Flying High - How a French farming cooperative used drones to boost its members' crop yields

OCEALIA Group is a pioneering French farming cooperative that has used senseFly drones and AIRINOV's agronomy expertise since 2015 to better assess and more accurately treat its crops. The result: a 10% average increase in yields.

The result of the merger of Charente Alliance and Corea, OCEALIA Group boasts 7,200 farmer members and almost 900 employees. Since 2015, five drone operators have been flying OCEALIA's two senseFly eBee Ag unmanned aircraft, or drones, carrying AIRINOV multiSPEC 4C sensors.

By employing this cutting-edge data collection technology and partnering with world-leading agronomy experts AIRINOV, OCEALIA's team is able to provide members with valuable fertilisation consultancy.

"The drone data is complementary to satellite imagery, which we still use for the general monitoring of our members' crops throughout the year," says Romain Coussy, who is in charge of decision support tools at OCEALIA. "However, for providing quick tips on fertilisation, the drone is best adapted to the job. By using the drone for aerial crop scouting, combined with data processing and analysis from AIRINOV, plus our complementary controls, we can provide members with fertilisation advice between 48 hours and four days after a flight."

"As agronomy experts, our role at AIRINOV is to help OCEALIA's farmers increase their yields and improve the quality of their crops – mainly cereals and oilseed rape," explains Romain Faroux, CEO and co-founder of AIRINOV. "We do this by analysing imagery with a strong agronomic approach that goes way further than typical NDVI maps. This enables us to provide reliable advice to optimise the application of nitrogen. It's about applying the right amount of nitrogen, at the right time, in the right place in the field. Lastly, on top of using our fertilisation advice, OCEALIA's technical and agronomist teams use the maps produced to improve their knowledge of their farmers' fields and so better advise them."

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Since 2015, OCEALIA's two drones have been used to help over 300 individual farmers, flying over 3,900 ha (9637 ac) of oilseed rape and 3300 ha (8,154 ac) of cereals, namely wheat, barley and triticale.

Drone methodology

OCEALIA's drone team typically flies once or twice per season for each farmer who requests the service.

OCEALIA's drones usually fly at an altitude of 150 metres above the ground and capture their images using AIRINOV's multiSPEC 4C camera. This flight height and camera result in an image resolution on the ground of approximately 30 cm per pixel. This data is then downgraded to one metre per pixel for large fields

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in order to speed up delivery time. In terms of field coverage, the drones map crops at a rate of around three hectares per minute, depending on field size.

Developed by AIRINOV in partnership with the world-leading agronomic research institute, INRA, the multiSPEC 4C camera is a multispectral sensor that was designed specifically for use with senseFly's eBee drone. It captures non-visible data of crops over four distinct spectral bands: green, red, red-edge and near-infrared. AIRINOV then processes this imagery into highly accurate maps that allow the company's agronomists to give a precise crop assessment for every square metre of a farmer's field.

AIRINOV, the agronomy experts that worked with more than 300 OCEALIA members, fly senseFly eBee drones carrying multiSPEC 4C sensor payloads.

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In the case of cereals, the drone's data is used to measure the amount of dry matter in the field and nitrogen absorption at key stages of the crop's development (from Z30 to Z39 on the Zadoks scale). For farmers looking solely to increase yield, a flight takes place when the crop is between Z30 and Z33 stage, while for those looking to boost crop quality—i.e. increase the amount of protein in the plant—the flight instead takes place at Z39 stage. "Farmers can choose to get a drone flight at any stage. The flight is then planned about a week before fertiliser application and the data used to variably apply the season's third and fourth fertiliser inputs," says Coussy.

For oilseed rape, OCEALIA's team flies the drones once at the start of winter and once at the end in order to calculate the amount of biomass lost. "This figure tells us a lot about the size and strength of the crop, as well as the amount of nitrogen that has not been absorbed since the farmer's previous application," AIRINOV's Faroux explains. "The aim again is to advise a farmer how much fertiliser to apply. This recommended amount is then usually applied in two or three different inputs during spring."

Algorithmic analysis

To generate its recommendations, AIRINOV's agronomists apply different innovative algorithms to the drone's digital crop maps, going further than typical industry standard normalised difference vegetation index (or NDVI) indicators.

In the case of oilseed rape for example, AIRINOV measures biomass development and combines this with other field data (soil type, variety etc) to make fertilisation recommendations with square-metre precision. In France, this recommendation is made using the French reference fertilisation model of Terres Inovia. In other countries, AIRINOV uses reference fertilisation models developed by local institutes.

For cereals, AIRINOV measures dry matter and nitrogen absorption in the field to assess the real growth potential of the crop, since taking a single approach—i.e. measuring only biomass or assessing only NDVI—had not proven to be precise nor robust enough to make reliable fertilisation recommendations. AIRINOV's own proprietary algorithms were developed through extensive field testing, both across France and Europe.

