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19-24 May 2024 in Accra, Ghana

Implementation of a complete process for the collection, processing and use of multi-spectral UAV data for agriculture (12462)

Audrey ALAJOUANINE, France

TS09F: Advancing Surveying through Technology including Uncrewed Systems

Summary

Introduction
Agriculture and Technology: Example of France
Presentation of UAVs Used for the Study
Case Study: Choosing a Farm in Occitanie, France
Examples of Conducted Analyses
Benefits, Limitations, and Prospects of UAVs in Agriculture
Conclusion

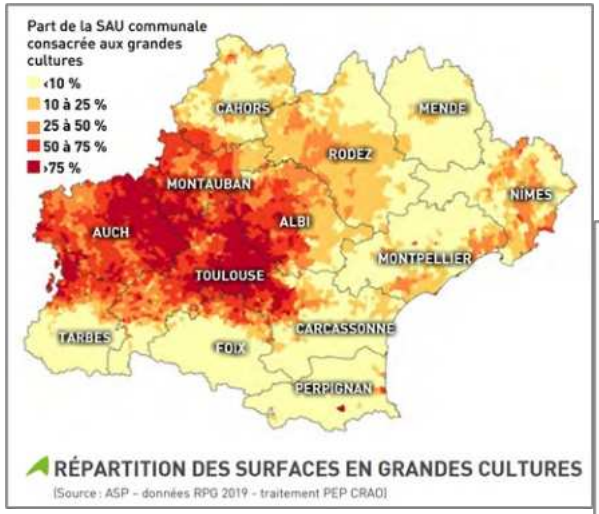
Introduction

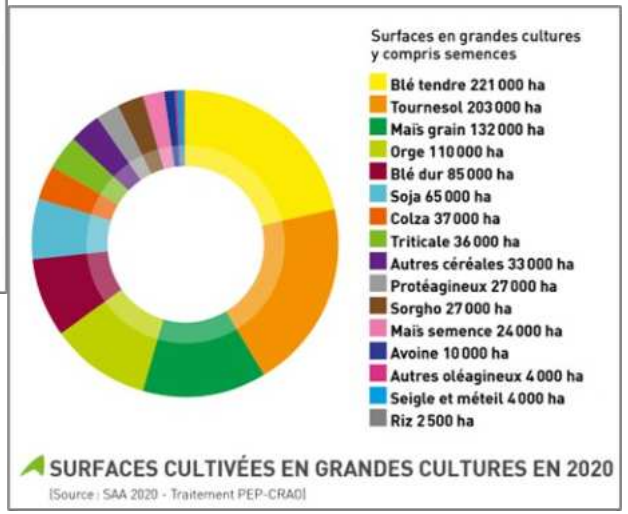
Agriculture and Technology: Example of France

Overview of changes in the French agricultural sector

Role of New Technologies in Agriculture

Understanding how technology can help address current needs and challenges in French agriculture.



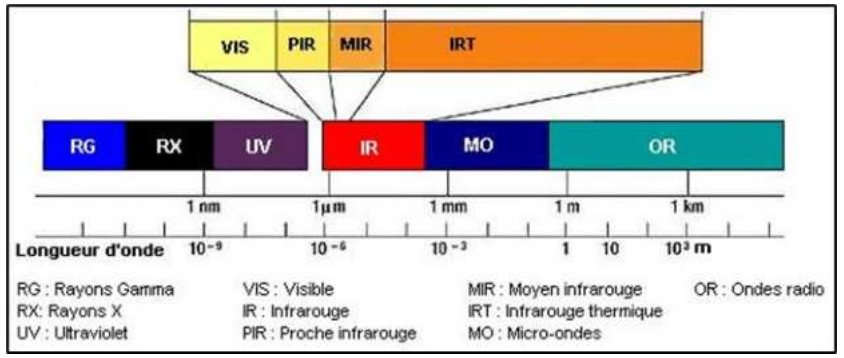


Presentation of the UAVs Used for the Study

UAV with Multispectral Camera::
DJI MAVIC 3 M RTK

Multispectral bands:

- Green: 560 ± 16 nm
- Red: 650 ± 16 nm
- Red Edge: 730 ± 16 nm
- Near-Infrared: 860 ± 26 nm

