

## Regional crop & irrigation monitoring: some examples of (new) opportunities

*Belgian workshop 'Space4Food'*

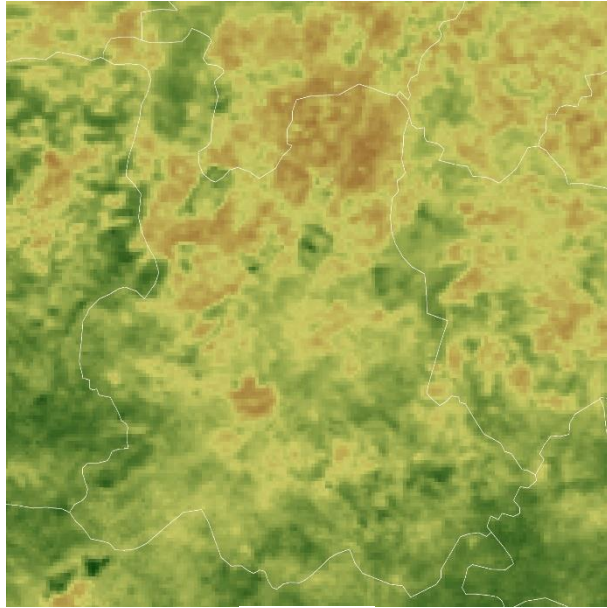
*June 11, 2015 - Milan*

Joost WELLENS & Water-Environment-Development unit

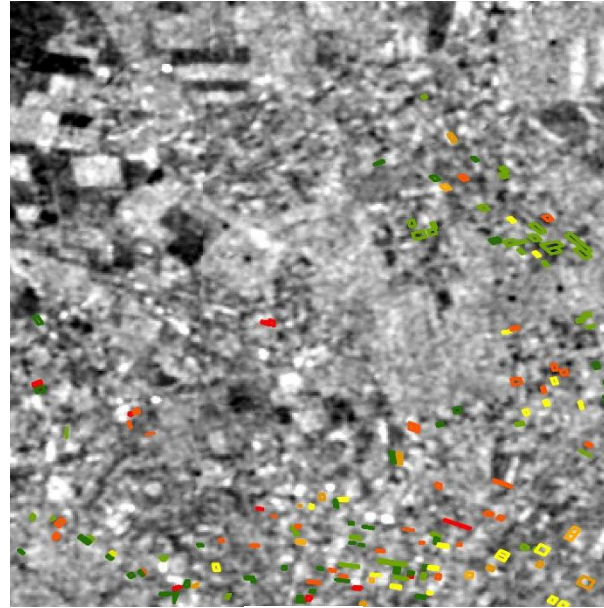


# ... Monitoring 'space4food'

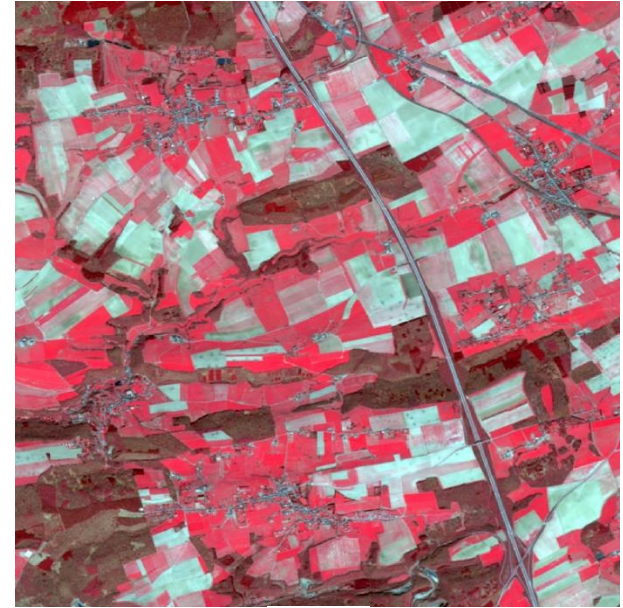
- applications at  $\neq$  levels -



170 km



10 km



5 km

National / regional:

- MODIS (NDVI, GAI, ...);
- temporal profiles;
- historic data.



