



Agroécologie
Dijon
Unité de Recherche



AIRINOV
The future of your land is in the sky

Aerial multispectral imagery for site specific weed management

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AIRINOV history



- 250 000 ha in 2 years
- 85% of all UAV flights in France
- 8 000 farmers
- 100 distributors
- 60 operators

AIRINOV services

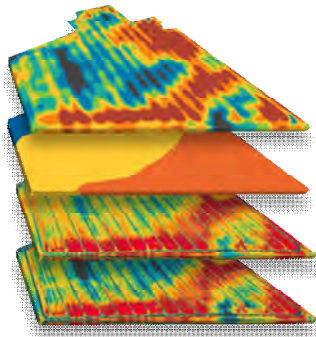
Farm monitoring

Objective

- Make a **simple, efficient recommendation** at a point in time to optimize the farmers business

Crops

- Cereals, Oilseed rape, Potato, New crops every year



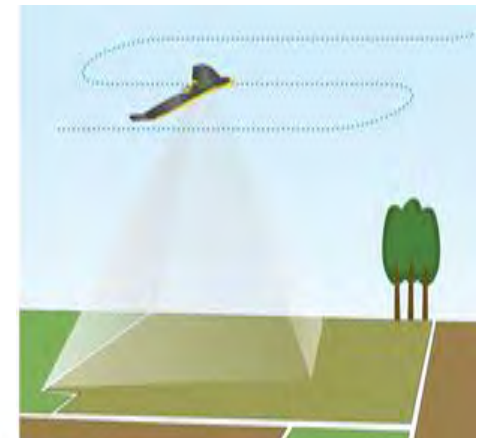
Field trial monitoring

- Provide **reliable, fast statistics** over a growing season to help select seeds, crop protection products, fertilizers...
- Any type of crops, any type of trials, in platform or in field



Remote sensing R&D

- **Look for new applications** of remote sensing with a dedicated partner
- On demand



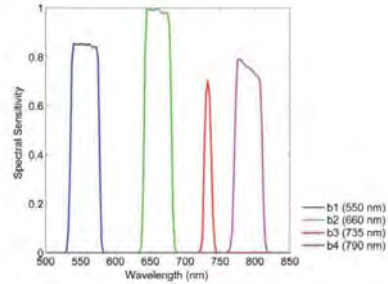
Why detect weeds by UAV?

- ^ Weed: a plant considered undesirable in a farm field
- ^ Impact on crop
 - > Income
 - > Harvest quality
 - > Health risks due to poisonous weeds
- ^ Main weed control technique in France: chemical herbicide
 - > Health and environmental effects
 - > Resistance
 - > Economic impact
- ^ Regulation to reduce herbicide use

Sensor and drone



Absolute
reflectance
data



Results comparable over the season and between different parcels

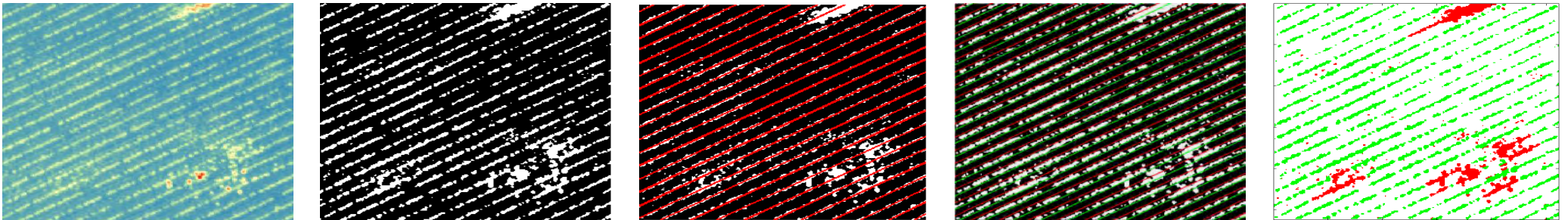
Automatic flight
from take-off to
landing



State-of-the-art drone equipment for efficient data collection

Weed detection from drone images

- ⤴ For row crops
- ⤴ Using multispectral maps at 6cm/px
- ⤴ Based on row detection

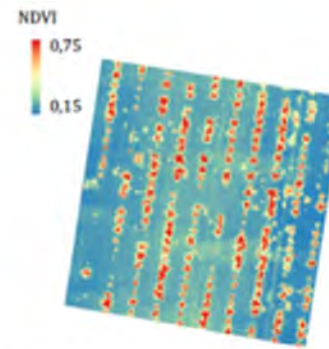


- ⤴ Good detection between rows
- ⤴ Not usable when row is not clearly visible

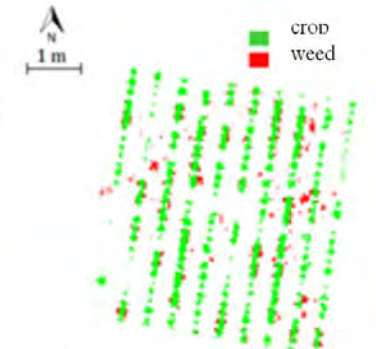
Validation with ground high resolution

- Ground mast to map at 6mm/px
- Using multispectral maps at 6cm/px
- True Crop Rate (TCR) and the True Weed Rate (TWR)

