Geophysical Research Abstracts
Vol. 17, EGU2015-13966, 2015
EGU General Assembly 2015

Deep soil layer is fundamental for evaluating carbon accumulation in agroecosystems

Nicola Dal Ferro, Francesco Morari, Gianluca Simonetti, Riccardo Polese, and Antonio Berti
DAFNAE, Agripolis, University of Padova, Italy, francesco.morari@unipd.it

Soil organic carbon (SOC) is essential to secure key ecosystem services such as the provision of food and other biomass production, the filtering, buffering and transformation capacity and the climate regulation. It has been estimated that approximately 57% of the globally emitted C (8.7 Gt y-1) to the atmosphere is adsorbed by biospheric C pools, ascertaining the potential soil C sink capacity of managed ecosystems at 55 to 78 Gt, of which only 50 to 66% attainable. Therefore it is essential the full knowledge of soil management practices that can affect SOC dynamics and, in turn, climate change. Several studies focussed on the evaluation of the best cropping management practices to accumulate C in the soil profile. Nevertheless, in most cases soil analyses were made in the topsoil (generally in the 0-30 cm layer), ignoring the effect of C translocation in the deeper soil profile as a result of tillage practices, crop root deepening etc.
In this context, in a long-term experiment established in the early 1960s, we quantified the SOC accumulation within the soil profile (0-90 cm) and evaluate the effects of different cropping system on SOC dynamics. The experiment is located at the experimental farm of the University of Padova, in northeastern Italy. The trial compares four rotations with three levels of mineral fertilisation and with or without organic fertilisation. The rotations considered are: continuous crops (grain maize, forage maize, winter wheat and permanent meadow); two-year (maize-wheat); four-year (sugarbeet, soybean, wheat, maize) and six-year (maize, sugarbeet, maize, wheat, alfalfa, alfalfa) with different levels of mineral, organic and mixed fertilisations.
Crops with superficially developed rooting systems (e.g. permanent meadow) highly increased SOC only in the topsoil. This effect was enhanced by the contribution of organic amendment-C. Root-derived carbon played a pivotal role also in the deepest soil profile (60-90 cm) by increasing the SOC translocation. Considering the whole profile, the highest C accumulation was observed in cropping systems with high biomass production and deep rooting systems. Results indicated that for estimating the effects of cropping systems and agricultural practices on C accumulation, analyses in the topsoil can be misleading and it is necessary to consider the whole profile.