



Centre wallon de Recherches  
agronomiques

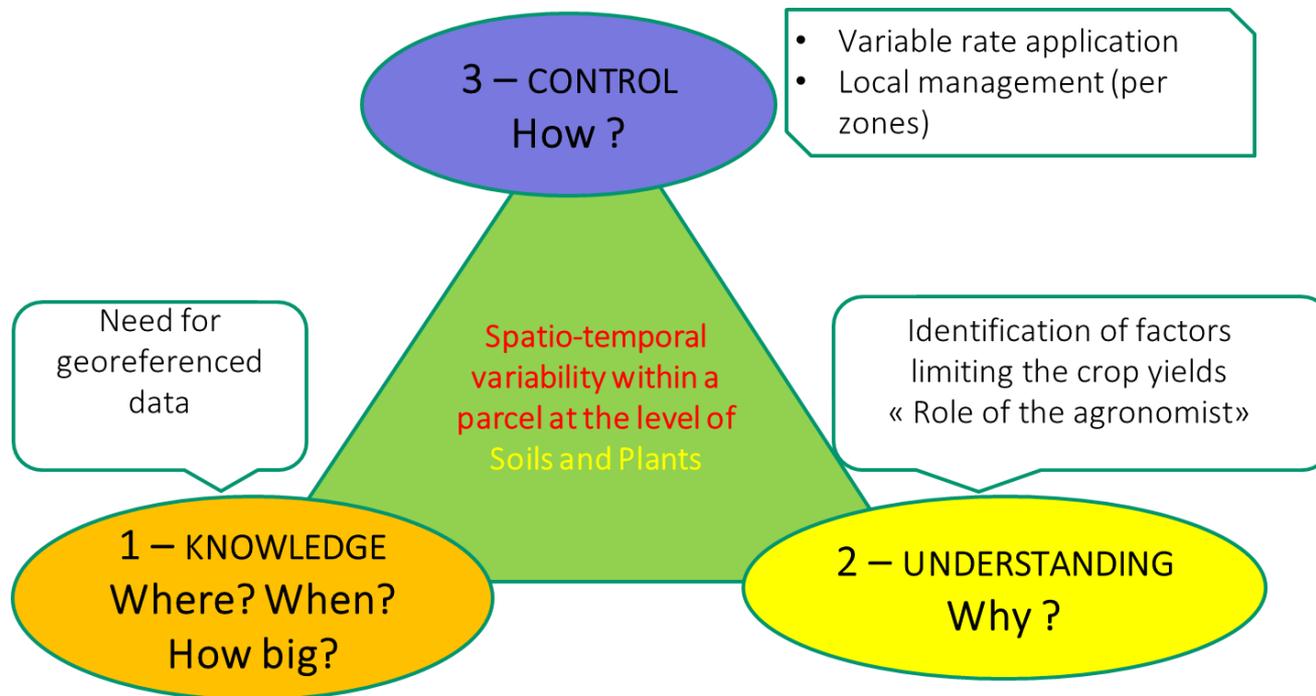
# Le développement de stratégies agronomiques de précision au CRA-W

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GTEO, Namur, 13-06-2016

# Precision agriculture ?

**Precision agriculture (PA)** is a farming management concept based on observing, measuring and responding to inter and intra-field variability in crops. The goal of precision agriculture research is to define a decision support system for whole farm management with the goal of *optimizing returns on inputs while preserving resources*.



# Precision agriculture at CRA-W



“Industrial Potato monitoring for the Belgian potato sector”  
*(finished)*



“BELgian Collaborative Agriculture Monitoring at parcel level for sustainable cropping systems” *(on-going)*

**VISA**

“Valorisation des Informations génériques et géo-localisées à la parcelle pour le développement de Stratégies Agronomiques de précision” *(on-going)*

**BEETPHEN**

Sugar beet phenotyping in breeding trials *(on-going)*

**UAVSOIL**

UAV borne spectrometers for high resolution soil and crop monitoring *(submitted, in evaluation)*



# Industrial Potato monitoring for the Belgian potato sector





# Objectives

- To provide the Belgian processing and fresh potato sectors with **near real time information at field or district level**, regarding growing conditions (soil, weather), crop development status and early yield estimation/prediction based on use of **satellite images time series** and **crop growth simulation models**.
- To develop a **web-platform with geolocalized data** allowing growers and industry (fresh and processed potato), together with research and technical centers, to analyse and combine those data with fields observations, aiming to improve management decision during growing season and at harvest and storage of the tubers for several months.
- **Finally, to improve potato fields monitoring over the whole production area, leading to higher volume and quality**



# Objectives

Risk of yield or quality losses ?

Problems ?  
Where? Priority list for field visits?



