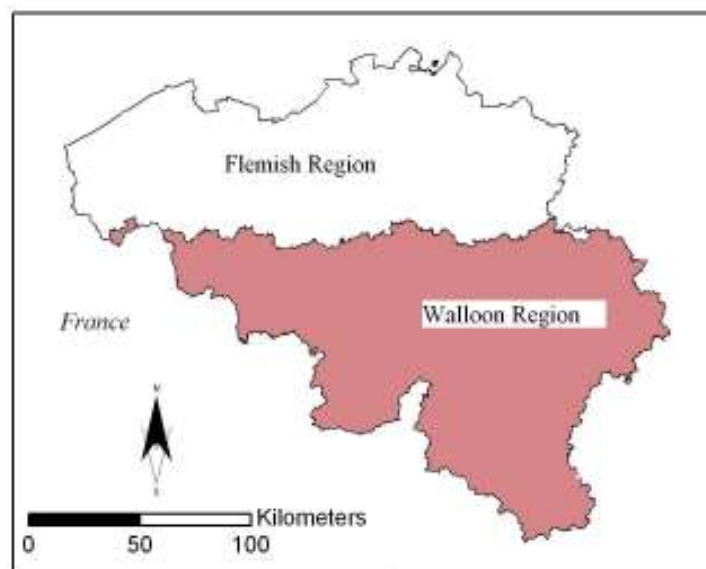# MONITORING OF THE WALLOON AGRICULTURAL STATE WITH REMOTE SENSING (SAGRIWATEL PROJECT)

B. Tychon, A. Istasse, F. De Longueville, B. Leteinturier, R. Oger, X. Blaes, P. Defourny, L. Quintin, C. Debouche, L. Vanhalle and M. Thirion

Context

Regionalisation of the Belgian agriculture

Evolution of the Common Agricultural Policy in Europe

Needs of the Walloon Region

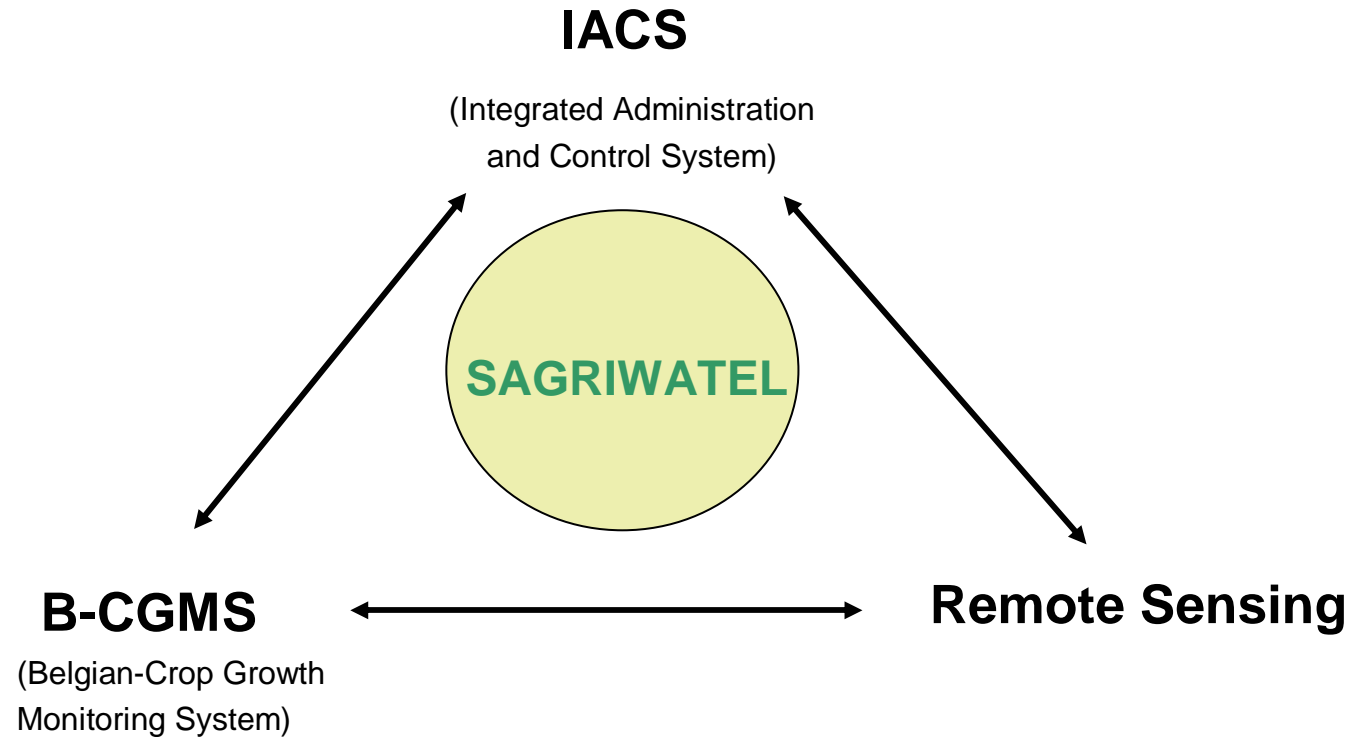Monitoring of the state of the Walloon agriculture

