Industrial Potato monitoring for the Belgian potato sector using remote sensing and crop growth modelling

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... iPot

- Industrial Potato monitoring for the Belgian potato sector -

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1 Belgian potato sector
- some background -

- Fast growing sector:
  largest exporter & largest importer (?!)
- More & more contracts:
  in a volatile market!
- Crop consulting between:
  processors & traders – growers.
- Necessity to realize higher yields:
  in a sustainable way;
  in a competitive way.
2 Monitoring
- a commonly accepted solution -

**Importance of monitoring**

- Improve quantity & quality;
- Manage storage, packaging & processing;
- Strengthen competitiveness of production & processing chain.

**Potentials for a better quality & quantity management**

- Real time information on potato growth and development:
  - yield and quality information on field level;
  - within field variability;
  - faster detection of “problem fields”.

- Risk assessment for diseases & deformations:
  - soil moisture;
  - temperature & solar radiation.

- Optimal information exchange:
  - between all concerned parties;
  - for a better harvest management;
  - for all related logistics.
3 Objectives
- web-based geo-information platform -

- Information on crop growth & continuous yield estimates;
- For the Belgian potato processing industry & research centres;
- Information exchange, integration of:
  - field observations;
  - close range sensing measurements;
  - satellite images;
  - crop growth models.
4 Methodology
- 2 objectives & 2 approaches -

Crop monitoring

- Field observations;
- Close range sensing measurements;
- Satellite images;
- Taken at regular intervals!

Yield assessment

- Crop growth models;
- Continuously improved through ever growing available data.
5.1 Monitoring
- field condition -

- Intra-field variability: fAPAR (photosynthetic activity/vegetation productivity)
- Vegetation moisture status: NDWI from Proba-V (100 m) or B-CGMS.
- Temperature (land surface) & radiation: Weather stations (10 km) & MSG (5 km).
5.ii Monitoring
- crop growth -

16 May
17 June

27 May

6 June

field observations
UAV (2 cm detail)
Deimos-1 (22 m detail)

% Cover

10
30
100
6.i Crop growth modelling
- e.g. AquaCrop (FAO) -

\[ B = WP \cdot \Sigma Tr \quad \text{or} \quad \text{Biomass} = \text{Water productivity} \cdot \text{Sum of transpiration} \]

\[ Y = HI \cdot B \quad \text{or} \quad \text{Yield} = \text{Harvest index} \cdot \text{Biomass} \]
6.ii Crop input
  - canopy cover -

Graph:
- crop characteristics;
- canopy growth & decline;
- phenological stages.
6.iii Crop growth modelling

- work-flow -

Weather grid cell

Soil map

Crop database

HR satellite data

Crop yield per simulation unit

Parcel crop yield

assimilation

(adapted from Delécolle et al., 1992)
7 Geo-spatial web platform

- screenshot -
8 Conclusion

- Bridge the gap between latest research and industry:
  earth observation & crop growth modelling;
  through Belgapom strong implication of industry.

- Readily available end products:
  user-friendly web based interface;
  data and model complexity is hidden for the end user.

- Better monitoring: quantity ↗ & quality ↗:
  - What is the state of my field?
  - What is the state of my crop?
  - What is the best time for haulm killing?
  - What is the expected yield?
Thank you!