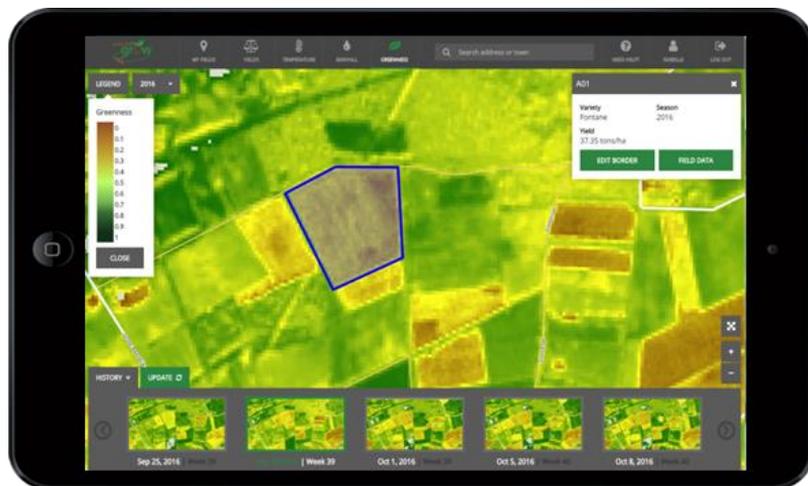
Contract negotiations !  
Expected yields ?

Planning ! Crop development stage



# Webplatform

WatchITgrow® for the future of the Belgian potato chain



## Monitoring potatoes from space!

- Crop development
- Field heterogeneity
- Risks at production and quality losses
- Yield forecasts

## For all actors in the potato chain:

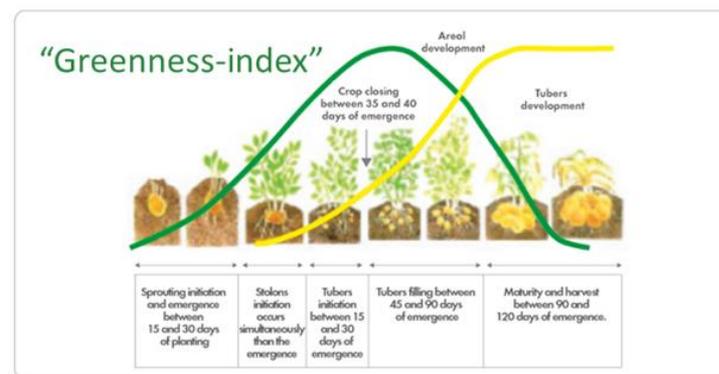
- Get access to satellite images/products, weather data, yield forecasts
- Store your own field data (e.g. treatments, yield samples,...)

# Satellite images



→ monitor & compare fields

- **Sentinel-2:**
  - 10m pixels
  - Since August 2015
  - Every 10 and soon every 5 days
- **DMC/Deimos:**
  - 22m pixels
  - since 2009
  - Every 2 days

