or a specific zone. Then simply specify your desired ground resolution (down to 1.5 cm / 0.6 inches per pixel), and set your required image overlap.

The rest is automatic: eMotion automatically generates a full flight plan, based on GPS waypoints, calculates the eBee's required altitude and displays its projected trajectory.

To ensure your mission's success, eMotion even offers a confidence-building simulation mode. This virtual flight simulates wind strength and direction, allowing you to make any flight plan enhancements needed before launch.
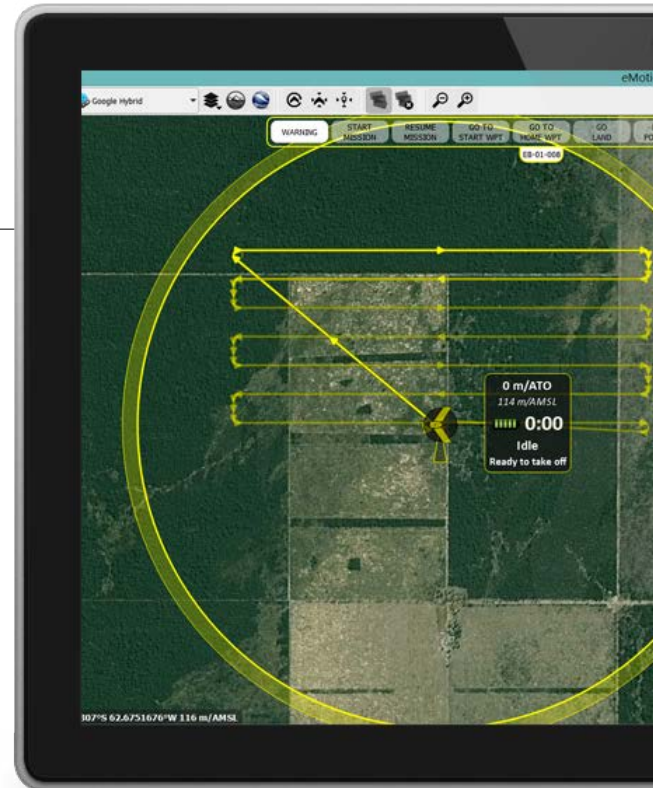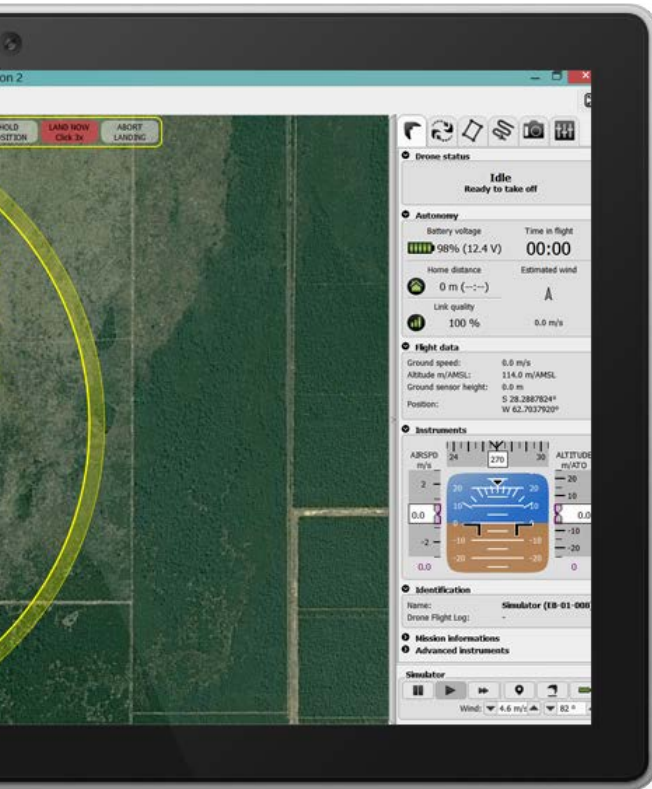
The eBee Ag is built with safety firmly in mind, from its ultra-light, shock-absorbent construction to its numerous embedded safety features. eMotion also includes a 3D flight planning feature. This uses real-world elevation data when setting the altitude of a flight's waypoints (shown above), for the most consistent ground resolution possible and the highest level of aircraft safety.

