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Organic Carbon and Nitrogen stocks in two soil types of Northwestern Tunisia: Temporal and spatial variation

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Soil organic matter has generated international interest in carbon and nitrogen sequestration. In reality, small fluctuations of soil organic stock could have large impacts on global warming. Therefore, quantification of Soil Organic Carbon (SOCs) and Total Nitrogen (TNs) stocks in surface and deep horizons are important to control the release of greenhouse gases. The present research was undertaken in order to determine SOCs and TNs evolution over 50 years. For this aim, we selected two soils (P1 and P2) developed under contrasted pedogenetic conditions in North-West of Tunisia (Beja governorate). P1 is a Luvisol located in a forest region. However, P2 is a Cambisol situated in an agriculture zone. Soil samples were gathered from surface (0-30 cm) and deep (50-100 cm) horizons in 1971, 2005, 2012 and 2019. SOCs declined in surface and deep horizons during the experimental period in both studied soils. In the case of Luvisol, the values declined from 91.01 t/ha to 75.54 t/ha and from 53.00 t/ha to 24.51 t/ha, respectively in surface horizons and deep horizons. Likewise, the SOCs values decreased from 84.24 t/ha to 25.52 t/ha in surface horizons and from 24.45 t/ha to 14.20 t/ha in deep horizons of the Cambisol. The TNs recorded lower values than SOCs. Nevertheless, they showed the same behavior. Our results showed that the highest values of SOCs and TNs were recorded in the Luvisol. This soil exhibited the greatest amount of organic matter since it was developed under forest vegetation. In addition, the results showed an enrichment in SOCs and TNs of superï¬cial horizons to the detriment of the deep horizons. Nevertheless, this decrease in organic stocks with depth occurred following different patterns according to soil type. In fact, the Cambisol reported an important depletion of soil organic stocks as compared to the Luvisol. The loss of SOCs and TNs were estimated to be 69.71% and 54.17% in surface horizon, and 41.94 % and 28.28 % in deep horizon, respectively. Indeed, the land-use change increases the decomposition of soil organic matter principal source of SOCs and TNs. Such a reduction has wider implications on global warming and soil fertility.