No later than four days after OCEALIA's flights over a farm, AIRINOV supplies the farmer with two variable application maps featuring its tailored nitrogen recommendations. One map is a detailed version, designed with automatic application in mind, for farmers who operate advanced precision agriculture equipment. In this case, the farmer receives a file by email that is compatible with their equipment (AIRINOV can produce files that are compatible with any brand). The second map is a simplified version, which is better suited to farmers who apply their nitrogen manually or using less advanced equipment. Thanks to both types of map being supplied, any farmer can begin variable rate application, whatever equipment they operate.

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Real-world results

Since OCEALIA's drone program began in 2015, AIRINOV's fertiliser application maps have had a tangible effect on farmers' operations.

"The OCEALIA farmers who have used our AIRINOV-supported drone service have recorded an average yield increase of 10%, compared to parcels analysed using traditional, non-drone methods," explains Coussy.

"This boost in yield is obviously of great value to OCEALIA's members," Faroux adds. "While it would not be accurate for every client to expect this kind of boost—since yields depend on so many variables: from the weather to the type of soil and a

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plant's particular traits—OCEALIA's results are a solid, real-world example of how drone data and expert algorithmic analysis can have a real beneficial effect on farmers' businesses."

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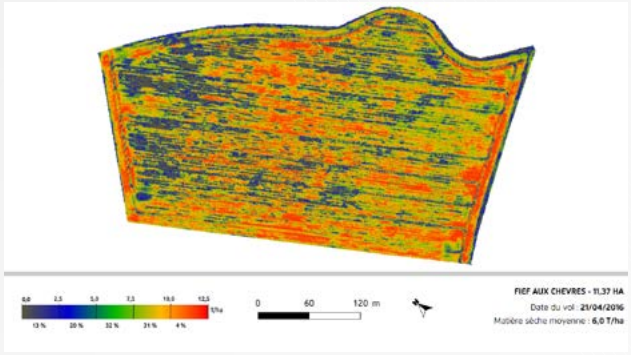
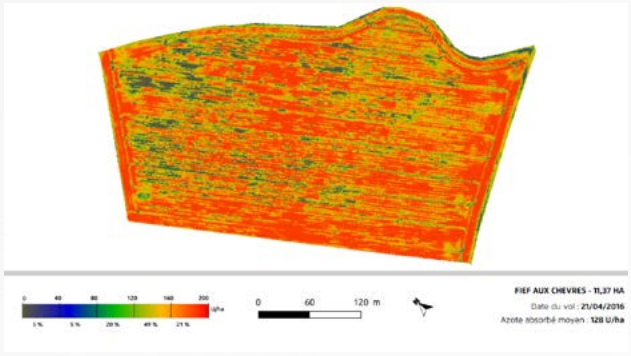
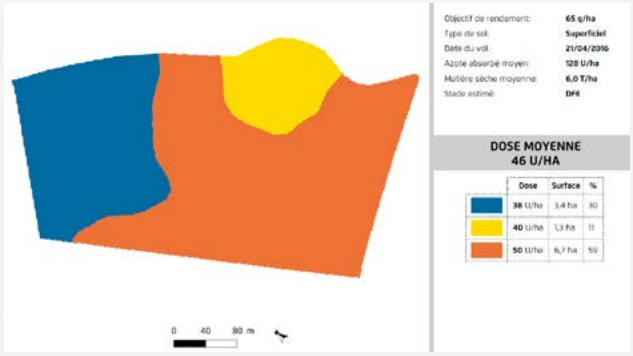


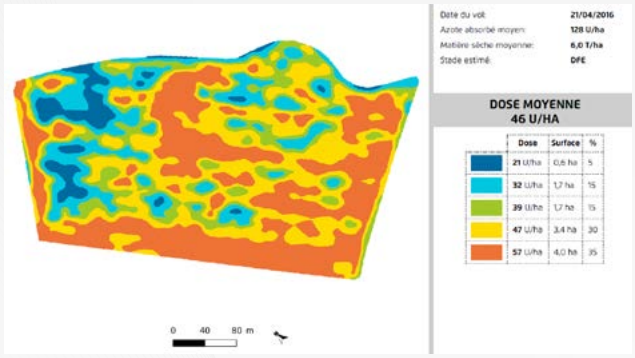
An AIRINOV-supplied dry matter map of a farmer's 11-hectare cereal field, showing tonnage per hectare differences (averaging 6 tonnes per hectare).



An AIRINOV-supplied map of the same field showing nitrogen absorption (averaging 128 units of active nitrogen per hectare).



A simplified AIRINOV application map supplied to the same farmer. This map highlights three zones where different amounts of nitrogen—measured in units of active nitrogen per hectare or U/ha—should be applied.



The detailed version of the same AIRINOV application map, designed for automated application by precision agriculture equipment.

About AIRINOV

AIRINOV (www.airinov.fr/en) was founded in 2010 by two engineers, specialists in robotics and telematics, and a farmer's son. These complementary skills enabled AIRINOV to quickly become the leading drone-based agronomic consulting company targeting the agriculture and research markets.

Today AIRINOV offers its products and services across the agricultural map, helping farmers with their decision making and researchers to accumulate statistics. Following a capital investment from leading leisure drone company, Parrot, in 2014, AIRINOV has now opened a new chapter in its history, going abroad to sell its services all over the world.

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