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Thema

Kommission IV: Bodenfruchtbarkeit und Pflanzenernährung

Biogeochemie gekoppelter Stoffkreisläufe (NPK) unter traditioneller Landnutzung

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Titel

Effective organic matter stock management in agricultural practices: modeling and observation

Abstract

Long-term fertilization experiments (LTFE), with the focus on analyzing soil fertility indicators and their interrelation with crop have fundamental importance for monitoring, modeling, and controlling the status of soils. Validation datasets from LTFE provide the basis for understanding cropland responses to key natural and management drivers such as climate and productivity, land use changes, soil fertility and greenhouse gas emissions. RothC model was used for simulation soil organic carbon (SOC) stocks in several Russian LTFE with mineral and organic fertilization. RothC was able to adequately simulate long-term SOC stock changes in the arable layer of different treatments of fertilization experiments on Podzols, Albeluvisols and Chernozems. Annual C inputs sufficient for maintaining constant SOM stocks and additional C gain were estimated. Simulation of SOC dynamics for plots with no fertilization and the lowest SOC stock revealed that above ground NPP input is sufficient for maintaining constant SOM stocks after conversion to a grassland for forage production and returning FYM in the same plot. The changes in the observed trends for different fields with the same treatments are related to the initial level of soil fertility and different crop-climatic year combinations. This simulation has demonstrated the role of crop rotations and fallowing in SOC dynamics and revealed possible C sequestration in a short-term as it is highly yield-dependent. Agricultural soils are sensitive to small changes of extreme year's pattern with more expressed loss of the initial C stock under intensive management systems.