> " *The eBee Ag is our main tool for precision agriculture. It is remarkable at identifying issues within crops before problems become too severe and when the drone's results are coupled with targeted soil testing, exceptionally accurate prescriptions can be made.* "

James O'Neill, Director, Signpost Surveys, Ireland

Fly

Nothing is easier to operate than the eBee Ag. Just shake the drone three times to start its motor, then throw it into the air—no catapult or additional accessories required!

The eBee Ag's eMotion software displays the aircraft's key flight parameters, its battery level and its image acquisition progress, in real time, while the artificial intelligence inside the eBee Ag's autopilot continuously analyses onboard IMU and GPS data to control and optimise every aspect of the drone's flight. This proprietary autopilot also manages a wide range of intelligent failsafe behaviours, improving safety and security still further.

Made a mistake with your planning? Reprogram the drone's flight plan and landing zone mid-flight. Or in the case of any issue, tell it to immediately hold its position, return home or land.

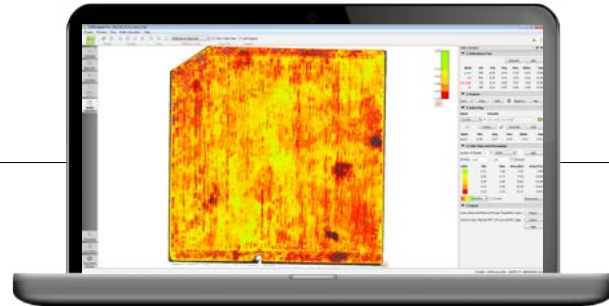+220,000 ⬈ FLIGHTS TO DATE

+65,000 🕐 FLIGHT HOURS

+2,700,000 📍 KM FLIGHT DISTANCE

Analyse

> ❝ *We use the eBee to monitor crops throughout the summer. We've found it especially useful in evaluating lodging damage in small grains and it was an amazingly accurate tool for evaluating spray drift from neighboring crops. Plus, its imagery is importable into the software we use to make variable rate prescriptions. We find it a very effective tool—it's easy to use and gives immediate results.* ❞

Wayne Spurrill Agronomist, Battle River Implements (Canada)

Transforming the eBee's imagery into actionable data is a simple, flexible process.

Every image the drone captures is automatically encoded with the drone's orientation, GPS location and other variables. These images can then be processed, depending on the camera used, to create either a full RGB orthomosaic or, if using an NIR, RE or multispectral camera, a full reflectance map, using professional image processing software or cloud-based services.

Next, use these same tools—such as Pix4Dmapper Ag or Drone Deploy—to apply your vegetation index algorithm of choice and create a full index map. This will form the core of your analysis, since it displays how different areas of a crop are developing, guiding your treatment decisions.
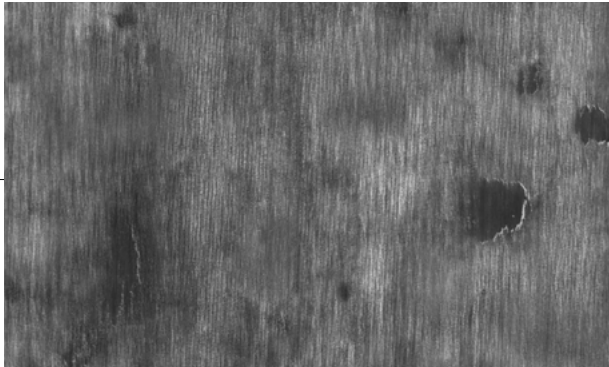
Reflectance map

