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iPot: Improved potato monitoring in Belgium using remote sensing and crop growth modelling

Isabelle Piccard (1), Anne Gobin (1), Yannick Curnel (2), Jean-Pierre Goffart (2), Viviane Planchon (2), Joost Wellens (3), Bernard Tychon (3), Nele Cattoor (4), and Romain Cools (4)

(1) Flemish Institute for Technological Research (VITO), Mol, Belgium, (2) Centre wallon de Recherches agronomiques (CRA-W), Gembloux, Belgium, (3) Université de Liège (ULg), Arlon, Belgium , (4) Belgapom, Brussel, Belgium

Potato processors, traders and packers largely work with potato contracts. The close follow up of contracted parcels is important to improve the quantity and quality of the crop and reduce risks related to storage, packaging or processing. The use of geo-information by the sector is limited, notwithstanding the great benefits that this type of information may offer. At the same time, new sensor-based technologies continue to gain importance and farmers increasingly invest in these.

The combination of geo-information and crop modelling might strengthen the competitiveness of the Belgian potato chain in a global market. The iPot project, financed by the Belgian Science Policy Office (Belspo), aims at providing the Belgian potato processing sector, represented by Belgapom, with near real time information on field condition (weather-soil), crop development and yield estimates, derived from a combination of satellite images and crop growth models.

During the cropping season regular UAV flights (RGB, 3x3 cm) and high resolution satellite images (DMC/Deimos, 22m pixel size) were combined to elucidate crop phenology and performance at variety trials. UAV images were processed using a K-means clustering algorithm to classify the crop according to its greenness at 5m resolution. Vegetation indices such as %Cover and LAI were calculated with the Cyclopes algorithm (INRA-EMMAH) on the DMC images. Both DMC and UAV-based cover maps showed similar patterns, and helped detect different crop stages during the season.

A wide spread field monitoring campaign with crop observations and measurements allowed for further calibration of the satellite image derived vegetation indices. Curve fitting techniques and phenological models were developed and compared with the vegetation indices during the season, both at trials and farmers' fields. Understanding and predicting crop phenology and canopy development is important for timely crop management and ultimately for yield estimates.

An intuitive web-based geo-information platform is developed to allow both the industry and the research centres to access, analyse and combine the data with their own field observations for improved decision-making.