

Long-term effect of levels of N-, P-, K-supply on the Shannon-Index for two pastures located in Central Germany

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Introduction Intensive grassland production, including the use of mineral fertilisers, has degraded the botanical diversity of grassland communities seriously (Chapman, 2001). There is little information on optimal amounts of soil nutrient availability to maintain/regenerate species-rich grassland communities. This study in Central Germany aimed to quantify the long-term effect of different N-, P-, K-supply combinations on biodiversity, expressed in terms of the Shannon-Index (Sh-Id), of 2 pastures classified as *Lolium-Cynosuretum*.

Materials and methods In a Latin square design with 3 replicates, 2 pastures on mineral soils at 260 and 360m above sea-level, respectively, were fertilised with 27 different N-, P-, K-supply combinations yearly from 1986-2002. Unfertilised soil exchangeable P and K levels were 1.3 and 13.0 mg/100 g, respectively, for the 260m site and 3.0 and 9.4 mg/100 g for the 360m site. Dry matter proportions of the species were estimated in spring 2002 using the Klapp/Stählin method (Klapp, 1929) and the Sh-Id (Magurran, 1988) was calculated for each plot.

Results N-supply had most influence on Sh-Id at both sites (Figure 1). K-supply had a significant effect at the 360m site, and P x K and P x N interactions had minor influences. Sh-Id for fertiliser combinations without N-supply was higher at the 360m than at the 260m site. This was due mainly to more species at this site without N-supply. Increasing N-supply on the 360m site encouraged *Elymus repens* and *Alopecurus pratensis* dominance and exclusion of less aggressive species; overall species and Sh-Id values decreased. Increasing the P- or K-supply on this site within a specific supply combination had an ambiguous effect on the Sh-Id. Although K-supply reduced the number of herb species, higher P- or K-supply sometimes increased the evenness of the species abundance distribution, resulting in higher Sh-Id values. N-supply encouraged *Holcus lanatus* and *Alopecurus pratensis* dominance and reduced the species number on the 260m site but species reduction was less than at the 360m site. N-fertilisation lowered Sh-Id only moderately at the 260m site because N-supply did not influence the evenness of species abundance distribution. Despite low original soil P levels, P-fertilisation had no effect on the Sh-Id at this site.

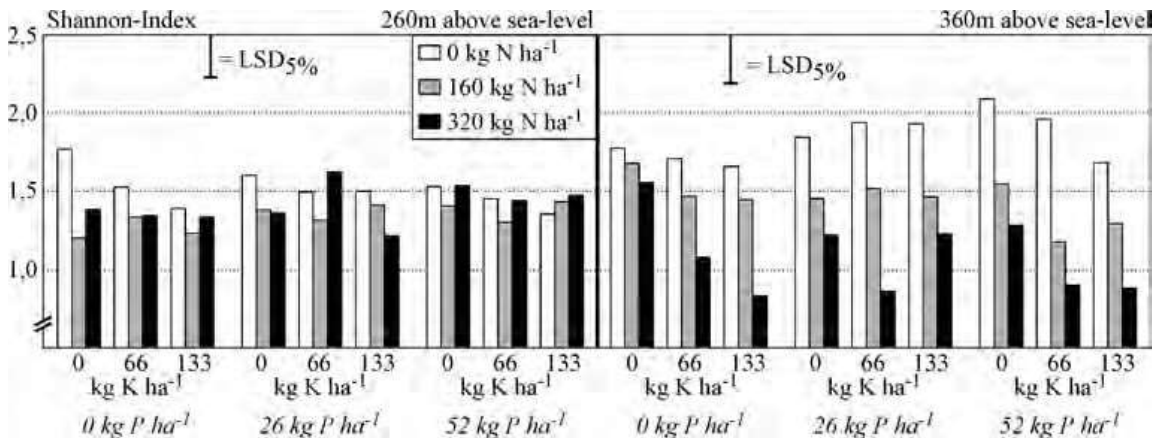


Figure 1 Shannon Index in relation to long-term N-, P-, K-supply for 2 pastures in Germany

Conclusion Nil-fertilisation does not necessarily result in highest biodiversity. Instead, the maintenance of long-term combinations of P- and K-supply, at levels specific to different sites, can increase biodiversity significantly.

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