Mapping and modelling agricultural landscape structure within Europe

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Contemporary landscapes are the result of the variation in the physical environment and the interactions between human activities with that environment, which are reflected in the landscape composition and spatial structure. In Europe, there is a wide variation of rural cultural landscapes, ranging from traditional to industrial landscapes. These landscapes are, for the most part, the result of a succession of different historical land-use stages (Plieninger et al., 2006). Information on the current spatial landscape patterns is important for understanding the drivers of these processes as well as their influence on ecosystems, their related ecosystem services and biodiversity. Furthermore, a better representation of landscapes beyond the dominant land cover is needed within studies of regional and global character (Verburg et al., in press).

Due to intensification of agricultural production and scale enlargement, field heterogeneity and linear landscape elements have strongly declined in the last 40 years in Europe (Stoate et al., 2001). Since linear landscape elements provide important ecosystem services and function as ecological infrastructure for species within agricultural landscapes, information on their spatial distribution is essential for the assessment of the role of landscape structure on ecological processes and ecosystem services (van der Zanden et al., 2013).

We present wall-to-wall maps for linear vegetation elements (green lines), ditches and grass margins for Europe, using spatial modelling of ground ground-based observations from the land use/cover area frame statistical survey database (LUCAS) (Eurostat, 2009). This database contains observations on linear features in the landscape for over 200,000 points within the European Union for 2009. A comparison between different interpolation techniques to model the transect information is made, ranging from spatial autocorrelation-based methods to methods that explain the occurrence of elements based on biophysical and socio-economic information. An independent validation of green lines is performed based on aerial photographs.

Furthermore, the information on linear landscape elements is used in a new typology of rural agricultural landscapes in Europe, based on detailed information on land cover, land use intensity (fertilizer application rates), field size and linear landscape elements. A comparison is made between two major methods of landscape classification; expert-based mapping and highly automated mapping (Van Eetvelde and Antrop, 2009). The former uses information from the literature and national classifications as guideline, while the latter is based on the unsupervised learning and clustering algorithm of self-organizing maps (SOMs) (Kohonen, 2001). Both mapping approaches are compared and their performance is tested using an expert-based validation.

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