- **Agricultural activities**
  - Agricultural yields, acreages, productions
  - Monitoring of the agricultural campaign
  - Monitoring of different stresses (water, nutrient, diseases…)

- **Agri-environmental activities**
  - Agri-environmental measures (MAE)
  - Good agricultural practices

Needs of the Walloon Region

- Control of farmer declaration

- Supervision and technical support of farmers

- Knowledge of the general trends, evolutions

Assets of the Wallon Region

IACS

(Integrated Administration
and Control System)

SAGRIWATEL

B-CGMS

(Belgian-Crop Growth
Monitoring System)

Remote Sensing

- Acces to updated spatial databases
- National policy promoting remote sensing

Project objective

Conception of tools for the control, the support and the monitoring activities of the Agricultural Administration in order to better know the state of the walloon agriculture.

These tools are mainly based on the valorization of spatial information derived from B-CGMS, IACS and RS data.

Methodology

1. Set up of a knowledge data base management system for the Monitoring of the agriculture in Walloon Region.

   ⇒ Elementary spatial unit = agricultural parcel

   ⇒ Valorization of Walloon assets

   ⇒ Multifunctional system

   - Only solution for an optimized valorisation of this gigantic amount of data

   - Combination of already existing system rather than creating new ones

   - Open and modular system

Methodology

2. Indicator approach choosen deliberately

- Approach selected by Walloon Region to present its Environment state

- A global approach is requested because all the Walloon Region is targeted

- Indicators allow to target zones for a specific control, a preferential support (selective monitoring).

- <u>Multi-scale</u> indicators
    - Parcel
    - Farm
    - Municipality
   - County
    - Watershed
    - Walloon Region

Methodology

3. Exchange Information Plateform – Farm advisory system

- Conception and development of a geographical plateform adapted to the Administration needs (WebGIS)

- Set-up of this plateform in a production environment
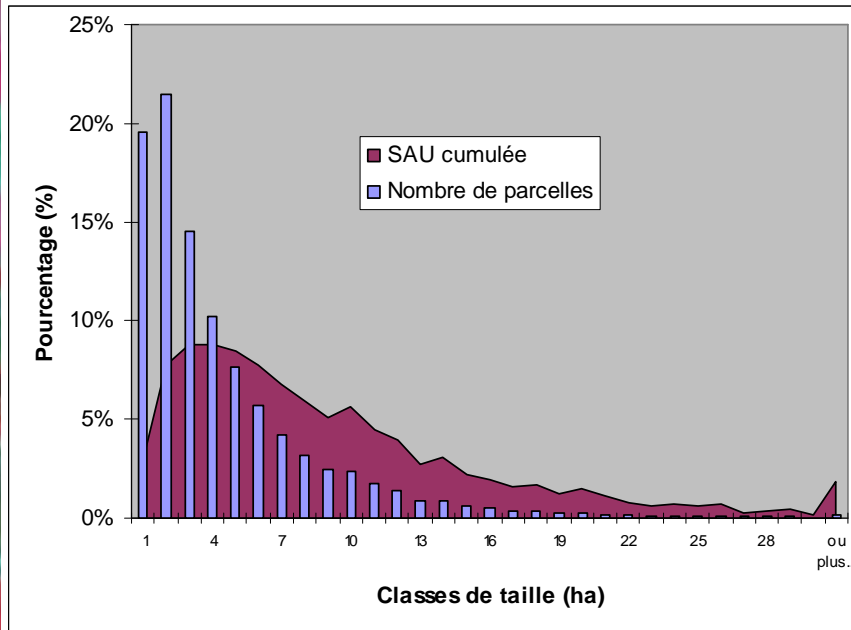
4. Team work

- 4 scientific institutions (ULG, CRAW, FUSAG, UCL)