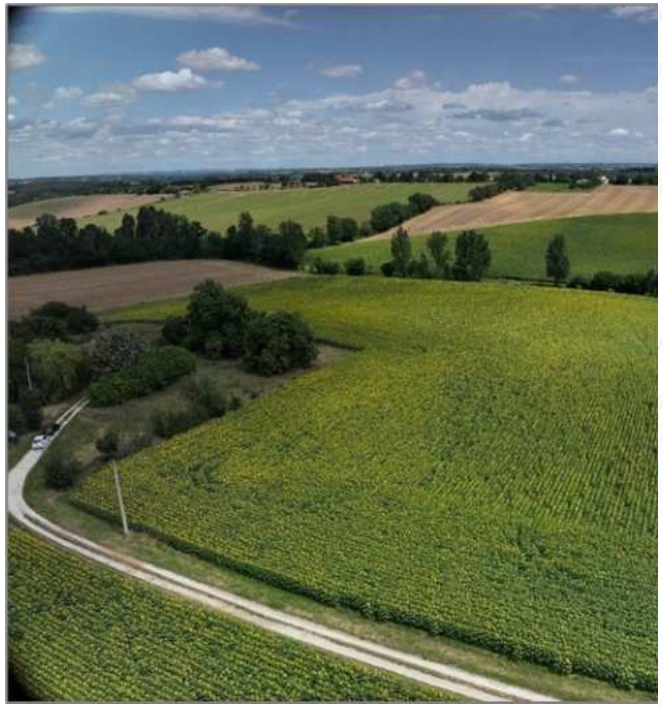


Presentation of the UAVs Used for the Study

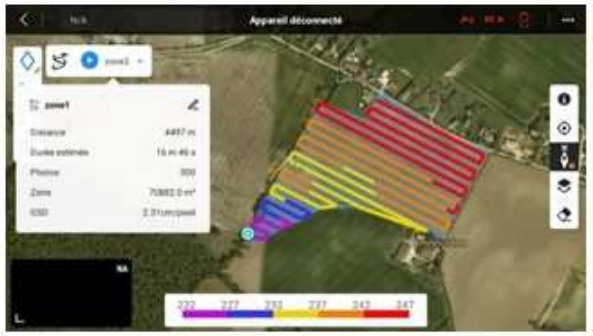
UAV with Lidar Sensor:
DJI M300 RTK avec Lidar DJI L1

- 45 MP sensor
- Lidar with 240,000 points/s and 3 returns
- 45-minute battery life
- Non-repetitive scan model and repetitive scan model

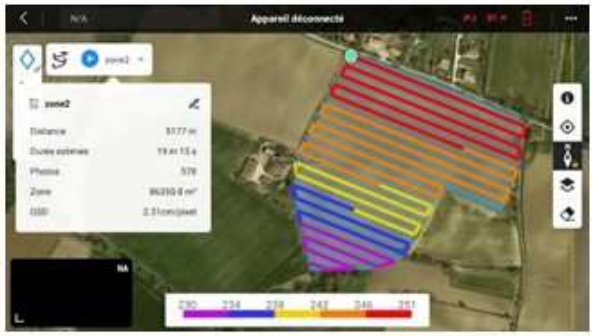
Case Study: Choosing a Farm in Occitanie, France



