



Mapping soil heterogeneity using RapidEye satellite images

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In the frame of BELCAM, a project funded by the Belgian Science Policy Office (BELSPO), researchers from UCL, ULg, CRA-W and VITO aim to set up a collaborative system to develop and deliver relevant information for agricultural monitoring in Belgium. The main objective is to develop remote sensing methods and processing chains able to ingest crowd sourcing data, provided by farmers or associated partners, and to deliver in return relevant and up-to-date information for crop monitoring at the field and district level based on Sentinel-1 and -2 satellite imagery.

One of the developments within BELCAM concerns an automatic procedure to detect soil heterogeneity within a parcel using optical high resolution images. Such heterogeneity maps can be used to adjust farming practices according to the detected heterogeneity. This heterogeneity may for instance be caused by differences in mineral composition of the soil, organic matter content, soil moisture or soil texture. Local differences in plant growth may be indicative for differences in soil characteristics. As such remote sensing derived vegetation indices may be used to reveal soil heterogeneity.

VITO started to delineate homogeneous zones within parcels by analyzing a series of RapidEye images acquired in 2015 (as a precursor for Sentinel-2). Both unsupervised classification (ISODATA, K-means) and segmentation techniques were tested. Heterogeneity maps were generated from images acquired at different moments during the season (13 May, 30 June, 17 July, 31 August, 11 September and 1 November 2015). Tests were performed using blue, green, red, red edge and NIR reflectances separately and using derived indices such as NDVI, fAPAR, CIrededge, NDRE2. The results for selected winter wheat, maize and potato fields were evaluated together with experts from the collaborating agricultural research centers. For a few fields UAV images and/or yield measurements were available for comparison.