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Land use change impact on soil organic carbon stocks: Development of carbon response functions from a meta-analysis data set

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In the temperate zone the net land use change effect of afforestation is carbon sequestration, owing to the biomass accumulation in tree biomass. In contrast, mechanisms and rates of soil carbon stock changes due to land use changes are poorly understood and their quantification is hampered by high variability of soil attributes across scales. However, there are numerous recently emerging studies, such as chronosequences or paired site studies that investigated the effect on soil organic carbon stocks. A meta-analysis of a global dataset of soil carbon changes for temperate climate regions was carried out. Soil carbon sequestration and loss dynamics were described with carbon response functions (CRFs). CRFs provide a simple tool to estimate soil carbon stock changes for different land use changes taking into account different environmental parameters such as soil type and climate. CRFs can be applied in the framework of UNFCCC for greenhouse gas reporting to improve the representation of widely overlooked soil carbon stock dynamics in the terrestrial carbon balance.