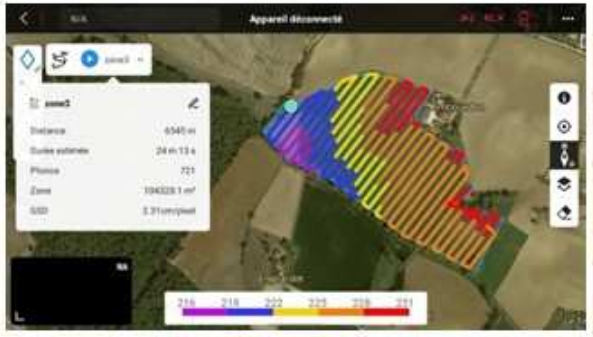
Zone 1



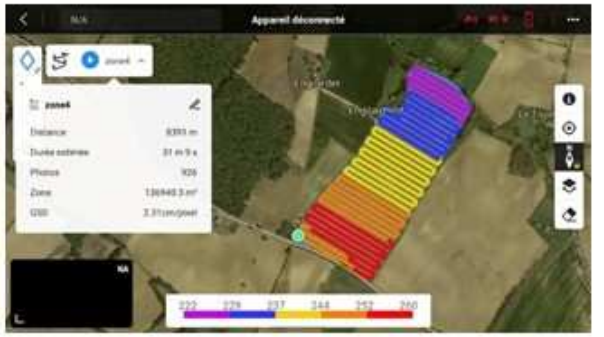
Zone 2



Zone 3



Zone 4



région Occitanie.

Placé à 45 km à l'ouest de Toulouse et 38 km à l'est d'Auch.

Source: Google Earth; Topo Airtech.
DATUM: EPSG:2154 - RGF93 v1 / Lambert-93.

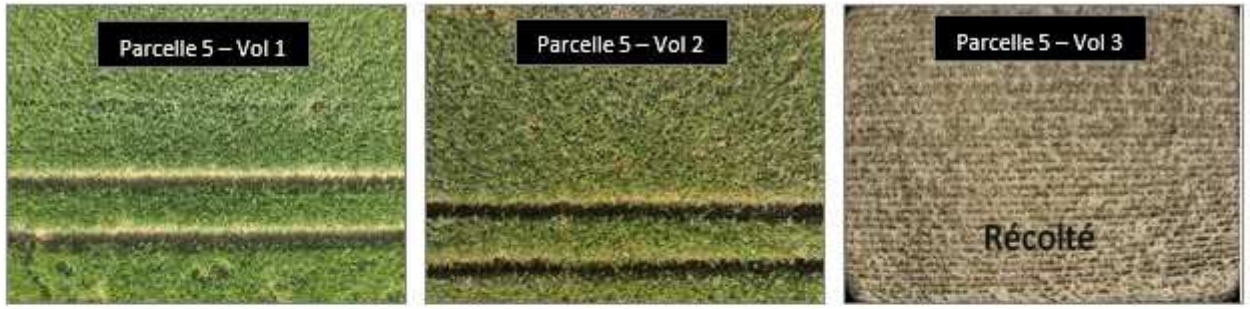
Auteur: Felipe AGUIAR MARTIN, 2023.

