A novel approach for the categorization of cropland and grassland based on multi-seasonal high and medium resolution satellite imagery

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Introduction
- The implementation of effective and sustainable cultivation procedures is a key element in the framework of the European Community agricultural production.
- Political, economic and environmental factors influence the cultivation strategies directly and indirectly, and therewith strongly determine the condition and transformation of the cultivated and natural landscapes.
- A frequent and area-wide monitoring of cropland and grassland is required to assess the actual status, identify basic trends, and mitigate major threats with respect to the agricultural production and its impact on the cultural and natural landscape.

Seasonal Characteristics of Grassland and Crops
- The spectral characteristics of grassland and crops show significant variations throughout the vegetation period, but their spectra are quite similar for at least some peaks in the visible spectrum.
- Cropland shows highly variable seasonal characteristics.
- Grassland generally experiences a more continuous seasonal development.
- Due to almost uncertain intra-class variabilities particular sub-classes might show similar behaviours.
- Main drivers for the different seasonal behaviours are the local climate at the given geographical region, weather conditions during the vegetation period, sowing dates, cultivation cycles and forms, and the harvesting times (cropland) or mowing dates (grassland), respectively.

Multi-scale Analysis of Seasonal Time Series Data
- Main challenge: the collection of a cloud-free data base covering key dates and seasons with enough spatial detail to assure an accurate analysis at field-parcel level;
- Basic idea: combining the interpretation of multi-seasonal high and medium resolution optical data;
- Test area: an agricultural region in Mecklenburg Western Pomerania (MW) and Brandenburg (BB), Germany dominated by agriculture, woodland, settlement and water bodies;

Results
- Percentage Overall Accuracy (OA%) of 86.0 and kappa of 0.79 for the considered 5-class problem;
- Grassland shows highest importance, followed by AWiFS July;
- NDVI and NR of LUS-3 May and AWiFS September scene have highest importance, followed by AWiFS July;
- Classification results based on a single scene (05.05.06) is 69.3% and based on two (05.05.06, 12.09.06) is 76.3% OA.

Conclusions
- Seasonal time series data enable accurate identification and characterization of main crops and grassland;
- Key issues are i) availability of constant seasonal and spatial coverage of multi-seasonal satellite data for specific dates of the year and ii) adequate reference information;
- Combination of HR and MR imagery ensures achieving a significant coverage with seasonal data and at the same time assuring a high spatial detail of the analysis;
- Presented object-based approach i) has capabilities for multi-sensor -scale and -season analysis on regional or national scale and ii) is a promising methodology for a frequent monitoring of trends and transformations of LC/UC;
- Key dates for data acquisition are: harvesting season (August-September for Central Europe) and spring season (March, April).

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