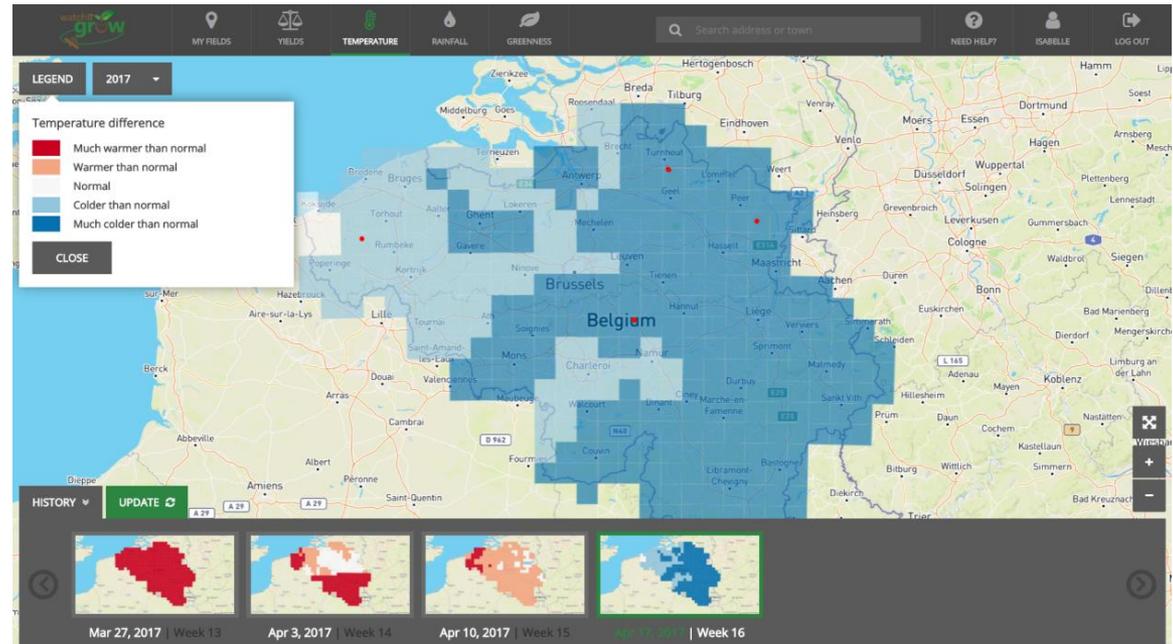




# Weather data

- Country wide weather info on a weekly basis:
    - Average temperature
    - Precipitation sum
- “deviation with average”

→ **risk at production  
or quality losses?**





# Monitor your fields throughout the season

## Emergence →

1 May 2016

8 May 2016

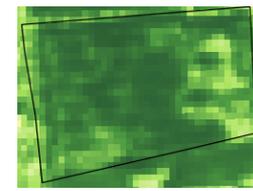
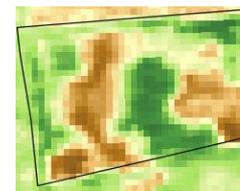
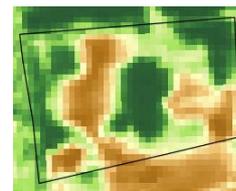
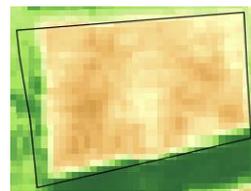
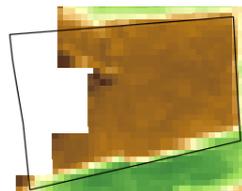
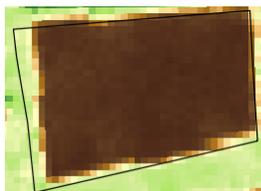
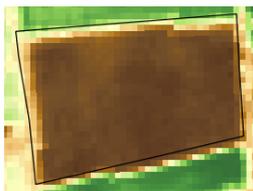
28 May 2016

6 June 2016

10 July 2016

20 July 2016

9 Aug 2016



## Senescence →

26 Aug 2016

5 Sept 2016

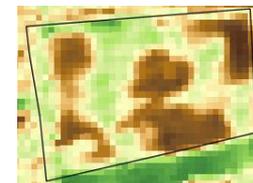
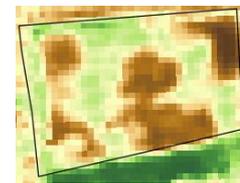
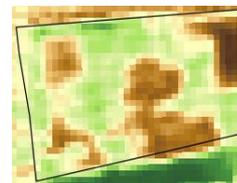
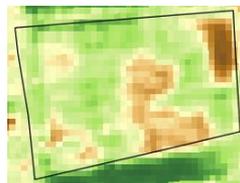
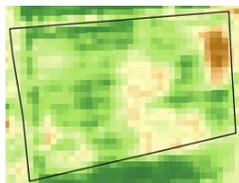
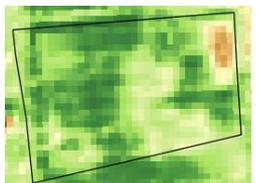
8 Sept 2016

15 Sept 2016

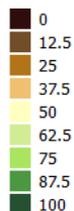
25 Sept 2016

28 Sept 2016

5 Oct 2016



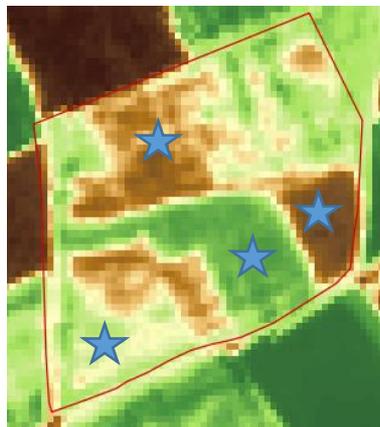
Greenness index



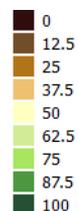


# Check your fields for heterogeneity

Sentinel-2 of 20 Aug 2016



Greenness index

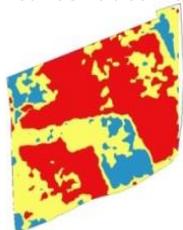


Useful for field selection (historical data)

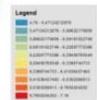
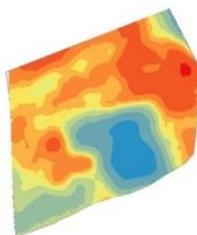
Improved sampling (per zone)

Evolution towards precision agriculture: variable rate application of fertilizers, irrigation, haulm killing,...

