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## The effect of legumes on stability and quality of yield in long-term grazing use

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**Key words:** white clover, lucerne, grazing, yield, quality

**Introduction** The presence of any legumes in grassland communities appears to result in increased above ground biomass (Spehn *et al.*, 2002). Legumes usually produce a higher content of crude protein than grasses (Halling *et al.*, 2002). The objective of our experiment was to evaluate effect of legumes on stability and quality of yield over several years in different swards.

**Materials and methods** During 1998–2006 a randomized block design field trial was carried out on a loamy *Endocalcaric-Epithypogleyic Cambisol* near Dotnuva, Lithuania (55°24'N, 23°50'E). Soil pH varied from 6.5 to 7.0, humus content was 2.5–3.2%, available P 50–80 mg and K 100–150 mg kg<sup>-1</sup>. The treatments involved different swards consisting of white clover (*Trifolium repens* L.), lucerne (*Medicago sativa* L.), perennial ryegrass (*Lolium perenne* L.), meadow grass (*Poa pratensis* L.) and *Festulolium* hybrid. The grazing season lasted from the beginning of May until middle of October with four grazing rotations. During 8 years of experimentation climatic conditions differed to a great extent: grazing periods 2000, 2001, 2004 and 2005 were normal, 1999 wet, 2003 dry, and 2002 and 2006 very dry and warm.

**Results and discussion** The total annual dry matter (DM) yield was primarily affected by the climatic conditions and less by sward composition (Table 1 and Table 2). The swards responded differently to seasonal conditions. The DM yield in 2002, 2003 and 2006 was markedly lower than in all other years. Nevertheless swards consisting of legumes had higher yield than pure grass swards without nitrogen fertilization. Only lucerne based swards had in all years (excluding 2002) a higher total and legume yield. The yield of white clover in dry seasons declined more than that of lucerne and grasses or forbs. The effect of legumes in different swards on crude protein content reflected their effect on DM yield (Table 2). Crude protein content in all swards met animal requirements.

**Table 1** Total dry matter annual yield of different swards and its persistence over eight years of use, t ha<sup>-1</sup>.

Swards	1999	2000	2001	2002	2003	2004	2005	2006
1 <i>T. repens</i> /L. <i>perenne</i>	6.12	5.49	5.02	2.58	2.69	5.26	4.74	2.74
2 <i>T. repens</i> /L. <i>perenne</i> /P. <i>pratensis</i>	6.56	5.36	5.16	2.47	2.20	4.73	5.25	2.93
3 <i>M. sativa</i> /L. <i>perenne</i> /P. <i>pratensis</i>	7.55	8.87	7.19	3.04	5.59	8.63	8.24	4.52
4 <i>T. repens</i> /M. <i>sativa</i> /L. <i>perenne</i>	6.96	8.11	6.56	3.02	4.76	7.04	7.03	4.77
5 L. <i>perenne</i> /N <sub>0</sub>	3.23	4.45	4.73	3.12	2.31	4.38	5.21	3.13
6 L. <i>perenne</i> /N <sub>240</sub>	7.54	7.10	4.51	3.04	4.20	7.72	5.70	4.26
7 <i>T. repens</i> / <i>Festulolium</i> hybrid	6.74	6.21	5.36	2.60	2.53	4.97	4.76	2.94
LSD <sub>0.05</sub>	0.511	0.421	0.398	0.615	0.366	0.497	0.466	0.591

<sup>1)</sup> Sward persistence index—last 2 years yield ratio to first 2 years, LSD—least significant difference (p<0.05)

**Table 2** Legume annual yield and crude protein content in total yield of different swards.

Swards	Dry matter t ha <sup>-1</sup>								Crude protein g DM kg <sup>-1</sup>							
	1999	2000	2001	2002	2003	2005	2006	1999	2000	2001	2002	2003	2005	2006		
1.	2.99	0.84	1.76	0.57	0.19	2.50	0.23	186	156	202	167	181	236	192		
2.	3.48	1.10	2.13	0.74	0.19	2.58	0.20	193	156	203	173	175	220	208		
3.	5.25	5.92	4.69	1.58	4.04	5.42	2.97	226	213	213	170	215	224	199		
4.	4.04	2.71	3.58	1.63	3.04	3.74	2.91	206	183	216	189	217	227	202		
5.	—	—	—	—	—	—	—	124	144	191	145	154	222	201		
6.	—	—	—	—	—	—	—	187	158	216	196	247	235	230		
7.	2.40	1.08	1.87	0.50	0.17	2.18	0.14	182	140	199	155	196	215	196		
LSD <sub>0.05</sub>	0.214	0.135	0.193	0.163	0.190	0.244	0.286									

**Conclusions** Lucerne based swards had a higher total and legume yield and showed a positive effect on stability of grazing swards over eight years. The grassland consisting of legumes can be productive and protein rich without mineral N and reduce external inputs.

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