Dry matter production and feed quality of agricultural grassland after ceasing fertilization

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Summary

To measure the agricultural value of some grasslands after ceasing fertilization the production and digestibility of the organic matter was determined. There was a large variability in measured parameters between the sampled plots. In general the digestibility decreased with the physiological stage of the sward. The intensity of the former agricultural management (soil fertility and botanical composition) and the level of the groundwater Table was of great importance to the growth of plant species and the development of vegetation communities and consequently to the productivity and digestibility.

Keywords: digestibility, feed quality, impoverishment, production, species-rich grassland.

Introduction

Due to the intensification of agricultural practices (much higher fertilizer inputs, lowering of the groundwater Table, increasing cutting frequencies and grazing densities) species-rich grasslands change into highly productive but species-poor grasslands. As the area of species-rich grasslands is declining, interest in grasslands, associated with intensive agricultural practices, is increasing from a nature conservation point of view (Bakker, 1987). The aim of this research project is firstly the integration of ecological and economic objectives in grassland management. The possibility of converting these highly fertilized species-poor grassland communities to species-rich communities is examined, in the context that the fertilizer application ceases and the groundwater Table has not been lowered. Further, it was the aim to determine the agricultural (economic) value of species-rich grasslands. The study was carried out in the nature reserve "Bourgoyn-Ossemeersen" in Ghent. This nature reserve (+/-200 ha) is situated in the alluvial valley of the river "Lele". Wet grasslands with many small channels and ditches are the main structural element of the landscape. The botanical composition and succession together with the production and the feed quality of the grass of different grassland communities were determined.
Materials and methods

Since 1993, or earlier, all the grasslands were managed with nature development as the main objective. There was no fertilization and the groundwater Table had not been lowered. The grassland was cut for the first time on 15th June. On some plots, a second cut was taken on 15th September. The other plots were grazed in summer and autumn. The vegetation was recorded in May and at the beginning of June, using a slightly modified scale after Londo (1984). After cutting, the DM production was calculated. Later, in the laboratory, the digestibility of the organic matter (OMD) of the grass from the first cut was measured (Tilley & Terry, 1963) and used as a parameter for feed quality.

Results and discussion

Vegetation

Six different vegetation types could be distinguished: *Poo-Lolietum* (PL), *Lolium-Cynosuretum* (LC), *Arrhenatheretum elatioris* (Ae), *Calithion palustreis* (Cp), *Magnocaricion* (M) and *Loo-Potentillion* (LP) (Butaye et al., 1995). The most important factor governing the vegetation development was soil fertility (mainly influenced by the former agriculture landuse) and the groundwater regime. Figure 1 shows a simplified overview of the vegetation communities with the most typical species. *Loo-Potentillion* is a special case. The vegetation type depends on a long inundation period in winter and is distinguished by the dependence on more or less regular inundations of various timespans.

Figure 1. A simplified survey of the vegetation types with the most specific species (De Becker, 1994).

Because of the recent change in the grassland management there was succession in the vegetation. We estimate that most grasslands will evolve towards vegetation types typical of soils with lower fertility level. The increased abundance of *Carex hirta* and *Cardamine pratensis* in the *Poo-Lolieta* association is one sign of this succession.
**Production in 1994 and 1995** (Figure 2)

The production when mowing on 15th June varied from 3000 to 7000 kg DM ha\(^{-1}\). The main difference in production between the different plots of the *Poa-Lolium* and the *Lolium-cynosureta* can be explained by the soil impoverishment, the earlier agricultural use, the botanical composition and the groundwater Table. The production was higher in 1995 (4990 kg DM ha\(^{-1}\)) than in 1994 (4550 kg DM ha\(^{-1}\)). Because of the impoverishment of the soil we rather suspect a decrease. But, spring of 1995 was very dry. This could be the reason for the strong growth of the vegetation on these wet soils.

*Figure 2. Dry matter production of different vegetation types in 1994 and 1995.*

**Production and feed quality** (Figure 3)

The DM production of the *Arrhenatheretum elatioris* was quite high but the digestibility of the grass was low. The OMD was low for the *Poo-Lolium* plots with a high production and relatively high for the plots with a low production. This is a logical phenomenon. When herbage ages there is a succession in the physiological stage of the sward with the consequence that the percentage of soluble material within the cells drops and the concentration of hemicellulose, cellulose and lignin, which are not (highly) digestible, rises. The botanical composition is also of large importance for the digestibility (Pearson & Ison, 1987). Because of the extreme wet circumstances in spring, the growth of the *Loo-Potentillion* vegetation starts very late. This was the reason for the very low production and the high digestibility. The production and the OMD of *Calthion palustris* vegetation and *Magnocaricion* vegetation was low. Here, the botanical composition was probably the main reason.
Figure 3. Production and OMD of different vegetation types in 1994.

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References


