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Conservation agriculture practices to enhance soil organic in Lombardy plain (Northern Italy)

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It has been demonstrated that conservation agriculture (CA) determines a long-term increase in soil organic carbon (SOC) stock in cropland. The present study aimed to estimate the amount of SOC stored in soil of Lombardy plain (Northern Italy) following the change from tillage agriculture (TA) to CA by using crop ARMOSA crop over 23 years (1989-2011). The territorial analysis was performed at agrarian region scale (AR) after identification of the representative crops rotation and soil types. The land use information were data available at cadastral scale and referred to 5 years (from 2007 to 2011). The meteorological data (i.e. maximum and minimum temperature, precipitation) were measured at 14 monitoring stations. Solar radiation was estimated using the equation of the Bristow and Campbell model (1994). A spatial interpolation method was used to extend the meteorological data throughout the entire plain of the region by employing Thiessen polygon method; the meteorological data of the polygon were assigned to each AR.
ARMOSA was parameterized to simulate the two tillage systems. For TA and CA scenario the depth of tillage was limited to 35 and 10 cm, respectively; crop residual incorporation was not simulated under CA. In TA scenario, we used the parameters calibrated and validated by Perego et al.(2013) on a wide dataset collected at six monitoring sites in Lombardy plain. In CA, the rate of C decomposition of humified organic C was assumed to be smaller by 30% in no-tillage than in TA (Oorts et al., 2007).
The model results showed a significant improve of SOC ($p<0.01$) from TA to CA under all the crop rotations with a potential SOC sequestration ranged from 0.1 to 0.48 t C ha-1 y-1. While soil type did not affect significantly the SOC sequestration, crop residue determined relevant increases in SOC. That was particularly evident in grain maize monoculture with or without cover crop.

References:
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