- Permanent dialog with the Administration when choosing and conceiving indicators
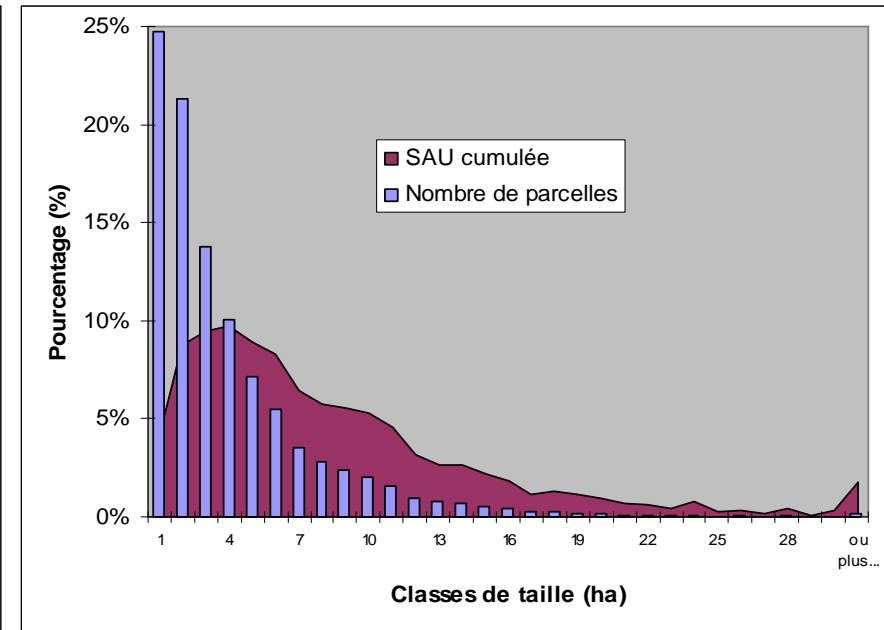
Some applications

Evolution of Parcel size of arable land
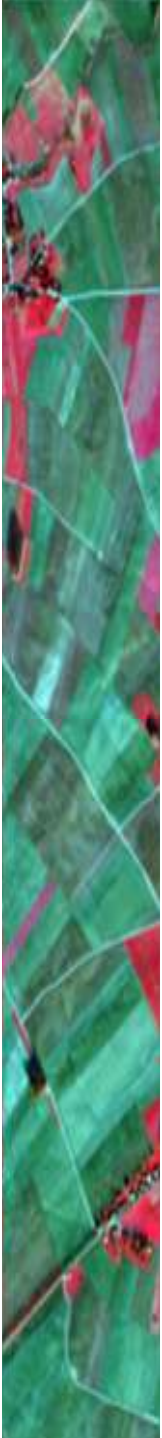
Distribution frequency of arable land parcels :

