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Hyperspectral, multispectral or index – How much spectral resolution do we need for vegetation parameter estimation from spectral data?

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Rapid non-destructive in-vivo methods for chemical and physical determination of crop parameters are needed for a wide range of applications in crop production (e.g. breeding, precision farming). Spectral reflectance measurements offer a fast way to retrieve this information on different spatial scales (e.g. leaf, canopy and region). With the availability of high resolution field and imaging spectrometers, the spectral reflectance can be measured in many small spectral bands. Unfortunately, spectral reflectance in the hyperspectral domain is often inter-correlated resulting in redundant information and huge datasets with a high demand of storage capacity. Therefore, several strategies have been developed to determine the optimal spectral setup for different vegetation parameters. They comprise pure statistical optimisation techniques, not taking into account the biophysical or biochemical properties of plants, as well as adopted band selection techniques such as selection of specific absorptions features from e.g. pigments.

In this study, the prediction quality for several vegetation parameters (e.g. pigment content, N-status, biomass and leaf area) using several spectral configurations for different crops have been examined. Having identified the optimal spectral bands low-cost spectral solutions for the rapid determination of vegetation parameters can be developed.