Electrical conductivity (EC)



Acidity (pH)



Reference data from soil scans (source: CRA-W)

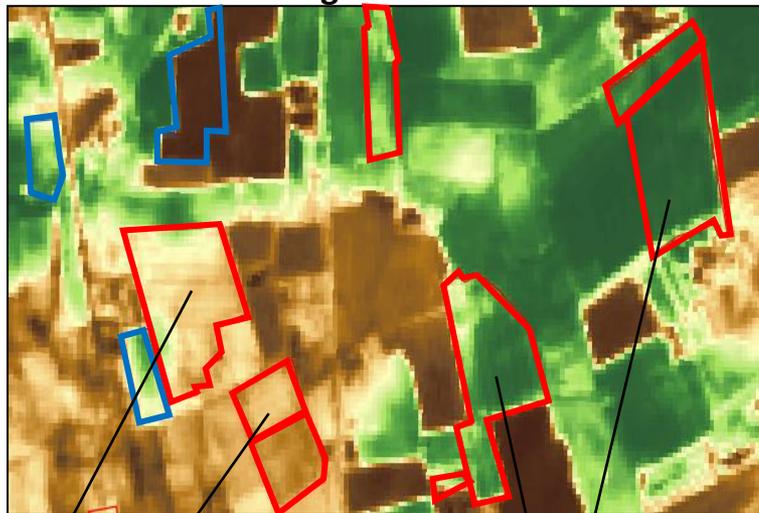




# Compare your fields

Early varieties (in blue) vs. late varieties (in red)

Sentinel-2 of 22 Aug 2016



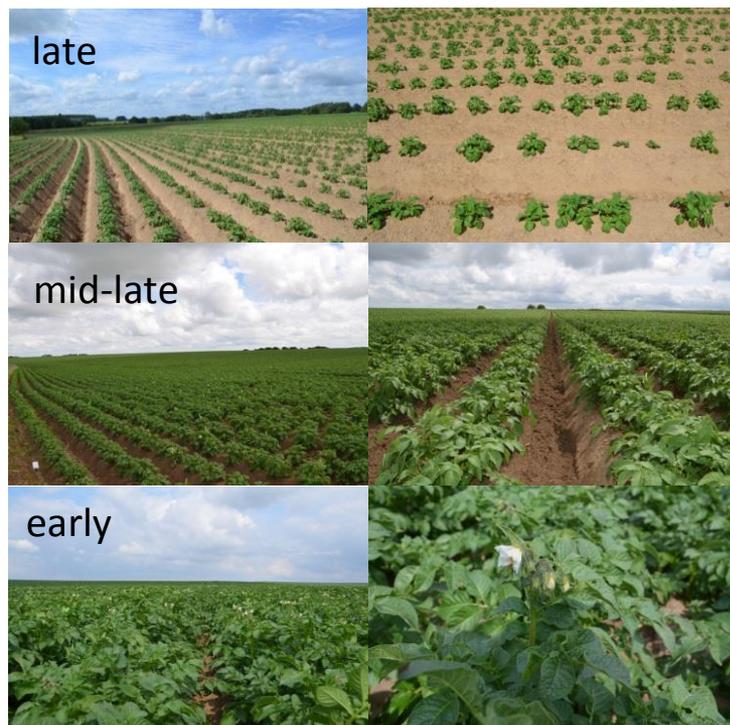
More advanced  
senescence

Still green

- optimize field visits
- input for planning / logistics (harvest)

Senescence started?

Haulm killing applied?



