Summary of deliverable D3.4

Maps of syndromes of land system changes in Europe

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Understanding drivers and patterns of land-use change is important for assessing their environmental and societal impacts and for developing effective policy tools to steer land systems towards desired pathways. In the past, land-use change has dominantly been assessed in terms of conversions among broad land-use categories, whereas changes in land management intensity within these broad categories have been neglected. Furthermore, underlying drivers of land-use change may play out differently in different regions, resulting in substantial complexity in terms of patterns and trajectories of land change.

D4.3 documents an approach to reduce this complexity by identifying and mapping high-level patterns and trends in Europe’s land systems. We used 12 land-use indicators, pertaining to area extent and management intensity, to map (i) land-system archetypes for the year 2006 (LSAs, defined as characteristic patterns of land-use extent and management intensity), and (ii) archetypical change trajectories between 1990 and 2006 (ACTs, defined as co-occurring changes in the land-use extent and management intensity) using Self Organising Maps. We then qualitatively evaluated the resulting LSAs and ACTs and compared them to a set of proximate and underlying drivers of land change.

We identified 15 LSAs in Europe for the year 2006 (Fig. 1, left). Low-intensity systems dominated (ca. 40% coverage), including low-production forests, medium-intensity croplands, and low-intensity mosaics. Agriculture-related LSAs generally were characterized by good accessibility and favourable topography. Within these, intensively managed LSAs exhibited better climatic and soil conditions and, especially for cropland-related LSAs, higher values of capital input or economic size of farms in comparison to the EU27 average. However, for grasslands labour input and utilised agricultural area were higher on less intensively managed areas. Fallow farmland was often found in fairly good environmental conditions but had low values for especially economic farm size and capital input. Characteristics of high-intensity mosaic landscapes tended to be similar to intensively managed croplands, whereas low-intensity mosaics were generally similar to the EU27 average.
In terms of change, we identified 17 ACTs (Fig. 1, right) with stable land systems as spatially most dominant (40%). The most important changes were the de-intensification of agriculture (ca. 25%, mainly in Western Europe) followed by agricultural intensification (ca. 12%, mainly in Eastern Europe). ACTs of intensifying croplands were characterized by better accessibility and topographic conditions as well as higher values of most socio-economic drivers compared to the EU27 average. Yield intensification was mainly located in areas with favourable agro-climatic conditions, whereas fertiliser-related intensification was mainly found in more marginal areas. Drivers of de-intensifying croplands were generally close to the EU27 average while de-intensifying grasslands were characterised by low accessibility but average to good climatic and soil conditions. Socio-economic drivers revealed differences between low-level livestock de-intensification with higher capital input and subsidies and high-level livestock de-intensification with higher economic activity. Forest-related ACTs were characterised by rugged topographic conditions, low accessibility, and low economic activity. Land conversions, such as forest loss for agricultural expansion or cropland-grassland conversions, revealed conversion-specific driver characteristics as for forest expansion over grasslands that generally showed low values for socio-economic drivers, especially economic activity as well as farm-related capital input and subsidies, on areas with favourable accessibility and topographic conditions.

Our archetypes could become useful templates for developing and applying context-specific land-management policies.
Figure 1: Spatial patterns of Land System Archetypes (LSAs, left) and Archetypical Change Trajectories (ACTs, right) for the EU27.