



Modelling soil organic carbon stocks along topographic transects under climate change scenarios using CarboSOIL

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CarboSOIL is a land evaluation model for soil organic carbon (SOC) accounting under global change scenarios (Muñoz-Rojas et al., 2013a; 2013b) and is a new component of the MicroLEIS Decision Support System. MicroLEIS is a tool for decision-makers dealing with specific agro-ecological problems as, for example, soil contamination risks (Abd-Elmabod et al., 2010; Abd-Elmabod et al., 2012) which has been designed as a knowledge-based approach incorporating a set of interlinked data bases.

Global change and land use changes in recent decades have caused relevant impacts in vegetation carbon stocks (Muñoz-Rojas et al., 2011) and soil organic carbon stocks, especially in sensible areas as the Mediterranean region (Muñoz-Rojas et al., 2012a; 2012b). This study aims to investigate the influence of topography, climate, land use and soil factors on SOC stocks by the application of CarboSOIL in a representative area of the Mediterranean region (Seville, Spain). Two topographic transects (S-N and W-E oriented) were considered, including 63 points separated 4 km each. These points are associated to 41 soil profiles extracted from the SDBm soil data base (De la Rosa et al., 2001) and climatic information (average minimum temperature, average maximum temperature and average rainfall per month) extracted from raster data bases (Andalusian Environmental Information Network, REDIAM). CarboSOIL has been applied along topographic transects at different soil depths and under different climate change scenarios. Climate scenarios have been calculated according to the global climate model (CN-RMCM3) by extracting spatial climate data under IPCC A1B scenario for the current period (average data from 1960-2000), 2040, 2070 and 2100. In the current scenario, results show that the highest SOC stock values located on Typic Haploxeralfs under olive groves for soil sections 0-25 cm and for 25-50 cm, but the highest values were determined on fruit-cropped Rendolic Xerothent in the 50-75cm section. On the other hand, lowest SOC stock values have been observed on sections 0-25 and 25-50 cm from Aquic Haploxeralf under wheat, cotton and other annual crops and vineyards, respectively. The lowest SOC values were determined in section 50-75 cm from Typic Ochraqualfs under olive groves. CarboSOIL predicted increases of SOC stocks in future climate scenarios in the upper soil section (0-25 cm) for areas under rotating wheat, cotton and other annual crops. In this case, SOC stocks increases are considerably larger in the areas above 400 masl. In the 25-50 cm soil section, SOC stocks are expected to decrease in the 2040 scenario and then increase in the following 2070 and 2100 scenarios, particularly in olive-cropped areas. Oppositely, SOC stocks from olive-cropped soils will decrease in the 50-75 soil section in the 2070 scenario.

Key words: Carbon sequestration, Global change, Land evaluation, MicroLEIS DSS, Topography.

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