THE PRODUCTIVITY AND BOTANICAL COMPOSITION OF PERMANENT, TEMPORARY AND SLOT SEEDED GRASSLAND

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ABSTRACT
The development of botanical composition and primary production was followed from 1993 to 1995 at the southern side of the Jizera Mountains on three-cutting permanent, temporary and slot seeded grassland. Each grassland type was divided into 4 variants with various doses of mineral fertilization. The same clover-grass mixture composed of 5 components were used for the renovation by ploughing and slot seeding. During three years of the observation a very fast drop of the clover portion for the benefit of grass species and herbs was noted especially by the renewed grassland. Also sown grass species in the renewed grassland declined quickly and a considerable succession of native species occurred. These changes together with the effectiveness especially of soil and climatic factors were shown by a reduction of the primary production. Compared with the permanent grassland a small yield stability was shown by the renewed grassland. The slot seeding into a 5 cm broad rotary cut path was little effective and already in the second year the vegetation didn't differ considerably from the permanent one concerning the yield and botanical composition.

KEYWORDS
Permanent grassland, grassland renovation, slot seeding, succession, primary production

INTRODUCTION
In the Czech Republic, cattle numbers are declining and grassland usage has decreased. It is necessary to stop its degradation and to find ways of economically managing these areas, taking into account soil protection, the quality of surface and underground water and the preservation of biodiversity. A specific way can be slot seeding into a rotary cut path where a part of the original vegetation remains conserved but the vegetation parameters are improved by additional sowing of suitable components to increase yield and nutritive value of the forage. Unlike the renovation, in the first weeks after the slot seeding, there is less danger from erosion and contamination of surface water. Another question is an economically acceptable fertilization dose which will not negatively influence grassland quality and botanical composition.

MATERIALS AND METHODS
The study was conducted from 1993 to 1995 at the station Oldrichov v Hájích in the Jizera Mountains (420 m above sea-level, average yearly temperature 7.1^0 C, yearly rainfall 918 mm, acid brownsoil pH 4.9). The study grassland area was divided into 3 blocks: renewed (DTP), slot seeded (PTP) and permanent (TTP). Each grassland type was divided into 4 variants with various doses of mineral fertilization: 1st var. - non-fertilized, 2nd variant 30kg $P.ha^{-1}$+60kg $K.ha^{-1}$, 3rd variant 3x30kg $N.ha^{-1}$+PK, 4th variant 3x60kg $N.ha^{-1}$+PK. For the renovation and additional sowing the same mixture and the same seeding amount were used : generic hybrid (*Lolium multiflorum x Festuca arundinacea*) cv. FELINA 12 $kg.ha^{-1}$, ryegrass (*Lolium perenne*) cv. SPORT 8 $kg.ha^{-1}$, cocksfoot (*Dactylis glomerata*) cv. NIVA 4 $kg.ha^{-1}$, red clover (*Trifolium pratense*) cv. KVARTA 3 $kg.ha^{-1}$, white clover (*Trifolium repens*) cv. HUIA 2 $kg.ha^{-1}$. The portion of single species in the above ground biomass was measured with the estimation method according to Klapp (1965) and the portion of empty places were determined before every cutting.

RESULTS
From 1993 to 1995 in the slot seeded grassland all additionally sown components essentially disappeared, except for *Trifolium repens* in the second variant. In view of the fact that PTP grassland was basically conformed to permanent TTP, we proceeded to the repeated additional sowing in spring 1995. Due to bad weather conditions, the development of the germinated plants was slow and a great part decayed and the vegetation did not regenerate to the end of the vegetation period.

A fast retreat of sown species of the vegetation was discovered on the renewed grassland (DTP). The greatest change was noted with the clover. During this study *Trifolium pratense* practically disappeared. *Trifolium repens* had the best representation in the 2nd variant with the P,K fertilization, where its portion decreased from 55% to 5% during 3 years. The highest representation of sown grass species had *Dactylis glomerata* (20-25%) on the variants fertilized with N. Major grassy weed species were especially *Agrostis capilaris*, *Holcus mollis*, and *Alopecurus pratensis;* as regards the herbs, mostly *Plantago lanceolata*, *Cerastium holosteoides*, and *Ranunculus acer* were infested. The changes of the botanical composition as regards the sown species of the renewed grassland are shown in the Fig. 1. On the permanent grassland the changes were not so radical. Especially *Festuca rubra* was infested to the detriment of *Poa pratensis* and *Trisetum flavescens*, in the 4th variant *Alopecurus pratensis* was infested considerably. The yields changes of all grassland types and variants are shown in the Fig. 2. Compared with TTP yields of the renewed grassland were higher in the first two years, but they had a plunging tendency and in 1995 were lower.

CONCLUSIONS
The successions of native species with a fast retreat of sown species have occurred on the renewed grassland. Similar results are presented by Krajcovic et al. (1995). These changes were also accompanied with a fast reduction of yields in comparison with TTP. On the contrary, Hrazdíra (1984) reported the long-time productivity on renewed grassland. But it is necessary to respect great numbers of factors (soil and climatic conditions, original grassland vegetation ao). These factors are to be also respected as regards PTP, where the effect of additional sowing is shown up only on competitive weaker vegetation under the conditions with an appropriate soil humidity (Krajcovic et al., 1995). A small success of slot seeding can be caused by the presence of inhibition matters in the top soil layer (Kohoutek, 1995). It is necessary to do further observation and compare the experience of great numbers of stations during a longer period to clear up a mechanism influencing the growth and development of sown species.

The work was supported by The Grant Agency of the Czech Republic (under no. 503/94/1040).

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Figure 1
Botanical composition (% of seed species)

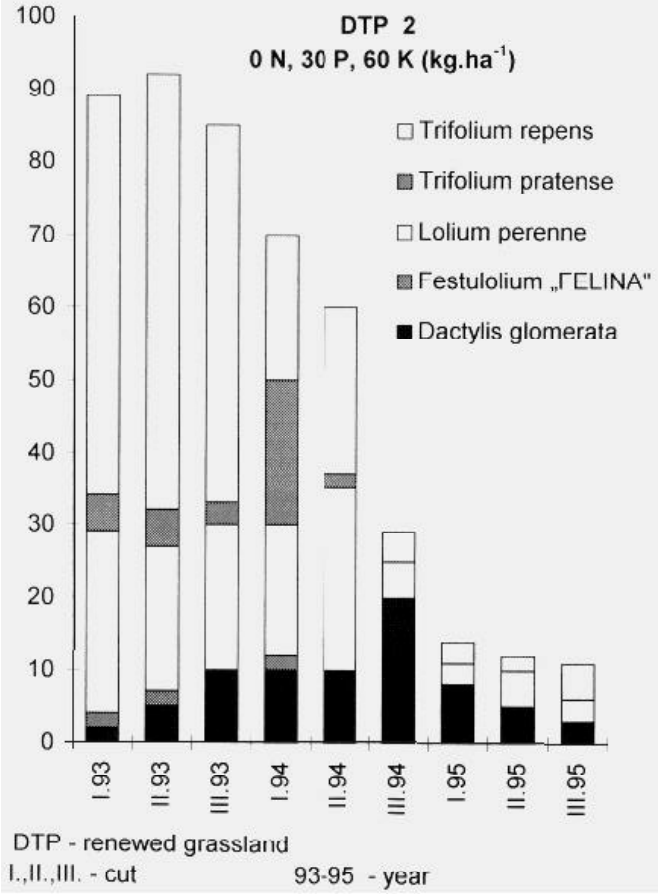

Figure 2
Yield dry matter (t.ha^{-1})