Statistical approach

Regional:

- ERS-2;
- irrigation management database.



Signal analysis

Field / Regional / National:

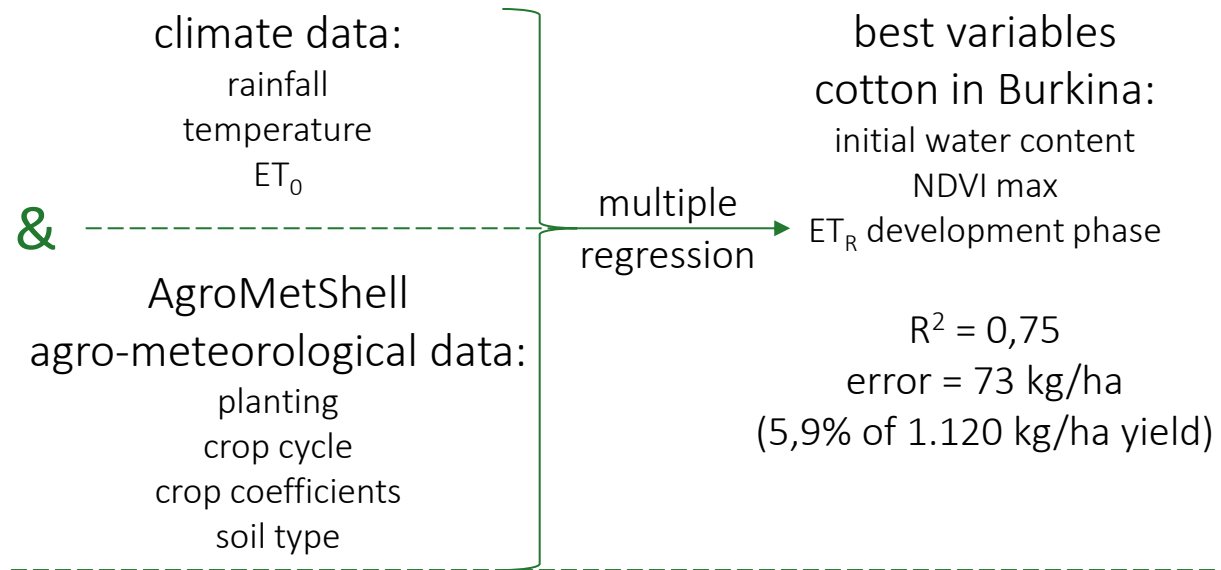
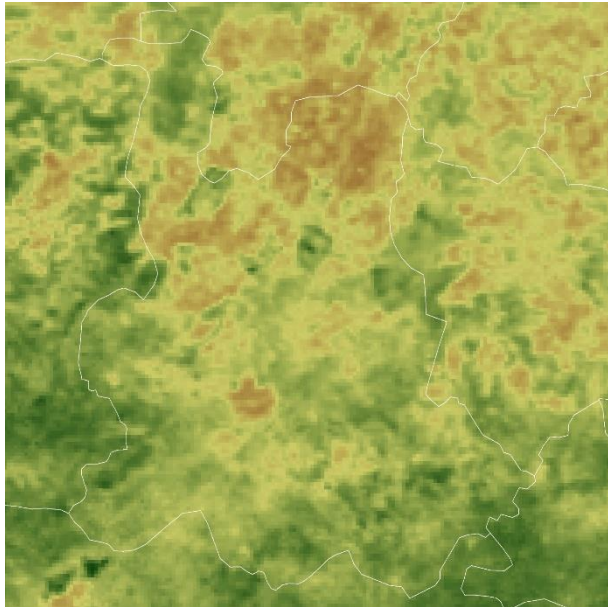
- SPOT-5 Take5;
- time series.
- field observations.