late

mid-late

early



# webplatform

GENERAL   TEMPERATURE   RAINFALL   GREENNESS   BENCHMARKS   SAMPLES   DELEGATE

LIST   CHART  

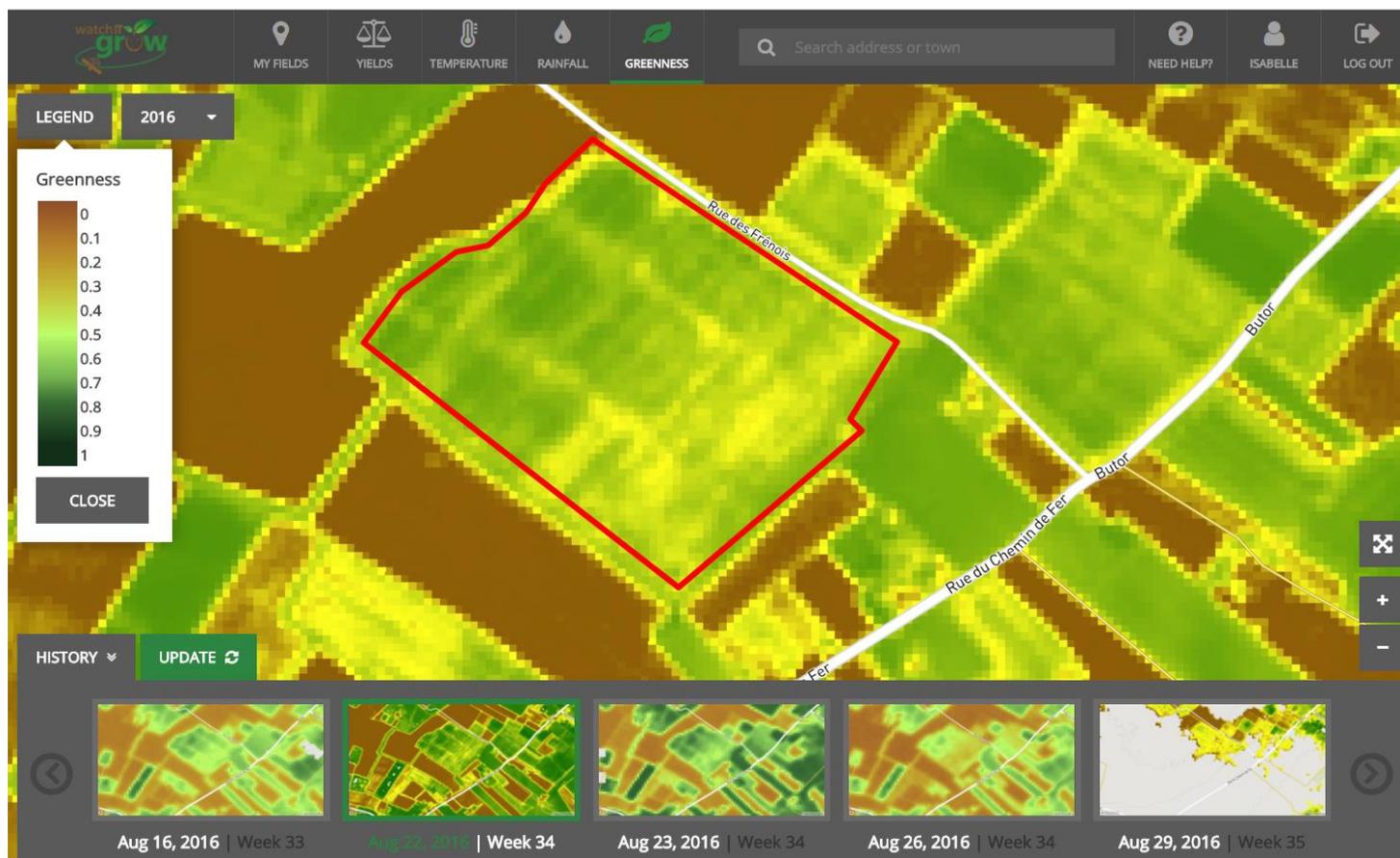
SAVE

Date	no.	Harvest	Plants	Stems per plant	Tubers per plant	Total fresh weight	% dry matter >35 mm	Under water weight >35 mm	% low sorting 35-50 mm	% high sorting >50 mm	
13-07-2016	1	<input type="checkbox"/>	7	4.29	16.43	9350 g	18.2 %	329 g	82 %	18 %	
04-08-2016	2	<input type="checkbox"/>	7	4.25	17.71	12350 g	21.2 %	390 g	43 %	57 %	
17-08-2016	3	<input type="checkbox"/>	8	4.88	20.25	15600 g	22.2 %	409 g	42 %	58 %	
21-09-2016	4	<input type="checkbox"/>	7	4.26	15.75	14250 g	22.7 %	420 g	30 %	70 %	

ADD SAMPLE +



# webplatform





# VISA

## Valorisation en temps réel des Informations génériques et géolocalisées pour le développement de **S**tratégies **A**gronomiques de précision