watershed of « Meuse aval »
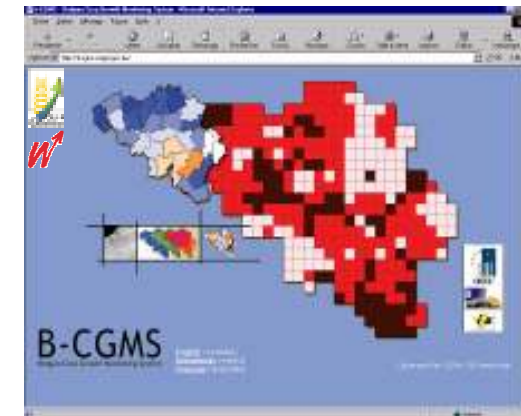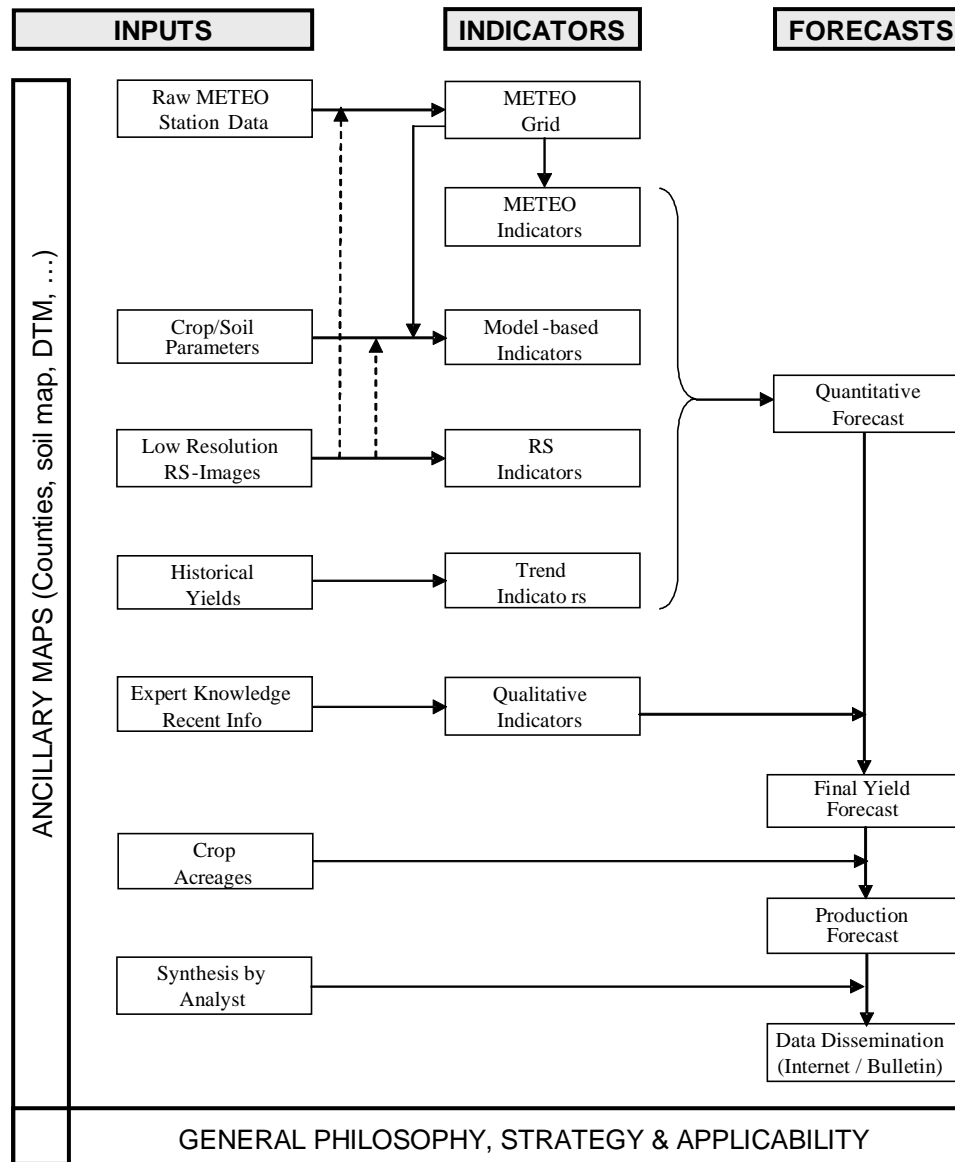

