EGU2020-7646
https://doi.org/10.5194/egusphere-egu2020-7646
EGU General Assembly 2020

Organic matter investigation in agricultural Apennine topsoils (Emilia-Romagna Region): carbon pools and isotopic C signature

Enrico Mistri[1], Gianluca Bianchini[1], Claudio Natali[2], Livia Vittori Antisari[3], Gloria Falsone[3], Mauro De Feudis[3], and Valentina Brombin[1]

[1]Department of Physics and Earth Science, University of Ferrara, Ferrara, Italy (enrico.mistri@student.unife.it)
[2]Department of Earth Sciences, University of Florence, Florence, Italy
[3]Department of Agricultural and Food Sciences, University of Bologna, Bologna, Itlay

The exploitation of soils due to farming has produced a progressive loss of soil organic matter (SOM) over the years. At the same time, the degradation of SOM has led to a decline of several ecosystem services provided by soil, especially in mountain. Against this background, the partnership between Department of Physics and Earth Sciences of University of Ferrara and Department of Agricultural and Food Sciences of University of Bologna led to the creation of the SaveSOC2 project (Save Soil Organic Carbon), funded by Rural Development Programme of Emilia-Romagna Region. This project primarily seeks to investigate and promote carbon storage processes in agricultural soils of Emilia-Romagna Region (NE Italy). The present study outlines an overview about the SOM dynamics of "I Rodi" organic farm, located in the Modena Apennine. "I Rodi" produces and processes small organic fruits, especially raspberries. Three different sites (grassland -G, very low productive raspberries -LR, and good productive raspberries -GR) have been selected and the topsoils (0-15 cm and 15-30 cm) have been investigated. Elemental and isotopic analyses of soil C were performed using an EA-IRMS. In particular, the application of the Thermally Based Separation protocol [1] allowed the determination of both inorganic (IC) and organic (OC) carbon contents in each soil sample. OC accounted for 93.50% of the total carbon (1.72-4.84 wt.%). The negative $\delta^{13}C$ values of the total carbon (from -27.8 to -19.7 ‰) confirmed the predominance of OC over IC in the investigated soils. The average values of OC isotopic C signature showed a decreasing trend among the three sites (-28.2, -27.2 and -25.8‰ for GR, G and LR, respectively), with the low productivity site having the highest $\delta^{13}C$ value. The isotopic C signature of separated organic C fractions (0-15 cm topsoils) showed that humin (832-879 g/kg), which is the SOM fraction mostly interacting with the soil mineral phase and the largest pool, confirmed the observed trend (-27.5, -27.0, -26.4‰, GR, G and LR). The humic acids (6-17 g/kg) showed similar trend but lower $\delta^{13}C$ values in all sites (-28.5, -28.0, -26.8 ‰, GR, G and LR). Finally, fulvic acids (5-10 g/kg) differed, having dissimilar trend and values of $\delta^{13}C$ (-27.1, -26.8, -26.0 ‰ for G, GR and LR). Comparing to G, the GR data suggested that organic management i) did not decrease quantity and quality of organic matter, and ii) it was more efficient in OC stabilisation, increasing the amount of less transformed OC in both humin and humic acids (more negative $\delta^{13}C$ values). In the LR site, instead, the observed trend can be due to low suitability of this soil to raspberries production, negatively affecting both crop yields and organic C dynamics. In our

opinion, in order to combine agricultural productivity and its sustainability, more attention should be paid both to soil management and suitability in the area.

[1] Natali C., Bianchini G., Vittori Antisari L. 2018. Thermal separation coupled with elemental and isotopic analysis: A method for soil carbon characterisation. Catena 164, 150-157.