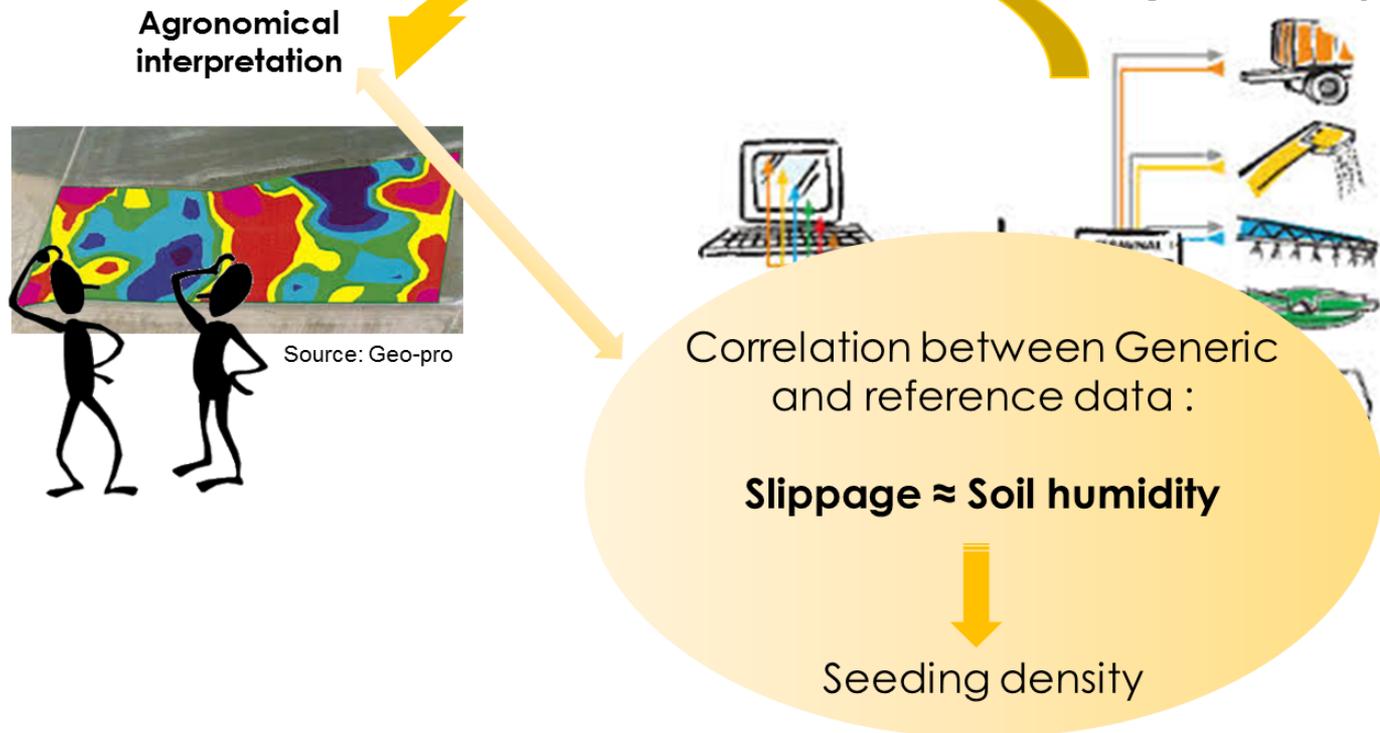


# VISA Concept

Concept = compare, correlate and validate the generic data with other pertinent and known agronomical data

Collection and analysis of the generic data

META-DATA  
(Generic and geo-localized)



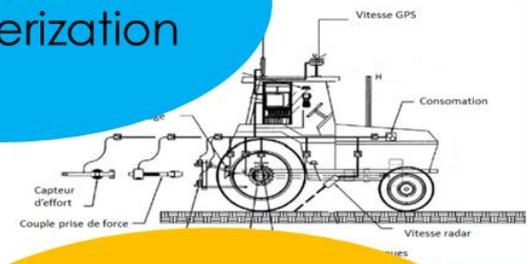
# VISA Data collection



Harvest  
characterization



Vegetation  
characterization



Soil  
characterization



Use of geolocalised generic data at the field level  
in order to develop precision agricultural strategies