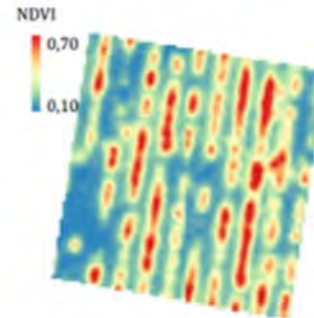
Spatial resolution	μ_{TCR}	μ_{TWR}	σ_{TCR}	σ_{TWR}
Images (6 mm/pixel)	0.877	0.7798	0.040	0.066
Images (6 cm/ pixel)	0.4738	0.7570	0.293	0.188



a. NDVI image with a 6mm spatial resolution



b. Results of image processing with a 6 mm spatial resolution image

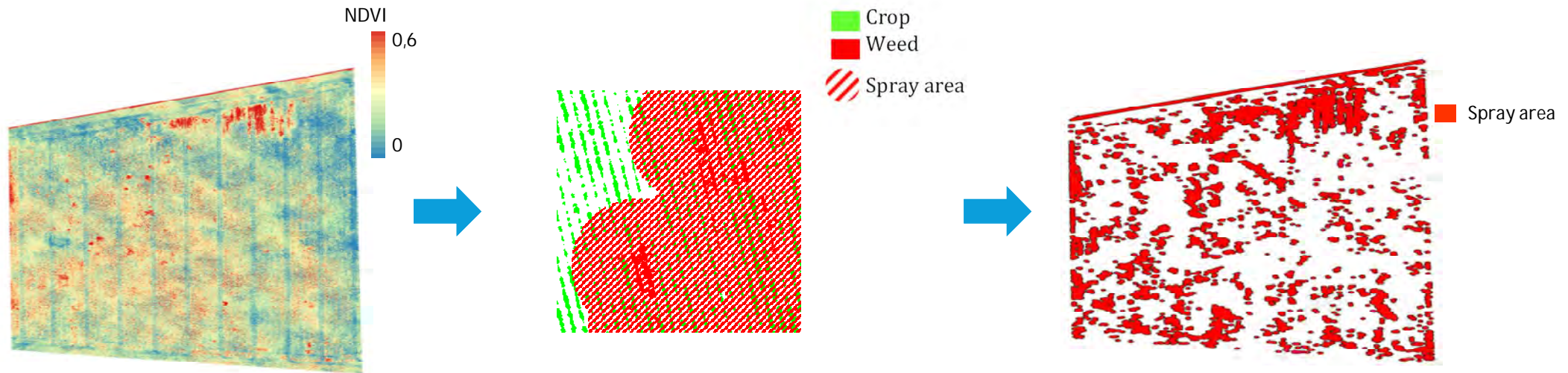


c. NDVI image with a 6 cm spatial resolution



d. Results of image processing with a 6 cm spatial resolution image

Pilot phase to validate applicable results



⬆ Good farmer feedback

⬆ Parameters to adjust: (buffer size, tractor displays interface)

Perspective: integrated workflow

UAV: multispectral mapping



Weed-infested field

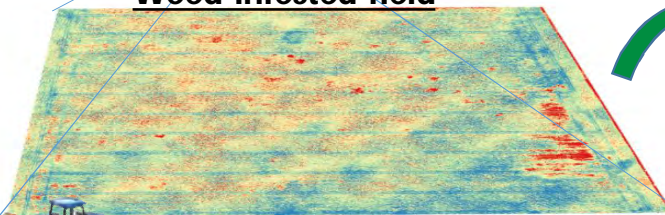
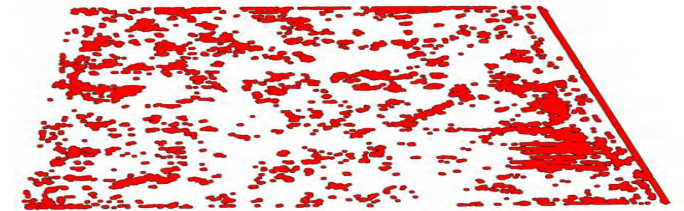
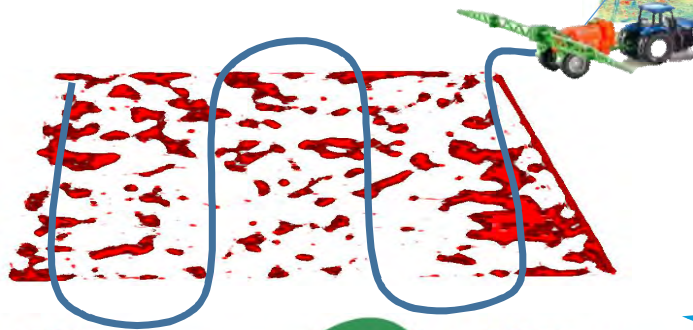


Image processing for weed detection



Spot application using Variable Rate sprayer



RTK GPS





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Thank you for your attention

