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The phosphorus content of the parent material shapes nutrition strategies of beech forest ecosystems

Friederike Lang and Jaane Krueger
University Freiburg, Forest Sciences, Soil Ecology, Freiburg, Germany (fritzi.lang@bodenkunde.uni-freiburg.de)

Beech forest ecosystems cover a large range of phosphorus supply by the parent material of the soils. Forest ecosystems show commonly high P use efficiencies and the processes behind this phenomenon are still unresolved. The members of the research programme *Ecosystem Nutrition* (DFG) have applied and refined the concept of ecosystem nutrition, which is based on the integration of results obtained from different spatial and temporal scales and from different disciplines, to unravel these processes. Aim of the presentation is to synthesize the results obtained from the analyses of a natural P gradient and from the short-term results of a NXP application experiment. The studies conducted, have been directed to test the hypothesis that plant and microbial communities established at P rich sites follow a P acquiring strategy introducing P from primary minerals into the biogeochemical P cycle. With decreasing P supply by the parent material, the strategy changes into tight P cycling to sustain the P demand of the forests. The analyses of five beech forest ecosystems on silicate rock representing a P geosequence with different parent materials and thus different total P stocks (160 – 900 g P m^{-2}; down to 1m soil depth) were adjusted to test this hypothesis. These analyses were linked to additional experimental approaches used by individual projects. In general, our data are in agreement with the assumption of supply-controlled P-nutrition strategies of beech forest ecosystems. All data indicate that slow turnover and high rooting intensity foster tight P recycling at P poor parent materials. As a consequence the majority of P applied to the P poorest site of our study is hold in the very surface organic-rich layers. Beyond this we have identified mechanisms which contribute to the differnt P nutrition strategies and which will be introduced examplarily. The indicator values obtained for P acquisition and recycling changed continuously along the P gradient, implying continuous adjustment of plant?microorganism?soil feedbacks in beech forest ecosystems to the P status of soils thereby achieving an enormous adaptability to changing P supply. This kind of ecosystem adaptation enhanced the P-use efficiency at poor sites. We conclude that P deficiency in beech forest ecosystems is rather caused due to the disruption of these ecological interactions than by low P supply per se.