1998

2003

From 1998 to 2003, shift of the arable land parcel distribution frequency to smaller parcels :
in 2003, 49% of the Used Agricultural Area (SAU) is covered by parcels < 6ha against 45% in 1998.
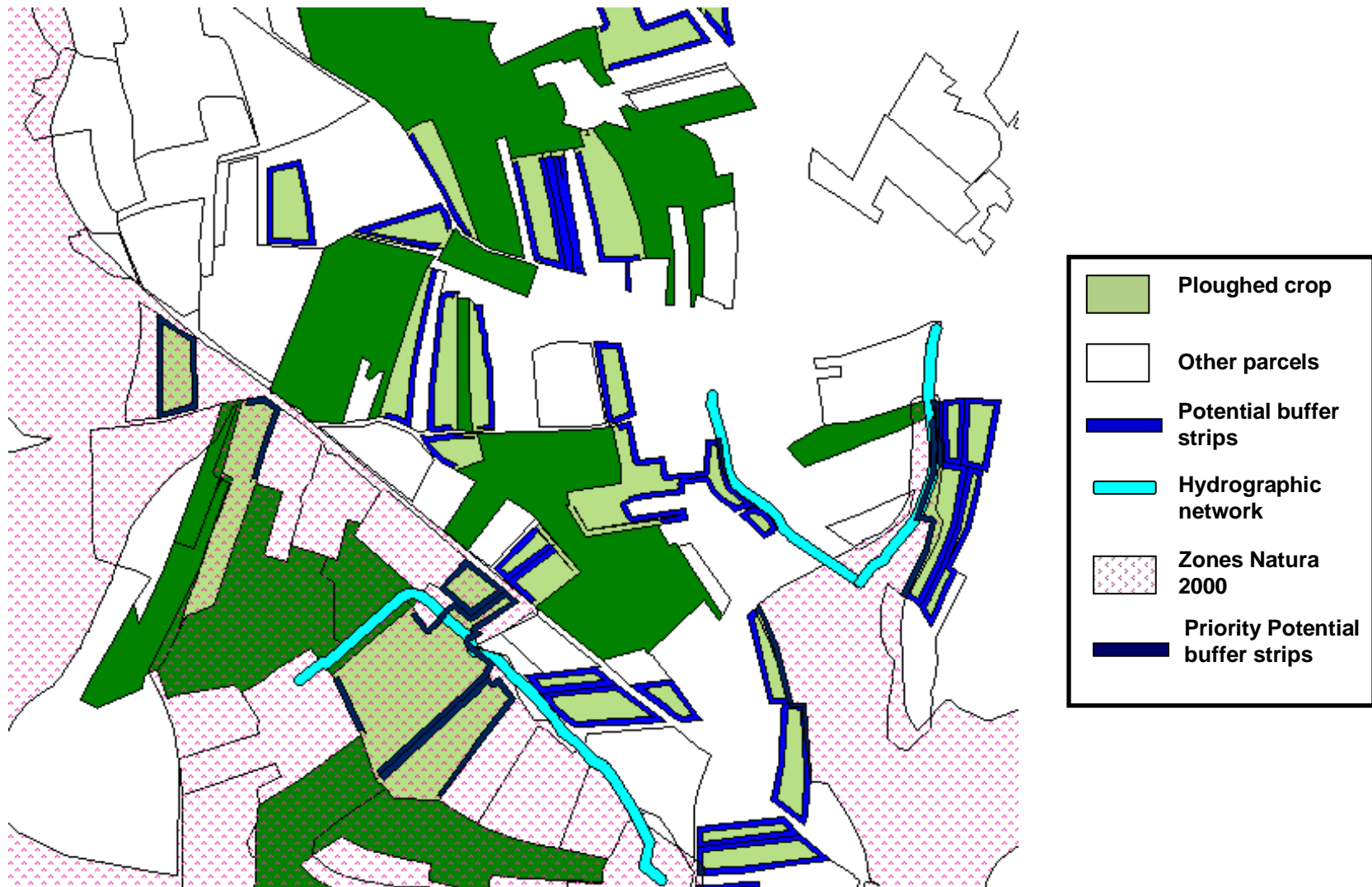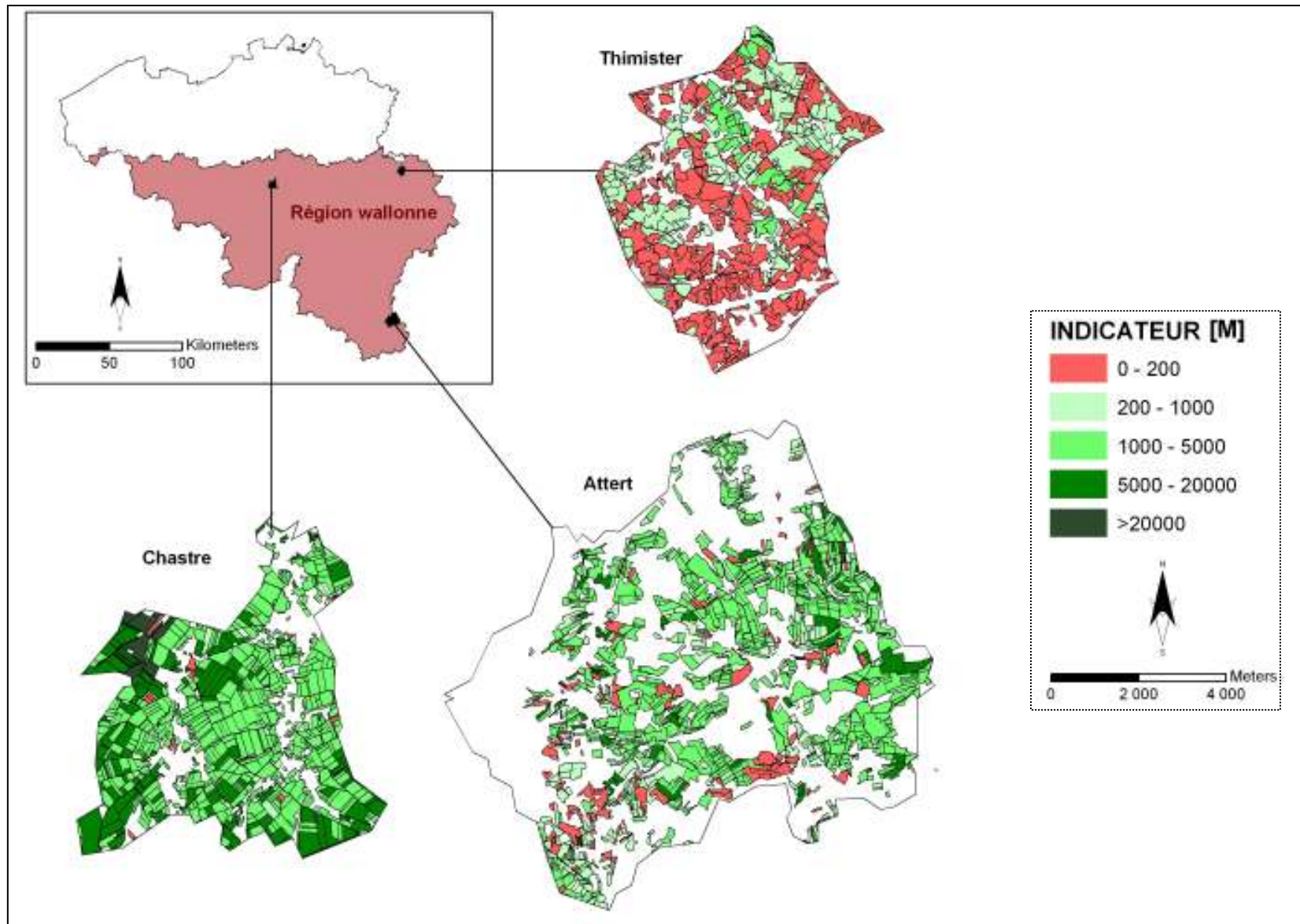
INPUTS | INDICATORS | FORECASTS