# VISA Data collection

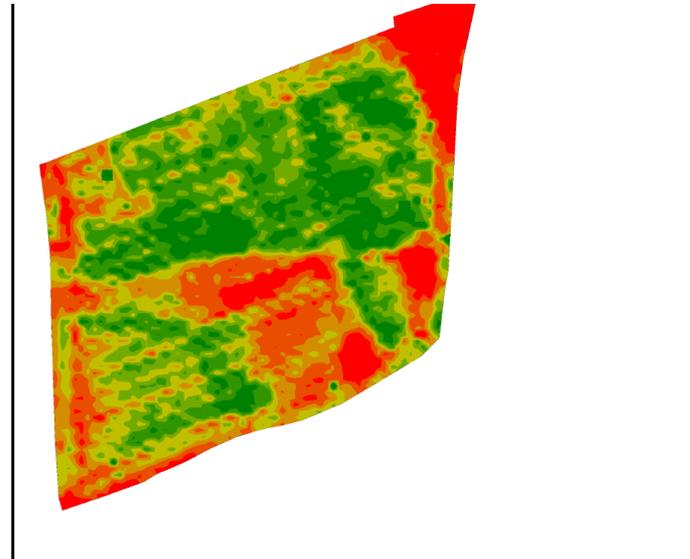
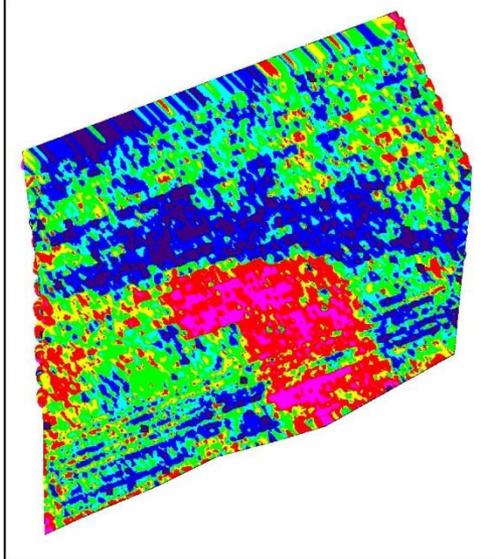
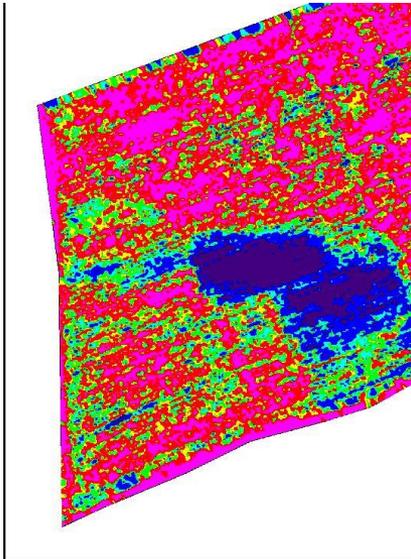
Rèves  
Patinae

11,000 - 45,000  
6,000 - 10,999

Slipping images

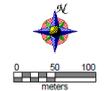
Height of the crop

Yield of the crop



4,1 - 103,0 kg/ha  
3,7 - 4,0 kg/ha  
3,4 - 3,6 kg/ha  
3,0 - 3,3 kg/ha  
2,6 - 2,9 kg/ha  
2,1 - 2,5 kg/ha  
0,4 - 2,0 kg/ha

Exploitation: < Exploitation non assign  
Ferme: Domaine  
Champ: Rèves  
Culture: 2016 Wheat  
Nom: rendement reves  
Date: 31/08/2016

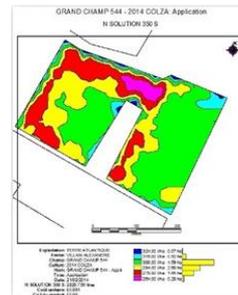


# Modulation and transfer to machines

Modulation through 3 levers:

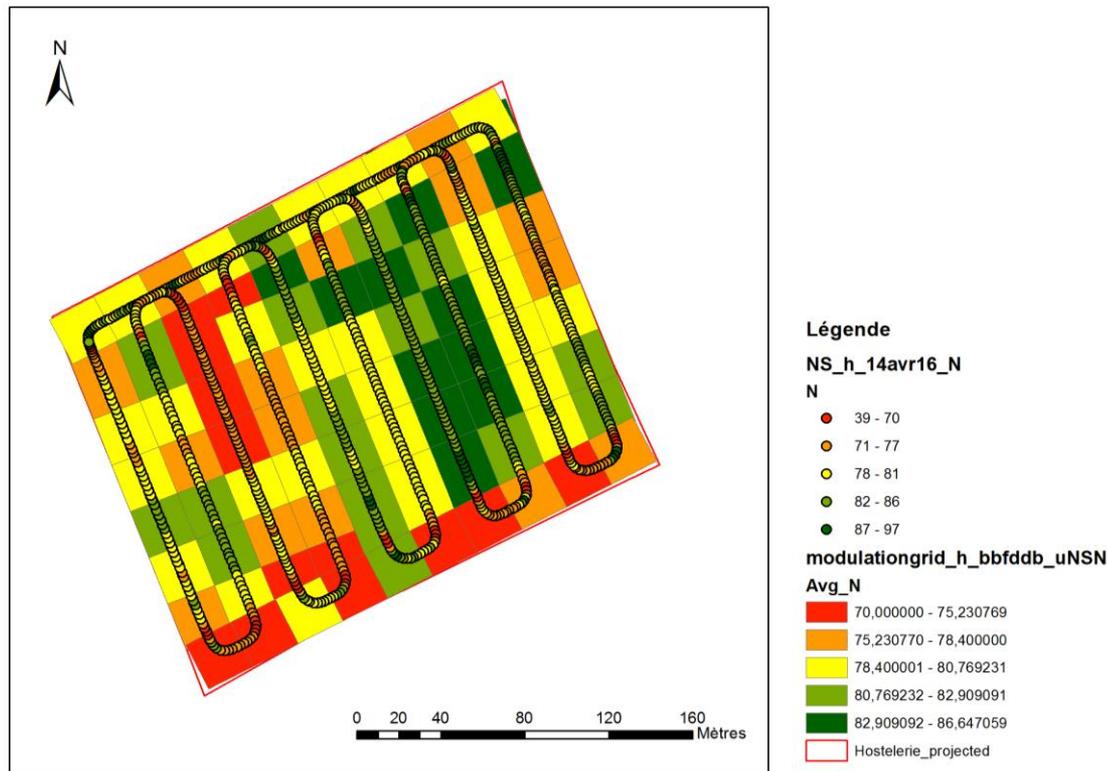
- Soil work
- Sowing
- Fertilizers and soil amendments