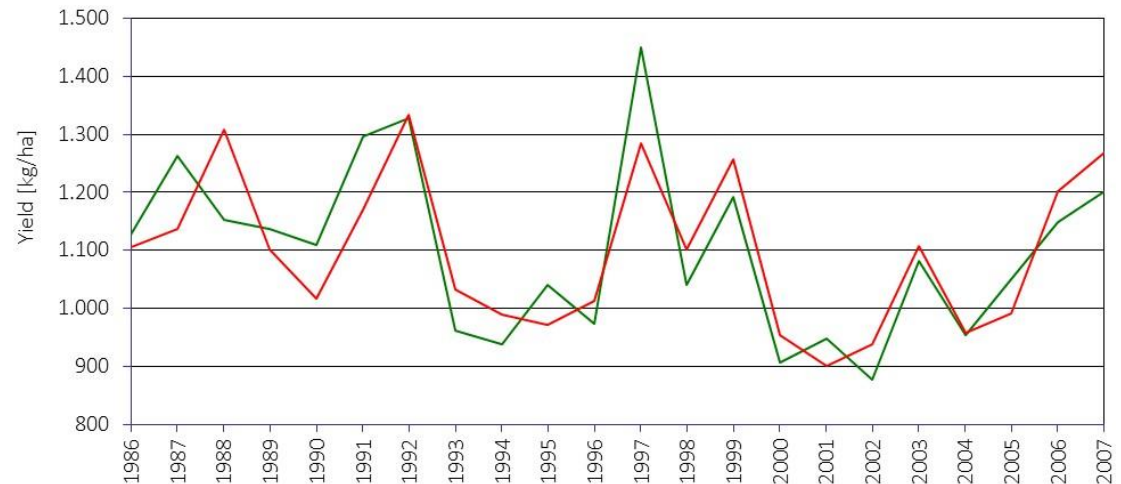
Assimilation

# 1.i Regional (coarse) crop monitoring

- Global Monitoring for Food Security -

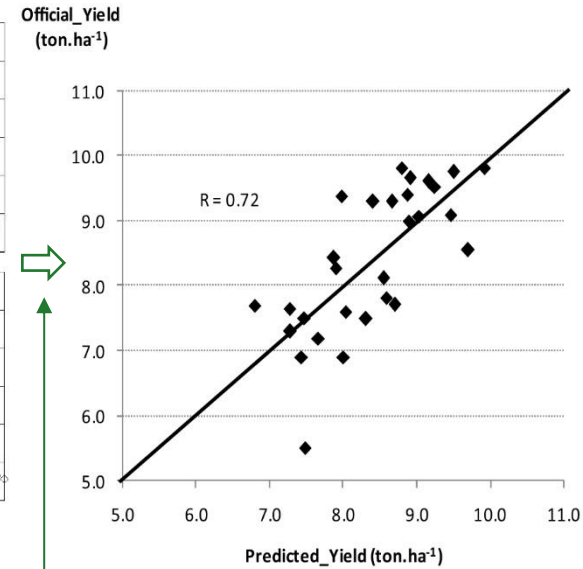
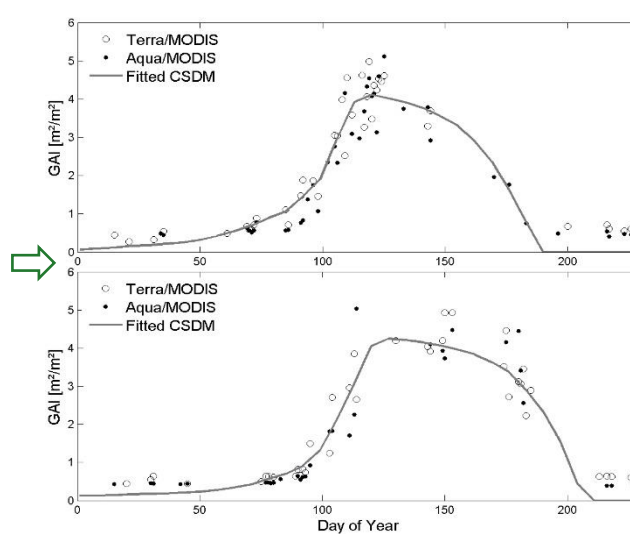
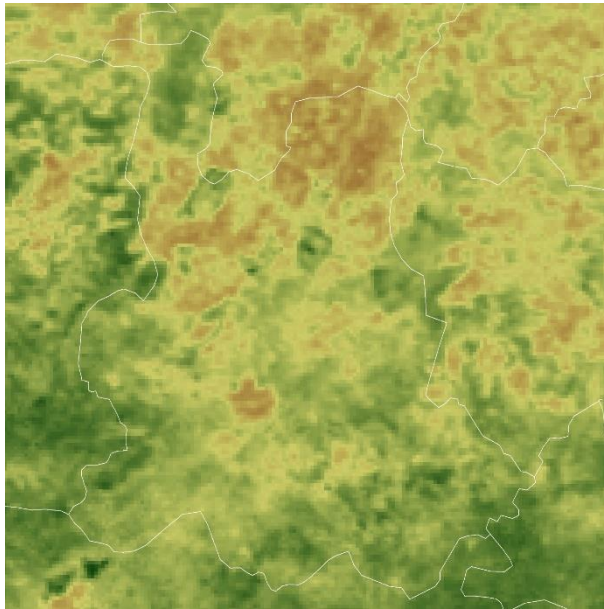