Case Study: Choosing a Farm in Occitanie, France

Tournesol

Tournesol Bio

Blé Tendre



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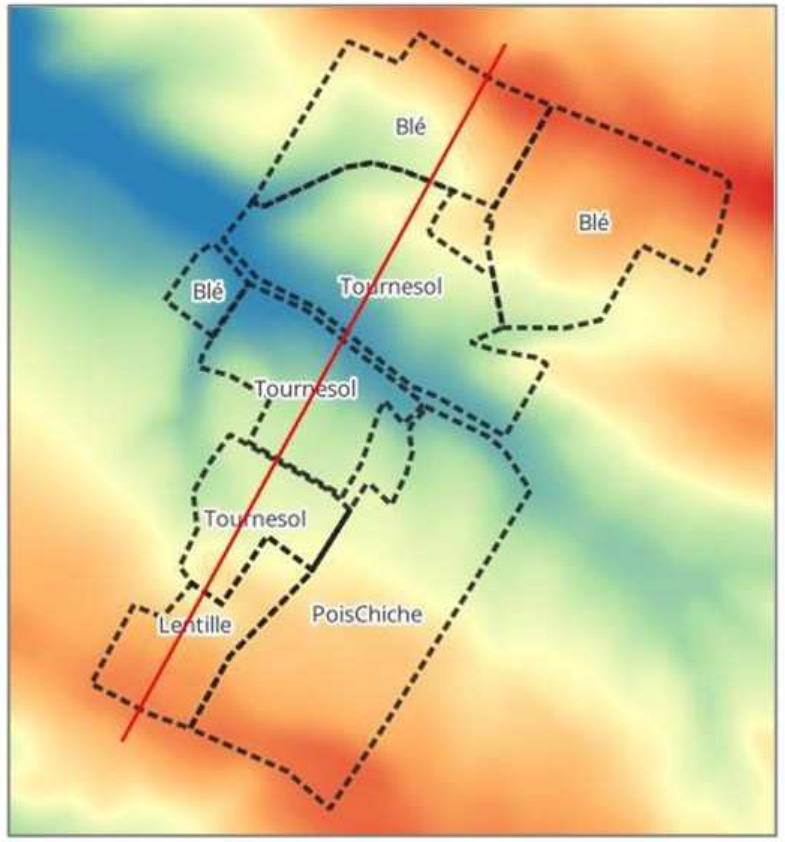