Modulation map



# Modulation and transfer to machines

Variability within a winter wheat field and proposition of nitrogen modulation for 2016





# BELgian Collaborative Agriculture Monitoring at parcel level for sustainable cropping systems



**Centre wallon de Recherches agronomiques**  
Répondre aux questions d'aujourd'hui et relever les défis de demain  
[www.cra.wallonie.be](http://www.cra.wallonie.be)



*UAVSOIL*

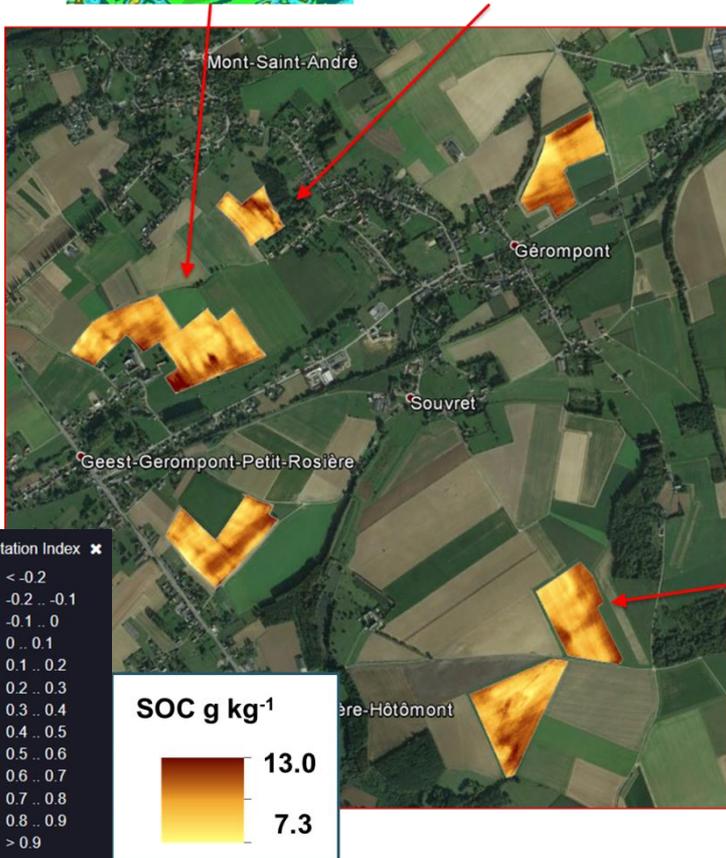
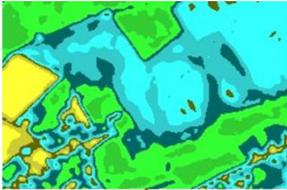


## UAV borne spectrometers for high resolution soil and crop monitoring



# UAVSOIL

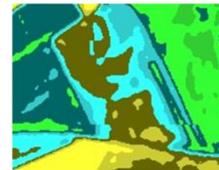
Sentinel-2a, 26 May 2017



Mineralization of soil organic matter contributes to the N supply for crops. High resolution spatial (soil) and temporal (crop) monitoring will contribute to the delineation of management variable zones aiming to optimize nitrogen management within each zone.

UAV is already used operationally for crop monitoring with increasing interest. The combination with soil monitoring will provide an added-value for N recommendation.

Comparison of high resolution soil and crop maps points to similarity in spatial patterns



Soil organic carbon maps from airborne data

Crop growth stage from Sentinel-2a



Strong complementarity / synergy  
between the different projects  
geared towards the development of  
integrated strategies for precision  
agriculture in Belgium

# Thank you for your attention !

