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Thema

Kommission IV: Bodenfruchtbarkeit und Pflanzenernährung

Biogeochemie gekoppelter Stoffkreisläufe (NPK) unter traditioneller Landnutzung

Autoren

E. Koller-France¹, Y. Oelmann¹, W. Wilcke²

¹Universität Tübingen, Geographie/Geoökologie, Tübingen; ²Karlsruher Institut für Technologie, Institut für Geographie und Geoökologie, Karlsruhe

Titel

Short- and long-term effects of biodiversity on soil nutrient concentrations in a semi-natural grassland: results from a 14-year experiment

Abstract

Global biodiversity is declining at an alarming rate, which is likely to have important consequences on ecosystem functioning. Previous studies have shown that in the short term, higher plant biodiversity in grasslands is linked to lower soil nitrogen concentrations, particularly of nitrate, probably due to higher plant uptake. It is unknown, however, how this trend will develop in the long term.

To establish long-term responses to experimental changes in biodiversity, long-term data in adequately high resolution is required to separate the long-term trend from seasonal variation in the data, and such data sets are still exceedingly rare. We present a data set of soil solution nitrogen and phosphorus concentrations collected every two weeks over 14 years after the establishment of an experimental grassland with varying levels of biodiversity. Analysis of this data allows us to determine a) whether the system has reached a new steady-state in soil nutrients after conversion from cropland soils to semi-natural grassland 15 years ago, and b) whether these steady-states are different for different levels of plant biodiversity. Furthermore, we expect to be able to detect c) the effects of extreme events (drought, flood) and d) temporal trends under different levels of plant biodiversity before the establishment of steady state. This will have important implications for our understanding of both the biodiversity-ecosystem functioning relationship and the nutrient dynamics of soils changing from previously fertilized systems to semi-natural grasslands. Our results might additionally have practical implications for the establishment and management of hay meadows.