- MODIS;
- NDVI temporal profiles.



# 1.ii Regional (coarse) crop monitoring

- 'curve fitting' -



- MODIS;
- GAI temporal profiles.  
(green area index)

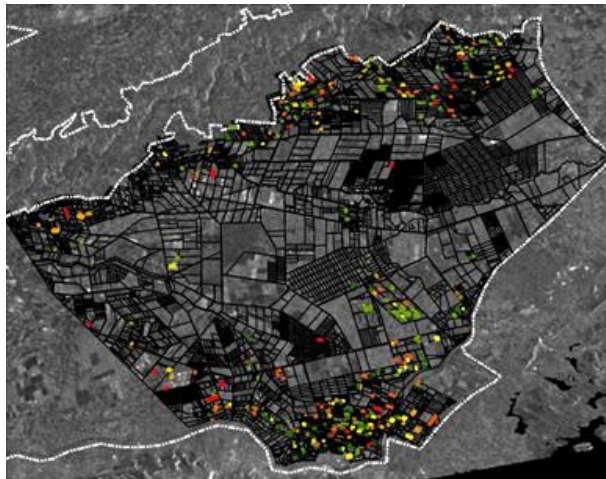
Shape of decreasing curves  
of green area index

~

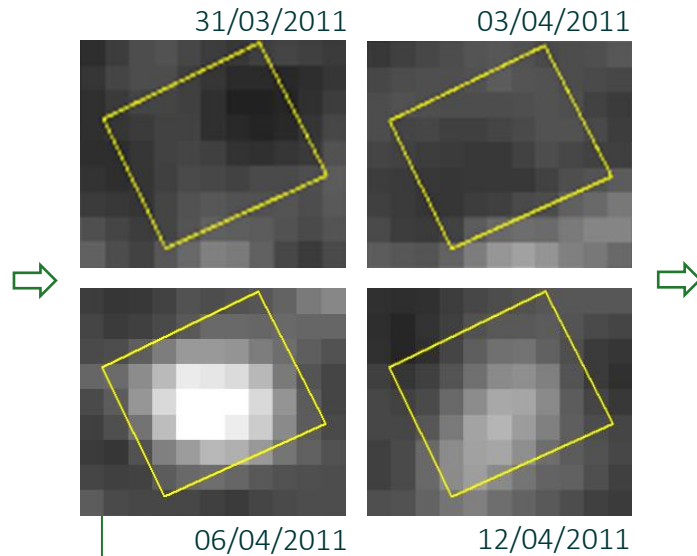
Regional wheat yield

# 2 Irrigation monitoring

- using SAR data -



- irrigated perimeter of Tadla (center of Morocco);
- 100,000 ha of wheat;
- flood irrigation, 2 to 5 times;
- irrigation water invoices database.



