Geophysical Research Abstracts
Vol. 20, EGU2018-15628-2, 2018
EGU General Assembly 2018

ECa-directed soil sample design to evaluate deep SOC sequestration in conservation agriculture

Matteo Longo (1), Ilaria Piccoli (1), Budiman Minasny (2), Carlo Camarotto (1), Lorenzo Furlan (3), Barbara Lazzaro (4), and Francesco Morari (1)

(1) DAFNAE Dept., University of Padova, Viale dell'Università 16, 35020 Legnaro (PD), Italy, (2) School of Life and Environmental Sciences, The University of Sydney, NSW 2006. Australia, (3) Veneto Agricoltura, Settore Ricerca Agraria, Viale dell'Università 14, 35020 Legnaro (PD), Italy, (4) Regione del Veneto, Direzione Agroambiente, caccia e pesca,U.O. Agroambiente, Via Torino 110, Mestre (VE), Italy

Conservation agriculture (CA) has been promoted as a set of agricultural practices contributing to climate change mitigation by means of soil organic carbon (SOC) sequestration. Nevertheless, SOC sequestration potential in CA systems is still under debate since it seems affected by sampling depth and scheme, and SOC stock calculation method.
The aim of this study was to evaluate the effects of CA practices with respect to conventional practices (CP) on deep SOC stocks after 6-yr application on two farms in Veneto Region (Northern-East Italy). A ECa-directed soil sample design was employed on 4 fields (2 treatments $\times$ 2 farms) by investigating soil ECa at three depths (i.e. 0.25 cm, 0.50 cm and 0.90 cm). A stratified simple random sampling was planned through a K-means clustering based on ECa maps, considering three strata (i.e. zones) per field and identifying six random position per stratum. A total of 72 undisturbed soil cores were identified and sampled with a hydraulic sampler down to 90 cm depth and successively cut in four layers (0-5 cm, 5-30 cm, 30-50 cm and 50-90 cm). Minimum equivalent soil mass approach was applied to evaluate SOC stocks on progressive soil profiles (0-5 cm, 0-30 cm, 0-50 cm and 0-90 cm). SOC stocks were tested with a linear mixed-effect model based on the REML (Restricted Maximum Likelihood) estimation method.
Results showed that CA practices affected only SOC stock distribution, being 0-5 cm values higher in CA than CP (10.7 t/ha vs 6.1 t/ha) while no differences were recorded at deeper layers, for instance being 121.6 t/ha in CA and 112.1 t/ha in CP at 0-90 cm. The absence of tillage operations and the retention of crop residues on the soil surface were associated with CA-induced SOC increase in the top layer. In addition, clay content resulted a significant factor to increase SOC stocks. ECa survey was recognized as a sensitive tool to identify soil chemical-physical spatial variability, which allowed to decrease the minimum number of cores for a correct SOC estimation. This research did not demonstrate the benefits of conservation practices on SOC sequestration. However, SOC sequestration is only one of the numerous ecosystem services provided by conservation practices (research funded by 'Helpsoil' life + European project (LIFE12 ENV/IT/000578).