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Slow reaction of soil structure to conservation agriculture practices in Veneto silty soils (North-Easter Italy)

Ilaria Piccoli (1), Carlo Camarotto (1), Barbara Lazzaro (2), Lorenzo Furlan (3), and Francesco Morari (1)

(1) Padova University, Department of Agronomy, Food, Natural resources, Animals and Environment, Italy (ilaria.piccoli@phd.unipd.it), (2) Regione del Veneto, Sezione Agroambiente, Settore Politiche Agroambientali, Via Torino 110, Mestre (VE), Italy , (3) Veneto Agricoltura, Settore Ricerca Agraria, Viale dell'Università 14, 35020 Legnaro (PD), Italy

Soil structure plays a pivotal role in soil functioning and can inform of the degradation of the soil ecosystem. Intensive and repeated tillage operations have been known to negatively affect the soil structure characteristics while conservation agriculture (CA) practices were demonstrated to improve soil structure and related ecosystem services. The aim of this study is to evaluate the effect of conservation agriculture practices on total porosity, pore size distribution, pore architecture and morphology on silty soils of Veneto low-lying plain (North-Eastern Italy). Experimental design was established in 2010 on 4 farms in North-Eastern Italy to compare conventional intensive tillage system "IT" versus conservation agriculture "CA" (no-tillage, cover-crop and residue retention). 96 samples were collected in 2015 at four depths down to 50 cm depth, and investigated for porosity from micro to macro by coupling mercury intrusion porosimetry (MIP) (0.0074-100 μm) and x-ray computed microtomography (μCT) (>26 μm). Pore morphology and architecture were studied from 3D images analysis and MIP pore size curve. Ultramicroporosity class (0.1-5 μm) positively responded to CA after 5-yr of practices adoption while no significant effects were observed in the x-ray μCT domain (> 26 μm). Silty soils of Veneto plain showed a slow reaction to conservation agriculture because of the low soil organic carbon content and poor aggregate stability. Nevertheless the positive influence of CA on ultramicroporosity, which is strictly linked to soil organic carbon (SOC) stabilization, indicated that a virtuous cycle was initiated between SOC and porosity, hopefully leading to well-developed macropore systems and, in turn, enhanced soil functions and ecosystem services.