ANCILLARY MAPS (Counties, soil map, DTM, ...)

- Raw METEO Station Data → METEO Grid → METEO Indicators
- Crop/Soil Parameters → Model-based Indicators
- Low Resolution RS-Images → RS Indicators
- Historical Yields → Trend Indicators
- Expert Knowledge Recent Info → Qualitative Indicators
- Crop Acreages
- Synthesis by Analyst

Quantitative Forecast

Final Yield Forecast

Production Forecast

Data Dissemination (Internet / Bulletin)

GENERAL PHILOSOPHY, STRATEGY & APPLICABILITY

B-CGMS

➡ **Site Web
(http://b-cgms.cra.wallonie.be)**

Legend:
- Ploughed crop
- Other parcels
- Potential buffer strips
- Hydrographic network
- Zones Natura 2000
- Priority Potential buffer strips

Agregated results at farm scale

INDICATEUR [M]

- 0 - 200
- 200 - 1000
- 1000 - 5000
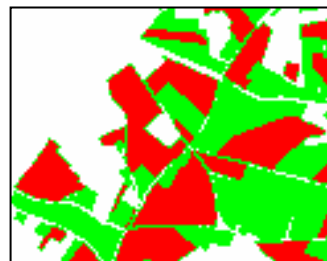- 5000 - 20000
- >20000

Winter land cover assessment

- **Based on IACS farmers declarations**
- **and with teledetection**

2003 Situation

X

2004 Situation

Land cover map December 2003 Situation (SPOT5 image)

crop

Bare soil
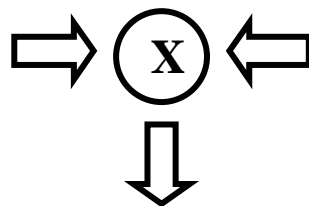
intercrop

Winter crop

Likely bare soil
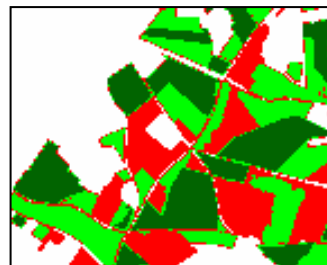
Bare soil
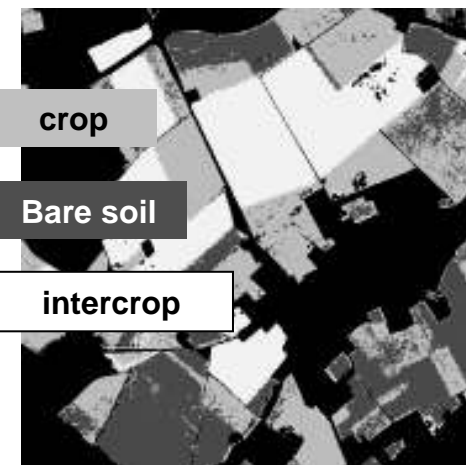
Crops