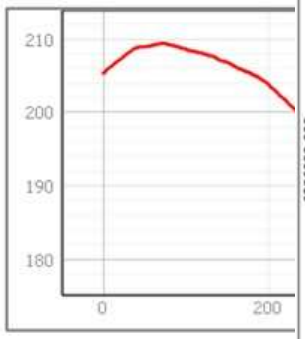
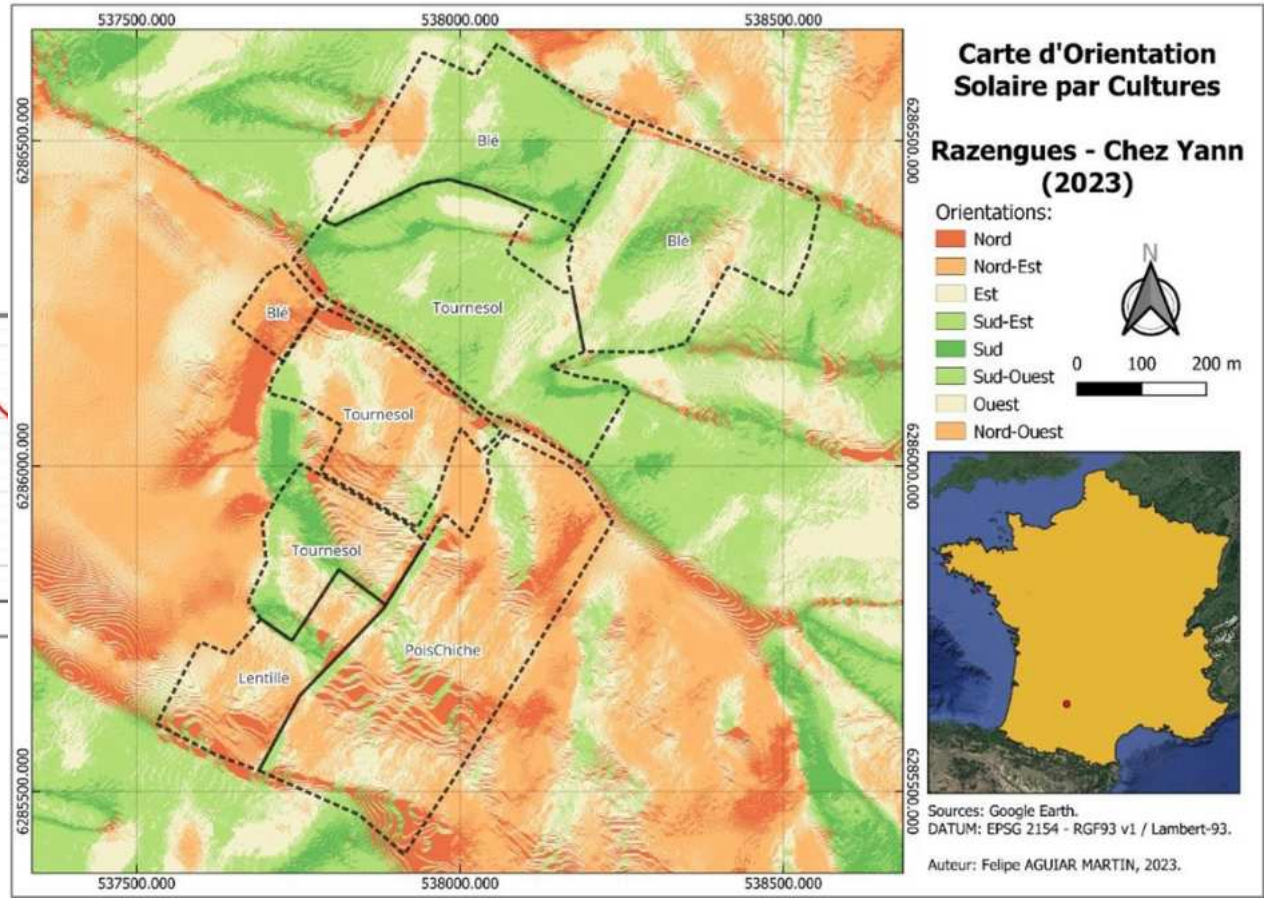
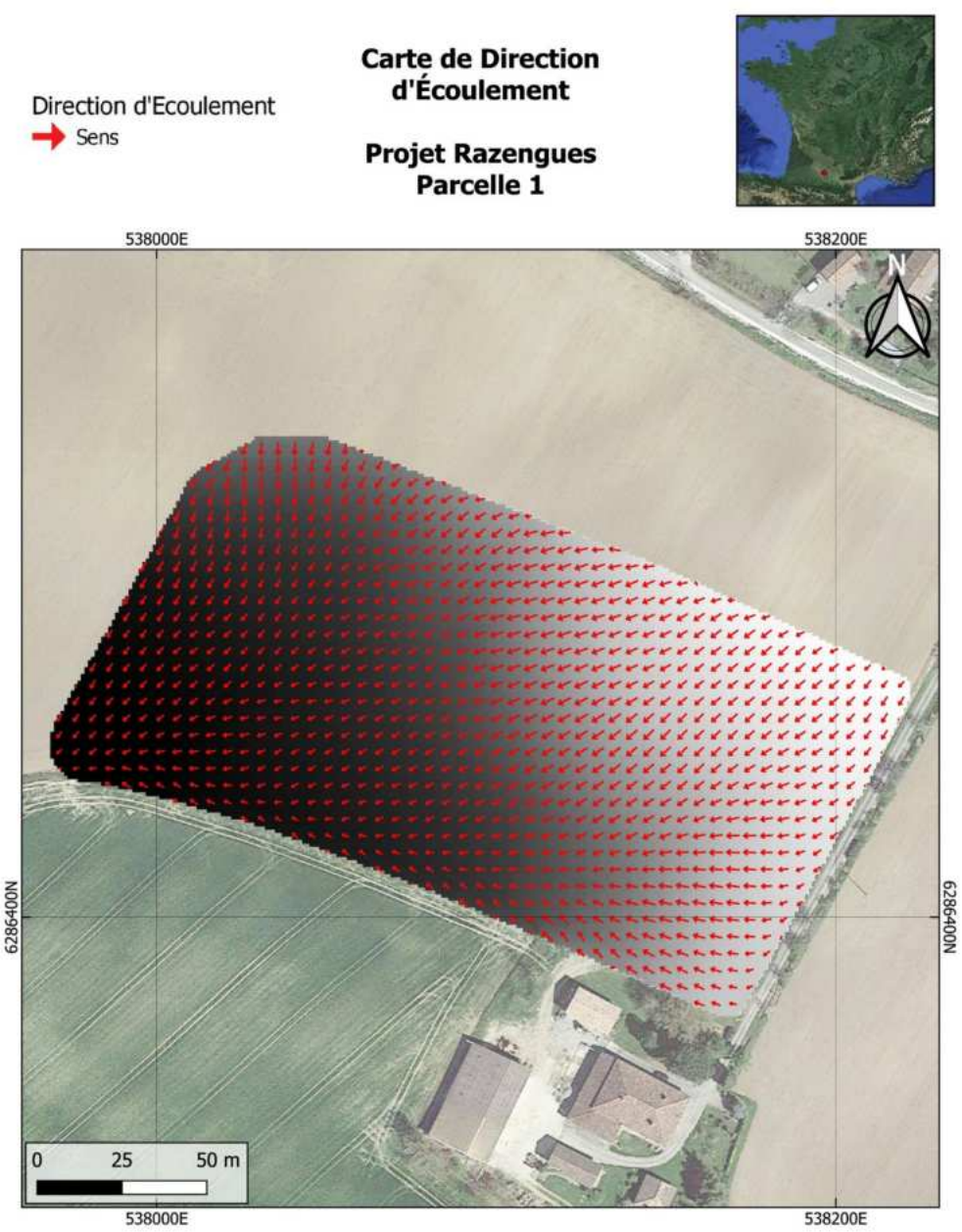
Examples of Conducted Analyses