Processing the eBee Ag's images, following a flight with a sensor such as an NIR or multispectral camera, results in a reflectance map like that shown above*. This includes corrections for incoming light, ISO, aperture, shutter speed and more.
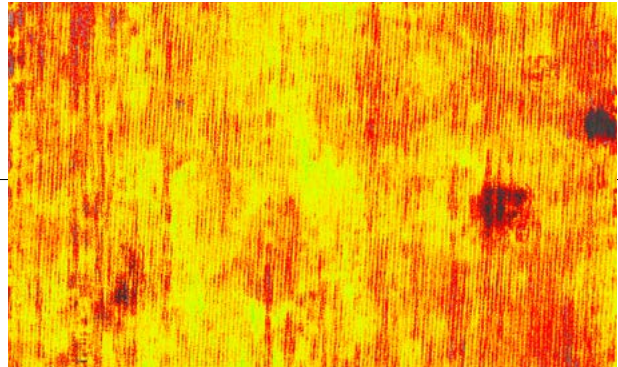
Index map

Applying a vegetation index algorithm, such as NDVI, creates a valuable, actionable output, highlighting which regions of crop are developing well and which are struggling.

Analyse the eBee's data with:

PIX4D · AIRINOV · ATLAS *imagery - analysis* · DroneDeploy · agAlytics · UAV-IQ · Farm Solutions · Agisoft · & more

Act

An eBee-derived index map—possibly combined with further groundtruthing, tissue sampling and/or soil sampling—provides the crop insight an operation needs to optimise its application of fertiliser, water and/or chemicals.

So with this analysis complete, it's time to act.

Data processing solutions such as Pix4Dmapper Ag can be used to turn this index map into a customised application map—simply input the values required to treat different regions of the field (above right).

This application map can then be exported as a prescription file, compatible with most modern tractor monitors and farm management information systems.

The result is a full drone-to-tractor workflow, in which highly accurate aerial data is used to create carefully tailored treatment plans on the ground.
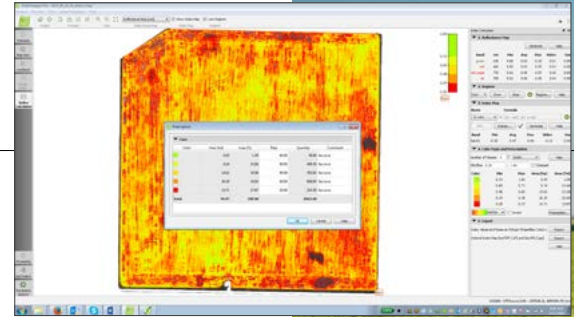
" *For our wheat fertilisation project we used an eBee Ag to capture NIR images of our field. With this data we then created a custom application map to optimise our nitrogen application. This approach reduced the amount of nitrogen used by 20%, with the field yielding 13-14% protein and 5 tonnes per hectare.* **"**

Dr. Berezovskiy,
Timiryazev State Agragrian University,
Moscow, Russia

Fully automatic
• Create your flight plan
• Hand-launch (no catapult required)
• Flies, acquires images & lands itself

Optimal range
• Up to 45 min flight time
• Maximum flight coverage* of 10 km²
 (3.9 mi²) or 1,000 ha (2,470 ac)

Green technology
• Low-noise brushless electric motor
• Rechargeable lithium-polymer battery
• Safe rear-facing propeller

> 66 *The eBee Ag is a simple to use, reliable and professional-grade platform. Our FarmSolutions pilots find it a dependable and accurate business tool; critical qualities for any professional flight service provider.* 99
>
> *Jon Tull, President, New Idea Software & FarmSolutions, USA*

* Based on the following test conditions: target ground resolution of 30 cm (11.8 in) / pixel, no wind, moderate weather temp. (18 °C/64.4 °F), new fully charged battery, flight altitude of 1,000 m (3,280 ft) above ground level, take-off at approx. sea level, take-off point in centre of desired coverage area.

2.4 GHz radio link
• Communicates with eMotion via USB ground modem
• Approx. 3 km (1.86 mile) range

High-resolution camera
• Multiple additional camera options available (inc. Sequoia multispectral)
• Fully controlled by eBee's autopilot
• Automatic image acquisition & geotagging

Lightest in its class
• Ultra-light EPP foam body & wings
• 0.71 kg (1.56 lb) take-off weight
• Less kinetic energy than a kicked football

S110 NIR

This modified camera acquires green, red and near-infrared (NIR) band data. The latter is used by many vegetation indices, including NDVI/SAVI, to assess leaf area and plant health.