intercrop

Accuracy : 80%

I_{farm} I_{region}

I = arable land with bare soil in winter/ total arable land
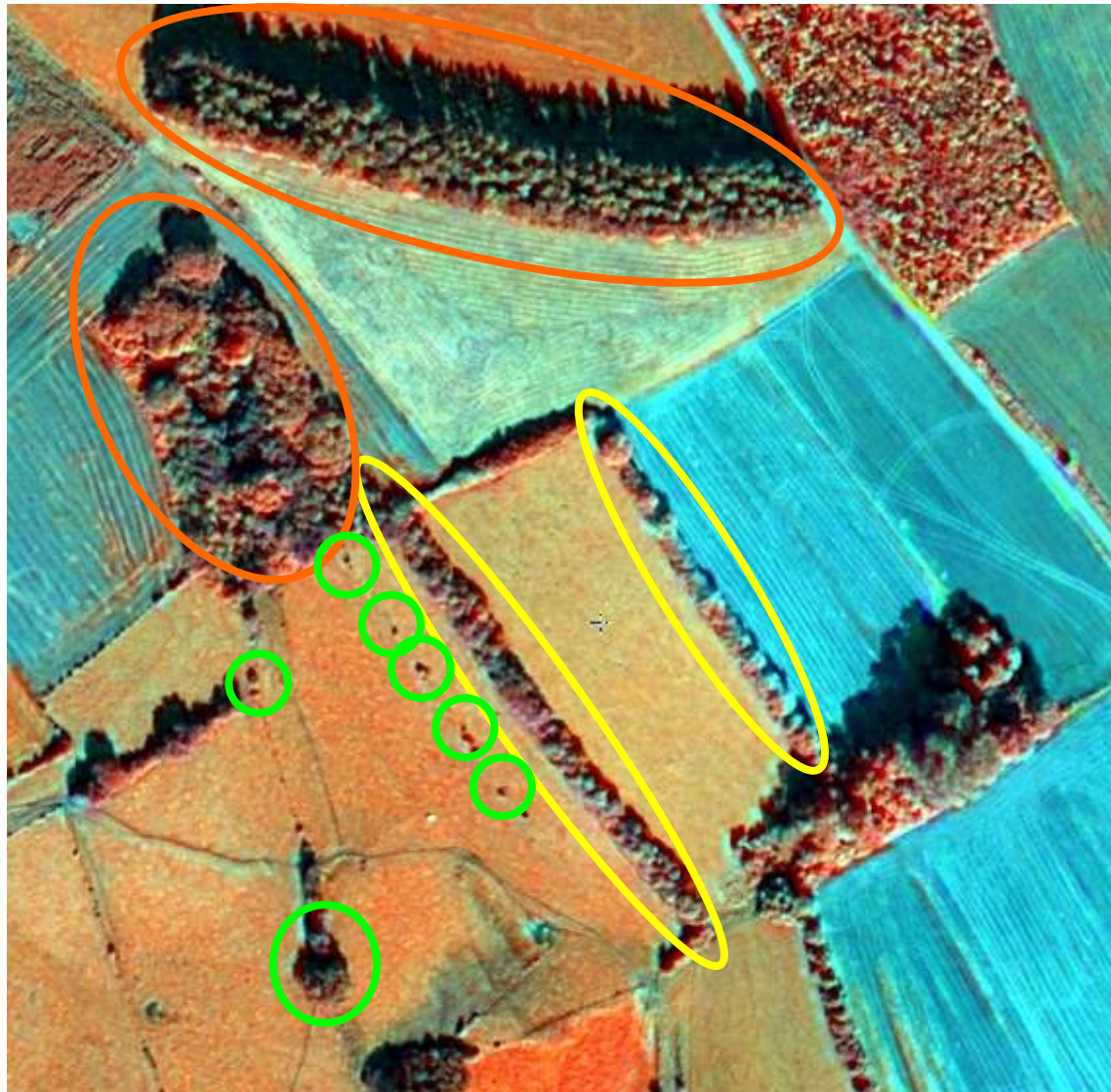
Crop succession (rotation) assessment