Examples of Conducted



L'analyse de direction d'écoulement prend en compte les données altitudes du modèle numérique de terrain (MNT) chaque pixel et le compare avec les voisins les plus proches, pour arriver a la direction d'écoulement.

Source: Google Earth; Topo Airtech.
DATUM: EPSG:2154 - RGF93 v1 / Lambert-93.

Auteur: Felipe AGUIAR MARTIN, 2023.

Examples of Condu

1

Formation de MNT et MNS

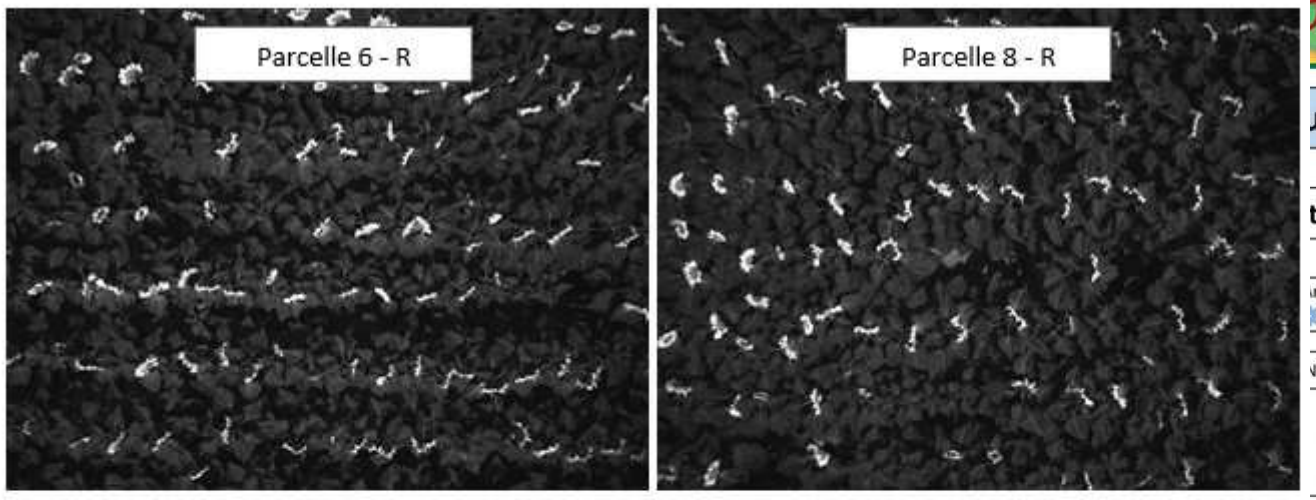
Global Mapper

Importation du DEM

Classification automatique

Formation de MNS et MNT

2



ur des Plantes

tatistiques de Zone)

QGIS

nalyse raster

Raster calculator

NS – MNT

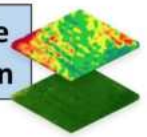
MNH

Symbologie

Pseudo-couleur

Examples of Conducted Analyses

Vigueur de Végétation et Analyse de Stress par Indice de Végétation

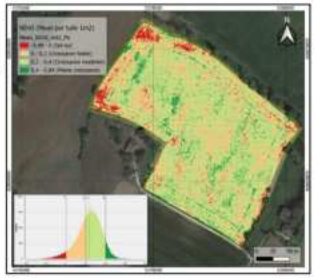


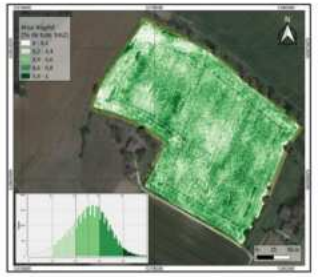
Orthomosaïque → Calcules des indices de végétation (IV) → Étude visuelle