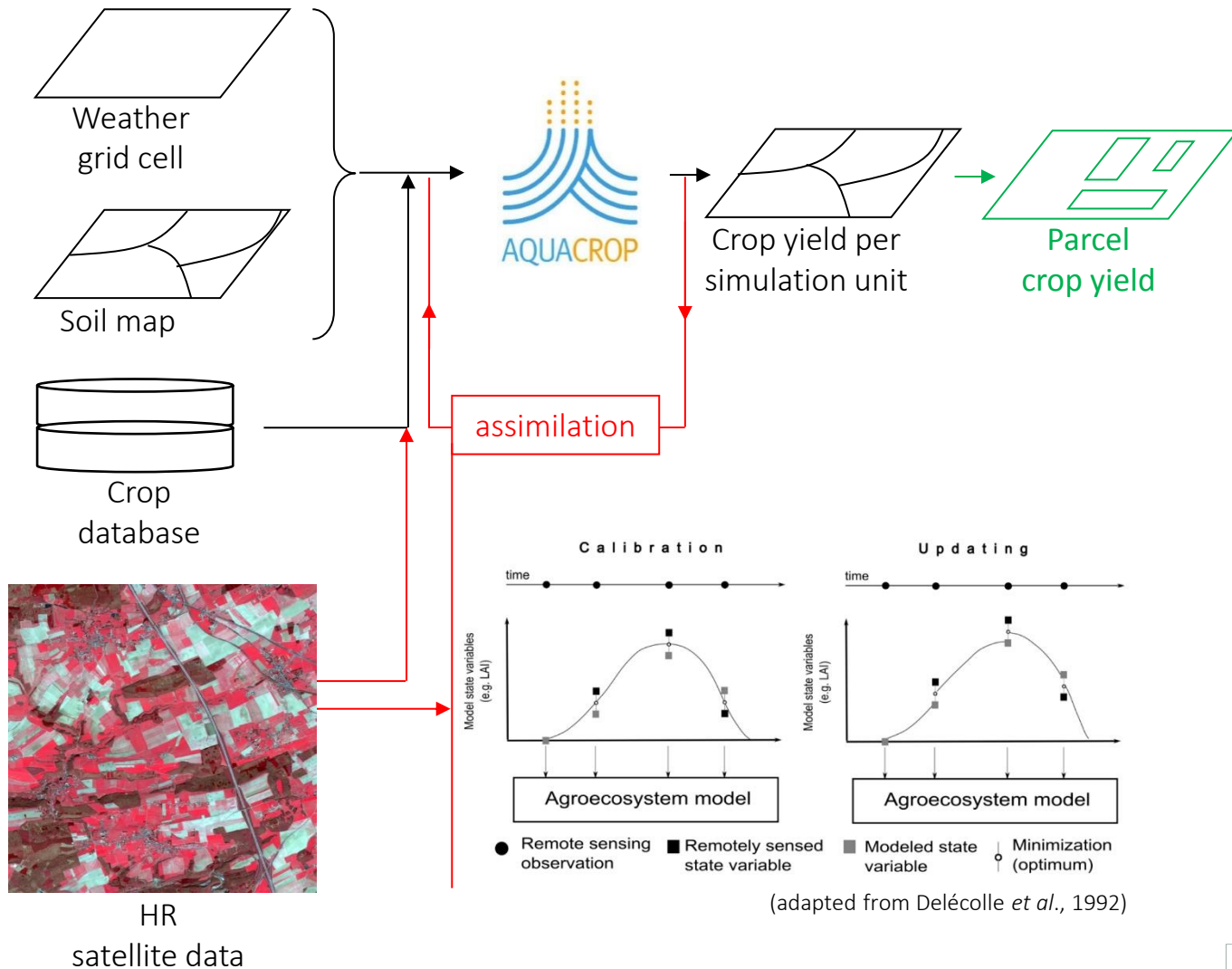
- ERS-2;
- C-band;
- dual polarizations (VV);
- 25 m.

backscatter  
~  
soil water content  
~  
irrigation

- 
- + atmospheric conditions;
  - + cost;
  - + commercial potential.

