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Sustainable agriculture, soil management and erosion from prehistoric times to 2100

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The rational use of soil requires the selection of management practices to take profit of the beneficial functions of plant growth, water and nutrient storage, and pollutants removal by filtering and decomposition without altering its properties. However, the first evidence of important and widespread erosion peaks can generally be found with the arrival of the first farmers all over the world. In areas with a long land-use history such as the Mediterranean, clear signs indicating the advanced degradation status of the landscape, such as heavily truncated soils, are visible throughout. Soil conservation practices are then aimed at reducing erosion to geological rates, in equilibrium with long-term soil formation rates, while maximizing agricultural production. The adoption of such practices in most areas of the world are as old as the earliest soil erosion episodes themselves.

This work firstly reviews historical evidence linking soil management and soil erosion intensity, with examples from N Europe and the Mediterranean. In particular, work by the authors in olive orchards will be presented that shows how significant variations in soil erosion rates between could be linked to the historical soil management. The potential of historical documents for calibrating a soil erosion model is shown as the model, in this case RUSLE-based and combining tillage and water erosion, adequately represents the measured erosion rate dynamics. Secondly, results from present-day, long-term farm experiments in the EU are reviewed to evaluate the effect of different soil management practices on physical soil properties, such as bulk density, penetration resistance, aggregate stability, runoff coefficient or sediment yield.

Finally, we reflect upon model and field data that indicate how future global climate change is expected to affect soil management and erosion and how the examples used above hold clues about sustainable historical management practices that can be used successfully in the future.