$$NDVI = \frac{(PIR + R)}{(PIR - R)}$$

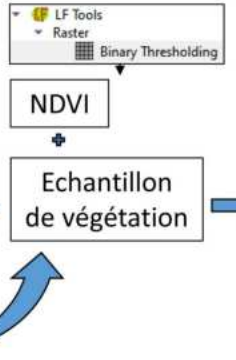
$$CVI = PIR \times (\frac{R}{V \times V})$$

$$NDRE = \frac{(PIR + RE)}{(PIR - RE)}$$





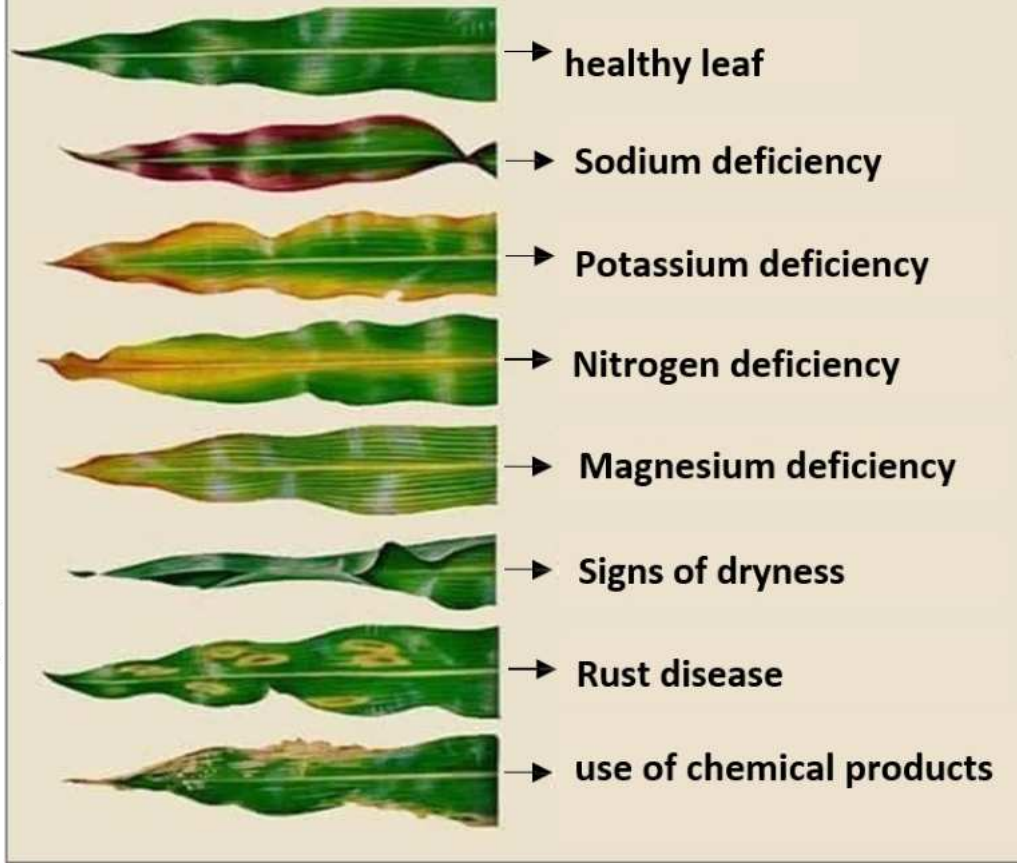
Echantillon de végétation



LF Tools → Raster → Binary Thresholding

NDVI

Echantillon de végétation → Création de vecteurs → Créer une grille → Grille de la zone d'intérêt → GDAL → Extraction raster → Découper un raster selon une couche de masque → Taux de végétalisation de la parcelle



Benefits, Limitations, and Prospects of UAVs in Agriculture

- Precise crop monitoring
- Optimized irrigation and input usage
- Improved performance
- Reduced operational costs

- Data processing complexity
- High initial cost
- Regulations and privacy

- Technological improvements needed
- Training and education programs
- Integrated solutions development

CONCLUSION

Complementarity of Multispectral Satellite and UAV Images in Agriculture

SUSTAINABLE DEVELOPMENT GOALS | International Federation of Surveyors supports the Sustainable Development Goals

Commission 5

Positioning and Measurement

Serving Society for the Benefit of People and Planet