# 3.i Regional (detailed) crop monitoring

- work-flow -



(adapted from Delécolle *et al.*, 1992)

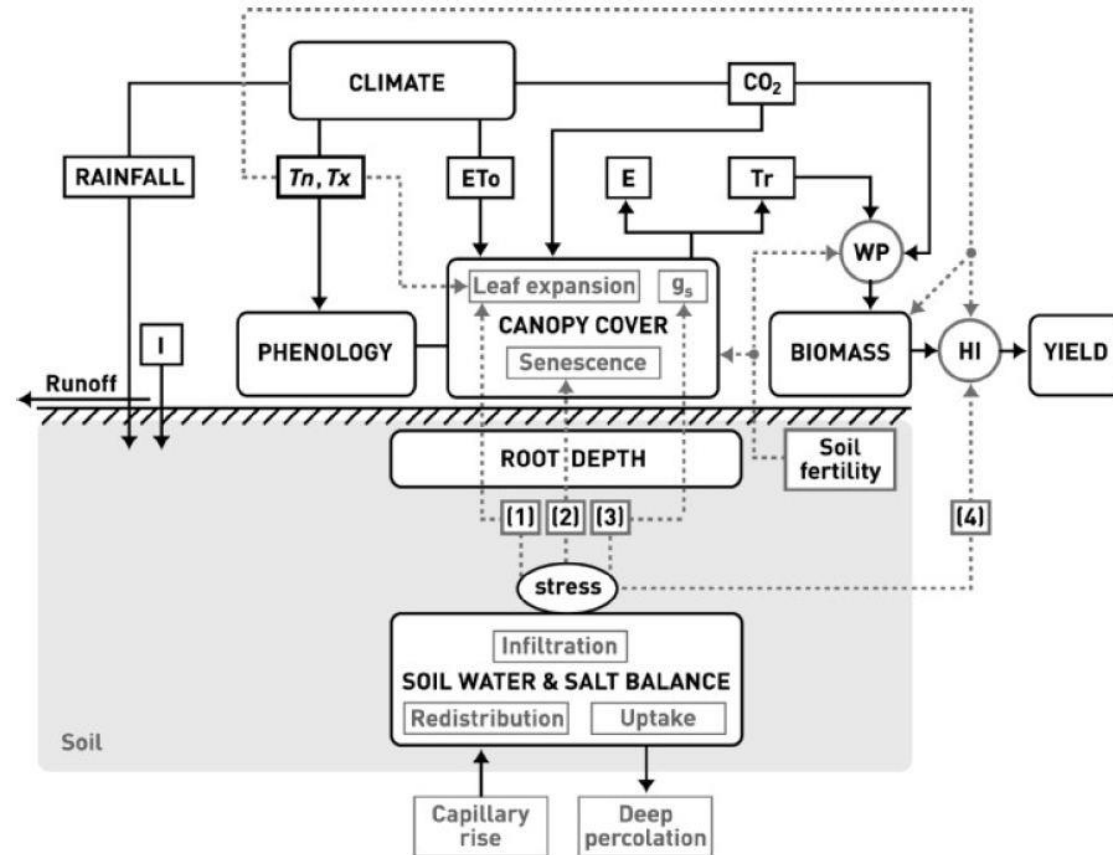
# 3.ii AquaCrop (FAO)