$$I_{sc} = k_p.k_r.k_d$$ adapted from the French Indigo procedure

- Former crop
- Return time
- Crop diversity

	$0 < Isc <= 1$
	$1 < Isc <= 2$
	$2 < Isc <= 3$
	$3 < Isc <= 4$
	$4 < Isc <= 5$
	$5 < Isc <= 6$
	$6 < Isc <= 7$
	$7 < Isc <= 8$
	$8 < Isc <= 9$
	$9 < Isc <= 10$
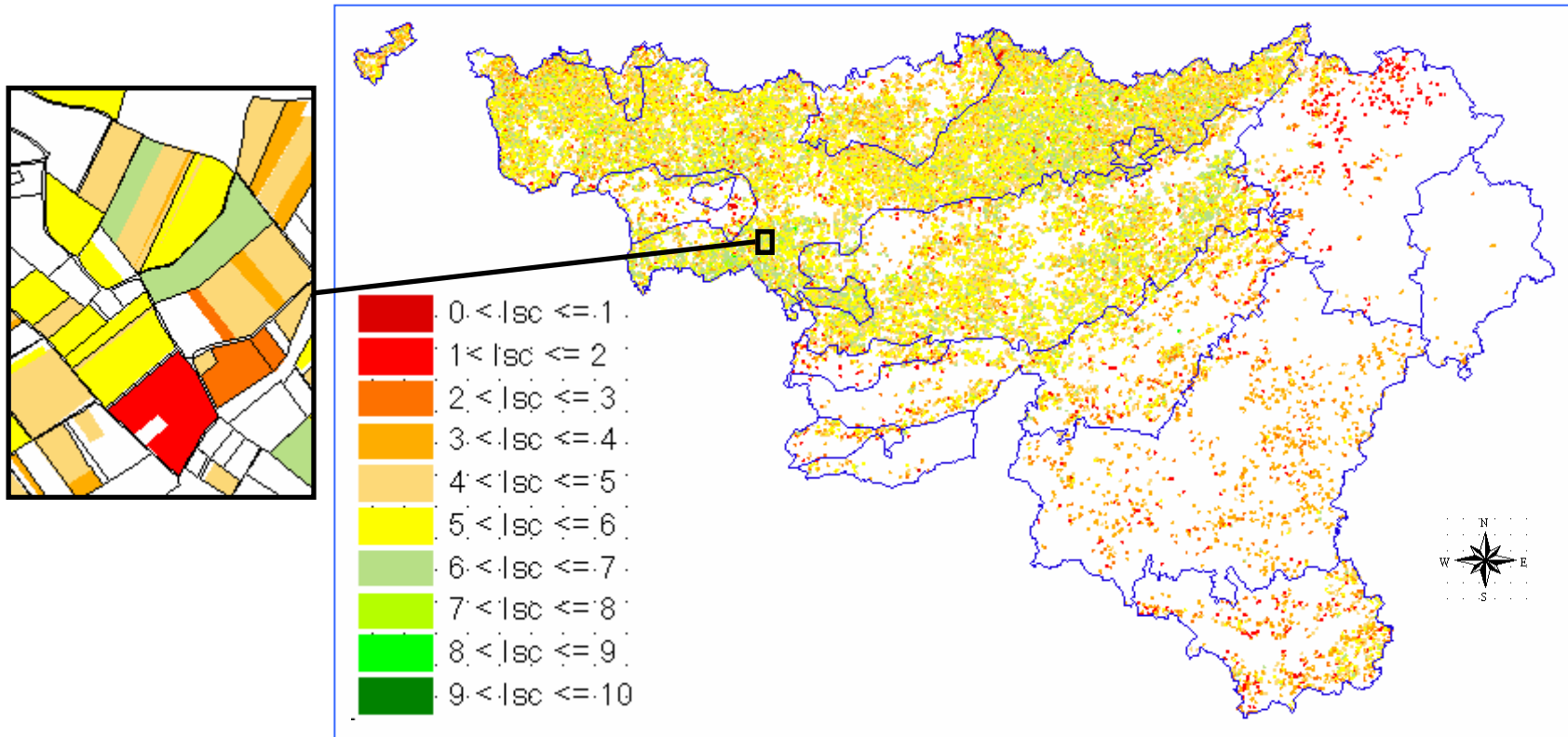
Spatial representation of the crop succession indicator in Walloon Region

Habay-la-Neuve – Stereo scientific meeting – 20.09.2005

Some elements

- **Woods parcels**

- **Hedges**

- **Isolated tree**

VHR Images

Nitrogen fertilization for maize parcels

Hyperspectral images

Precision : 75%

Under-fertilized
Correctly fertilized
Over-fertilized
Commune d'Attert

0   2,5   5 km

Conclusions

A set of concrete applications have been set up for the needs of the Walloon Agricultural Administration such as :

- yields and productions forecasting
- water stress areas delineation
- location and length/size estimation of buffer strips, hedges, water ponds...
- location of winter land cover
- location of ploughing direction versus parcel slope/length
- monitoring of crops successions (rotations)
- monitoring of crops diversity
- evolution of parcel sizes
- monitoring of N-Fertilization in corn crop

...

Some applications are in a nearly operational state, others do require more research.

Conclusions

1. **Original Valorization of the Geographical IACS.**
2. **Interest of the combination of IACS database with aerial or satellite information.**
3. **Tools modulable and adaptable to evolution of needs.**
4. **Extension of a tool already controled by the Administration**
5. **Management computing coupled with scientific developments.**
6. **Permanent link between Research and Administration**