Abstract:
Bottom-up estimates from long-term field experiments and modelling are the most commonly used approaches to estimate the carbon (C) sequestration potential of the agricultural sector. However, when data are required at European level, important margins of uncertainty still exist due to the representativeness of local data at large-scale or different assumptions and information utilised for running models. In this context, a pan-European (EU + Serbia, Bosnia and Herzegovina, Montenegro, Albania, Former Yugoslav Republic of Macedonia and Norway) simulation platform with high spatial resolution and harmonised datasets was developed to provide consistent scenarios in support of possible carbon sequestration policies. Using the CENTURY agroecosystem model, six alternative management practices (AMP) scenarios were assessed as alternatives to the business as usual situation (BAU). These consisted of the conversion of arable land to grassland (and vice versa), straw incorporation, reduced tillage, straw incorporation combined with reduced tillage, ley cropping system and cover crops. The conversion to grassland showed the highest soil organic carbon (SOC) sequestration rates, ranging between 0.4-0.8 t C ha-1 y-1, while the opposite extreme scenario (100% of grassland conversion to arable) gave cumulated losses of up to 2 Gt of C by 2100. Among the other practices, ley cropping systems and cover crops gave better performances than straw incorporation and reduced tillage. The allocation of 12 to 28% of the European arable land to different AMP combinations resulted in a potential SOC sequestration of 101-336 Mt CO2 eq. by 2020 and 549-2141 Mt CO2 eq. by 2100. Modelled carbon sequestration rates compared with values from an ad hoc meta-analysis confirmed the robustness of these estimates.

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