- how does it work? -

$B = WP \cdot \sum Tr$  or Biomass = Water productivity · Sum of transpiration

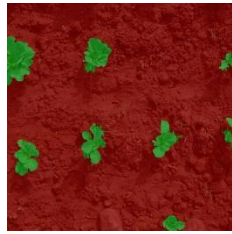
$Y = HI \cdot B$  or Yield = Harvest index · Biomass

simple  
&  
solid

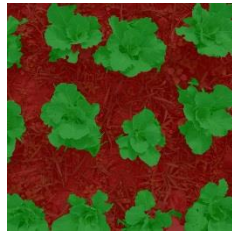


# 3.iii Crop input

- canopy cover -



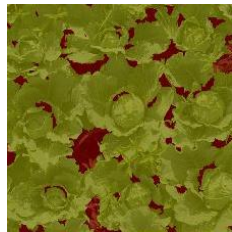
08%



44%



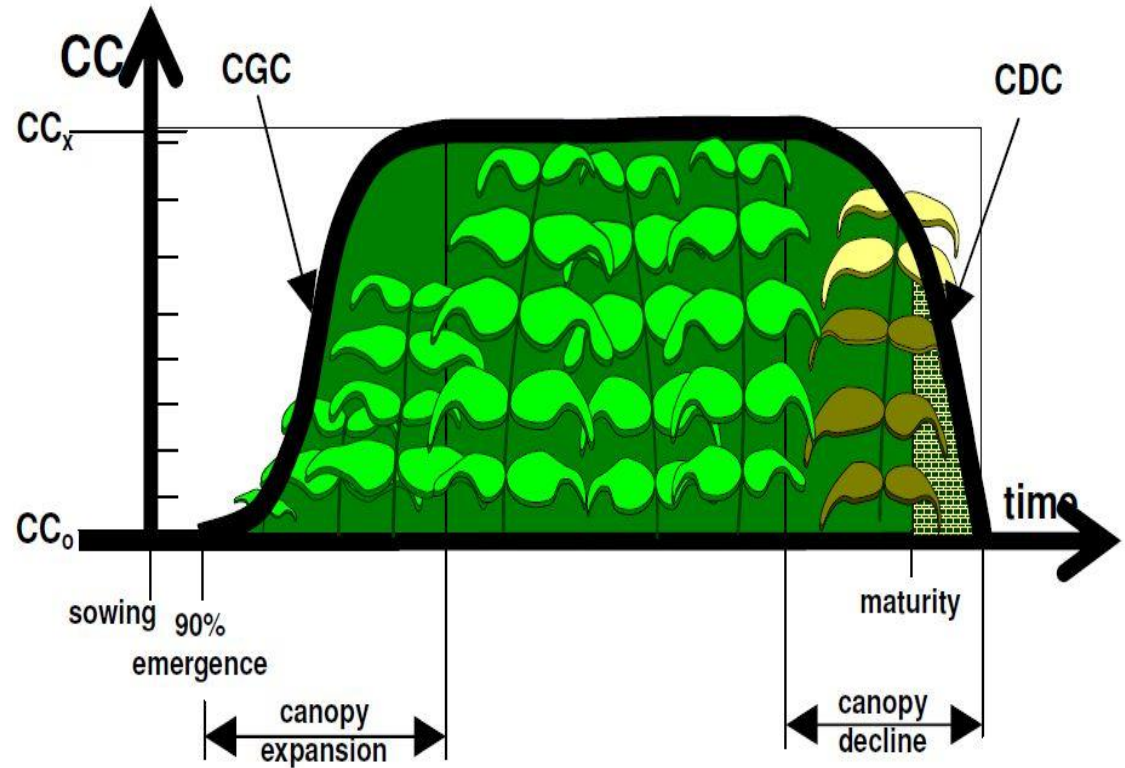
85%



88%

① Overhead pictures

② Canopy cover (eCognition)

