Geophysical Research Abstracts
Vol. 19, EGU2017-4834, 2017
EGU General Assembly 2017

Agricultural management impact on physical and chemical functions of European peat soils.

Arndt Piayda (1), Bärbel Tiemeyer (1), Ullrich Dettmann (1,2), Michel Bechtold (3), and Christoph Buschmann (4)

(1) Thünen Institute of Climate-Smart Agriculture, Braunschweig, Germany, (2) Institute of Soil Science, Leibniz University Hannover, Hannover, Germany, (3) Division Soil and Water Management, KU Leuven, Heverlee, Belgium, (4) Thünen Institute of Rural Studies, Braunschweig, Germany

Peat soils offer numerous functions from the global to the local scale: they constitute the biggest terrestrial carbon storage on the globe, form important nutrient filters for catchments and provide hydrological buffer capacities for local ecosystems. Peat soils represent a large share of soils suitable for agriculture in temperate and boreal Europe, pressurized by increasing demands for production. Cultivated peat soils, however, show extreme mineralization rates of the organic substance and turn into hotspots for green house gas emissions, are highly vulnerable to land surface subsidence, soil and water quality deterioration and thus crop failure.

The aim of this study is to analyse the impact of past agricultural management on soil physical and chemical functions of peat soils in six European countries. We conducted standardized soil mapping, soil physical/chemical analysis, ground water table monitoring and farm business surveys across 7 to 10 sites in Germany, The Netherlands, Denmark, Estonia, Finland and Sweden.

The results show a strong impact of past agricultural management on peat soil functions across Europe. Peat soil under intensive arable land use consistently offer lowest bearing capacities in the upper 10 cm compared to extensive and intensive grassland use, which is a major limiting factor for successful agricultural practice on peat soils. The difference can be explained by root mat stabilization solely, since soil compaction in the upper 25cm is highest under arable land use. A strong decrease of available water capacity and saturated hydraulic conductivity is consequently observed under arable land use, further intensifying hydrological problems like ponding, drought stress and reductions of hydrological buffer capacities frequently present on cultivated peat soils. Soil carbon stocks clearly decrease with increasing land use intensity, showing highest carbon stocks on extensive grassland. This is supported by the degree of decomposition, which is lowest for extensive grass land. Both findings indicate a strong impact of land use intensity and management on soil carbon losses and peat conservation on the European scale.

This study provides evidence how functions of peat soils, valuable for successful agricultural production and relevant for climate change mitigation, are impacted by agricultural management.