Technical features

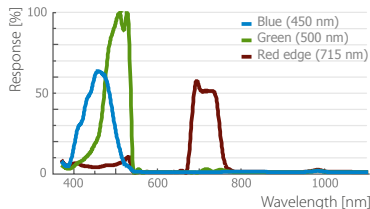|	
Resolution	12 MP
Ground resolution at 100 m (328 ft)	3.5 cm (1.4 in) / pixel
Sensor size	7.44 x 5.58 mm
Pixel pitch	1.86 µm
Image format	JPEG and/or RAW
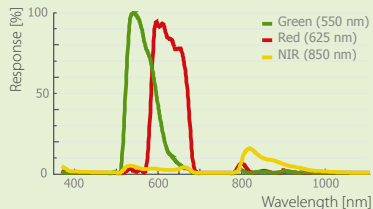
S110 RE

This modified camera acquires Red-edge, Green and Blue band data. It can be used in conjunction with the S110 NIR to compute indices such as NDRE, for chlorophyll estimation.

Technical features

|	
Resolution	12 MP
Ground resolution at 100 m (328 ft)	3.5 cm (1.4 in) / pixel
Sensor size	7.44 x 5.58 mm
Pixel pitch	1.86 µm
Image format	JPEG and/or RAW

S110 RGB

Acquires data in the visible spectrum (red, green and blue bands), providing useful visual imagery that can also be used to create topographic field maps and surface/elevation models.

Technical features

|	
Resolution	12 MP
Ground resolution at 100 m (328 ft)	3.5 cm (1.4 in) / pixel
Sensor size	7.44 x 5.58 mm
Pixel pitch	1.86 µm
Image format	JPEG and/or RAW
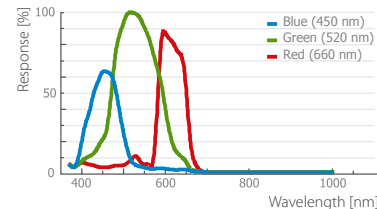
*Optional in Turkey.

thermoMAP

This calibrated camera captures thermal infrared video and still images, allowing you to create a crop water stress index (CWSI) to map water distribution or check irrigation.

Technical features

|	
Resolution	640 x 512 pixels
Ground resolution at 75 m (246 ft)	14 cm (5.5 in) / pixel
Scene temperature	-40 °C to 160 °C (-40 °F to 320 °F)
Temperature resolution	0.1 °C (32.18 °F)
Temperature calibration	Automatic, in-flight
Output formats	TIFF images + MP4 video
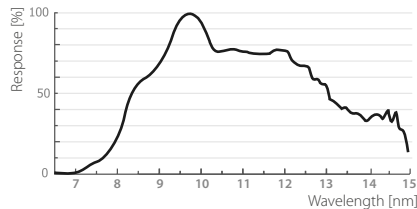
Sequoia

This small, light, calibrated multispectral camera captures images across four spectral bands (near-infrared, red-edge, red & green), plus RGB imagery, in just one flight. This breadth enables numerous indices to be computed, including (but not limited to) NDVI, MCARI, NDRE, CCCI, and CI_{RE}, used in the assessment of plant cell structure and chlorophyll health.

Main body
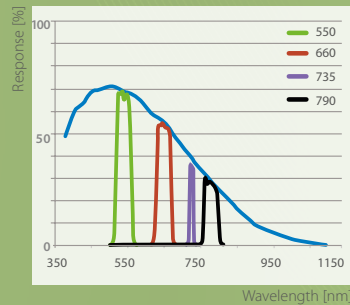
- Four 1.2 MP spectral cameras
- Up to 1 fps
- One 16 MP RGB camera with rolling shutter
- 64 GB built-in storage
- 5 W (~12 W peak)
- 72 g (2.5 oz)

