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LANDSCAPE DESIGN FOR SOIL CONSERVATION UNDER LAND USE AND CLIMATE CHANGE

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Soils and landscapes evolve simultaneously. Soil evolution is controlled by redistribution and transformation processes influenced by topographic and climatic parameters, with also a major contribution of management strategies. The perennial landscape features have a strong influence on soil spatial distribution (geometry) and soil genesis. Building landscapes which enhance soil resilience to degradation processes and increase soil services appears as a promising way to adapt to forthcoming climatic and land use evolutions. The presentation aims to synthesize major results from a research program nicknamed Landsoil which focused on the evolution of agricultural soils over medium time scales (decades to centuries) in relation to changing conditions of land use and climate. Precise study of the soil 3D organization in three contrasted landscapes (Brittany, Touraine, Languedoc-Roussillon) enabled to link soil redistribution in space to landscape components (field geometry, hedges or ditches network) and their past evolution. A dynamic and high resolution spatial modeling approach was developed coupling erosion processes and soil organic matter evolution and was calibrated over past evolution using dating techniques (Cs137, C14, OSL). The resulting Landsoil model was afterwards applied in a prospective manner under different scenarios of land use and climate change over the 21th century. Indicators of soil vulnerability and soil resilience were defined and tested by the comparison of several prospective scenarios applied on a same landscape and by comparison of the contrasted landscapes.