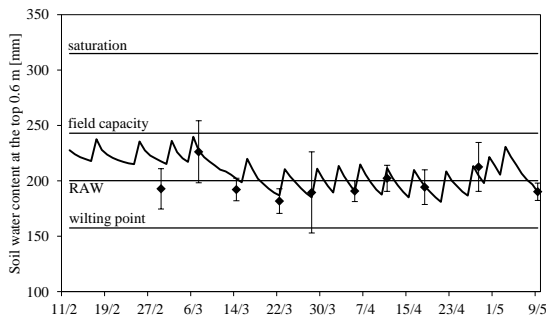
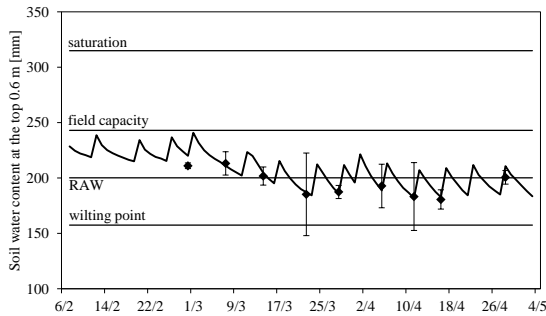


③ Graph: - crop characteristics;  
- canopy growth & decline;  
- phenological stages.

# 3.iv Results

- soil moisture, canopy growth, yield: e.g. cabbage -

Observed vs. simulated soil moisture:



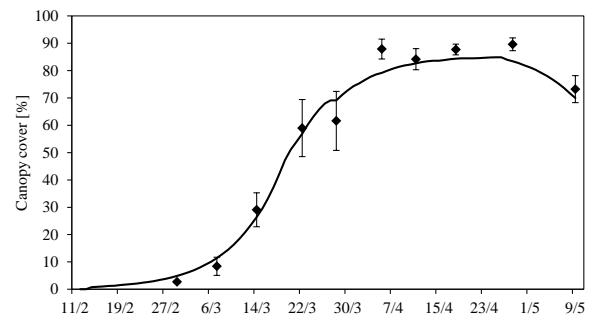
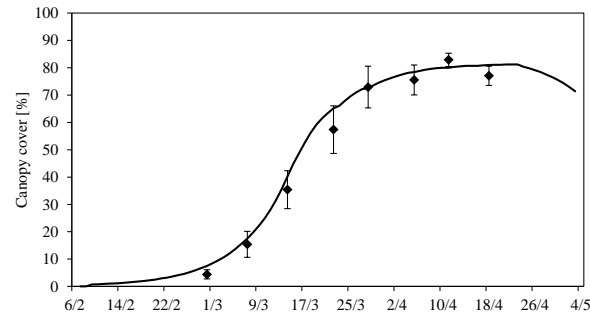
...

①

Soil moisture:

- soil type;
- irrigations;
- ...

Observed vs. simulated canopy growth cover:



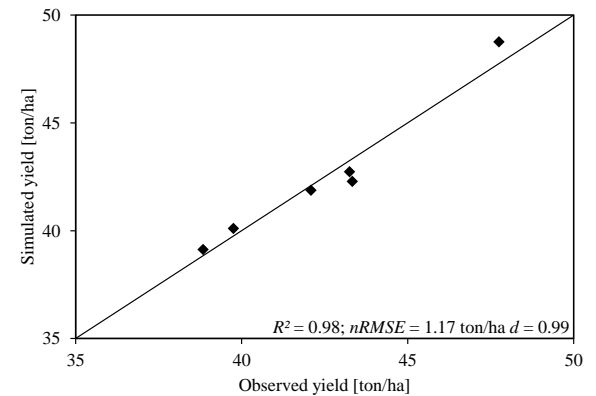
...

②

Canopy cover:

- growth & decline coef.;
- plant densities;
- ...

Observed vs. simulated yield:



③

Yield:

- water productivity;
- harvest index.

# ... Agricultural advice

- 'modelling for the masses' -

Based on the priorly presented knowledge & expertise:



Mobile phone:

- GPS coordinates;
- crop data (type, sowing, ...);
- etc.

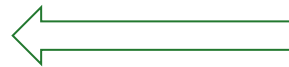


Server with web-application

Send-in data;  
National soil maps;  
Meteo-broadcasts.



Yield forecasts;  
irrigation calendars.



Mobile phone:

- Weekly updated irrigation guidelines;
- Yield estimates.

*Gracie!*

[www.eed.ulg.ac.be](http://www.eed.ulg.ac.be)



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