Sunshine sensor
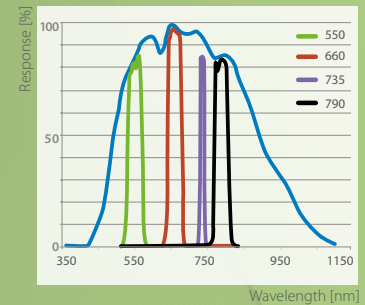
- 4 spectral sensors with same filters as body
- GPS
- IMU & magnetometer
- SD card
- 1 W
- 35 g (1.2 oz)

About senseFly

At senseFly we develop and produce aerial imaging drones for professional applications.

Safe, ultra-light and easy to use, these highly-automated data collection tools are employed by customers around the world in fields such as agriculture, surveying, GIS, industrial inspection, mining and humanitarian aid.

senseFly was founded in 2009 by a team of robotics researchers and quickly became the industry leader in mapping drones. Today we continue to lead the way in developing situationally aware systems that help professionals make better decisions.
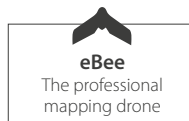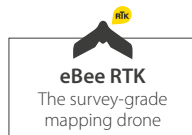
For more information, visit www.sensefly.com. senseFly is a Parrot company and a member of the Small UAV Coalition.

Where can you buy your eBee Ag?
Visit www.sensefly.com/about/where-to-buy to locate your nearest eBee Ag distributor.

eBee RTK
The survey-grade mapping drone

eBee
The professional mapping drone

albris
The intelligent mapping & inspection drone

senseFly SA
Route de Genève 38
1033 Cheseaux-Lausanne
Switzerland

HARDWARE

Wingspan	96 cm (37.8 in)
Weight (inc. supplied camera & battery)	Approx. 0.71 kg (1.56 lb)
Motor	Low-noise, brushless, electric
Radio link range	Up to 3 km (1.86 miles)
Detachable wings	Yes
Camera (supplied)*	S110 NIR (12 MP)
Cameras (optional)	WX RGB, S110 NIR/RE/RGB, Sequoia, thermoMAP

SOFTWARE

Flight planning & control software (supplied)	eMotion
Image processing software (optional)	Pix4Dmapper Pro/Ag

OPERATION

Automatic 3D flight planning	Yes
Cruise speed	40-90 km/h (11-25 m/s or 25-56 mph)
Wind resistance	Up to 45 km/h (12 m/s or 28 mph)
Maximum flight time	45 minutes
Maximum coverage (single flight)	10 km^2 (3.9 mi^2) / 1,000 ha (2,470 ac)**
Automatic landing	Linear landing with ~ 5 m (16.4 ft) accuracy
Multi-drone operation	Yes
Ground control points (GCPs)	Optional
Oblique imagery	0 to -50°

RESULTS

Ground sampling distance (GSD)	Down to 2 cm (0.78 in)/pixel***
Absolute horizontal/vertical accuracy (w/GCPs)	Down to 4 cm (1.5 in) / 7 cm (2.5 in)
Absolute horizontal/vertical accuracy (no GCPs)	1-5 m (3.3-16.4 ft)

Optional in Turkey.

*** Based on the following test conditions: target ground resolution of 30 cm (11.8 in) / pixel, no wind, moderate weather temp. (18 °C/64.4 °F), new fully charged battery, flight altitude of 1,000 m (3,280 ft) above ground level, take off at approx. sea level, take-off point in centre of desired coverage area.*

*** Depends upon environmental conditions (light, wind, surface type).*

Package contents

- eBee Ag body (inc. all electronics & built-in autopilot)
- Pair of detachable wings
- S110 NIR camera (inc. SD card, battery, USB cable & charger)
- 2.4 GHz USB radio modem for data link (inc. USB cable)
- Two Lithium-Polymer battery packs & charger
- Spare propeller
- Carry case with foam protection
- Remote control & accessories (for safety pilots)
- User manual
- eMotion software download key (accessible via my.senseFly at no extra cost)

senseFly

a **Parrot** company

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subscribe to our newsletter at
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