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Chemometric modelling for the assessment of the effectiveness of conservation agriculture in a study area in Italy

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The Common Agricultural Policy (CAP) supports farmers' incomes while encouraging sustainable production. In line with market and societal requests, CAP's reforms over the last two decades have re-oriented European agriculture towards an ever increasing level of environmental consideration. Nowadays, farmers' subsidies are subject to the respect of minimum standards as established by the Cross-Compliance and Statutory Management Rules mechanisms. Additional support is granted to farmers who voluntarily subscribe for Rural Development Programmes. Under such programmes, the Agro-Environmental Measures (AEMs) play an important role as they absorb nearly a third of the Rural Development Funds. AEMs are proposed by the Member States based on common rules and approved by the European Commission, but their effectiveness is rarely assessed. In certain EU countries, one of such AEMs is conservation agriculture (CA), which has been repeatedly shown to help reducing soil degradation, augment soil organic matter while decreasing production costs.
A wider use of CA would be therefore desirable. As a contribution to the discussion on the next CAP reform, foreseen for disclosure by 2013, the present PhD research aims at developing a simple yet efficient mechanism for studying the influence of conservation agriculture on soil organic matter (carbon) and crop residues through the use of in situ data, hyperspectral satellite imagery and chemometric modelling.
The use of satellite imagery allows for the assessment of soil properties over large areas in Europe.
A study area has been identified in Northern Italy and Hyperion imagery are being acquired over it.
In situ data on a number of sampling points over a wider area are being acquired and will comprise chemical laboratory analysis of soil components, including organic matter (carbon), as well as hyperspectral reflectance signatures in the VIS, NIR and mid-IR through proximal sensing. Such data will be used to calibrate and validate a chemometric model. Hyperion imagery will then be used as input data over the study area to derive information on the soil organic matter (carbon) content following the application of conservation agriculture practices.
Additional analythical methods will be applied for the establishment of the degree of soil cover by crop residues through remote sensing, including vegetation indeces and spectral unmixing.