Production and non-production functions of grassland in an upland region of Slovakia

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Introduction The importance of grassland lies chiefly in its production of good quality forage that is utilised by cattle and sheep. In upland and mountain regions the non-production functions of grassland such as landscape enhancement or water catchment are especially important. These functions are performed mainly through the sward tillering zone (boundary area between above-ground vegetation and roots) and root characteristics (Jancovic, l985). The objective of this research was to study the biomass above, at, and below ground level of three sward types at different fertilisation levels.

Materials and methods The production of total biomass (CB) was evaluated in three grassland ecosystems: seminatural (SG), overdrilled (OG) and sown (TG) at Radvan (Banska Bystrica,460m a.s.l.) over six years (1993-98). Soil type was cambisol (pH 4.3). Seminatural grassland (Poa- Trisetum; Arrhenatherium) was oversown with a grass/legume mixture. All three grassland types were fertilised in the same pattern: 1- no fertilisers, 2- $P_{30}K_{60}$, 3- $P_{30}K_{60}+N_{90}$ and 4- $P_{30}K_{60}+N_{180}$ (kg/ha). The following measurements were made on a dry matter (DM) basis: production of above-ground biomass (NB) by a 3-cut regime; production of the tillering zone (ZO), which was defined as the biomass on the soil surface boundary and comprised two parts-underground biomass to the depth 1.5-2.0 cm and above-ground biomass to the height of 2.0-3.0 cm; production of root biomass (Ko) to the depth of 10 cm. The sum of these components (CB) represents the total biomass. Nutrient uptake (N, P, K, Ca and Mg) levels in the components were also calculated from standard analysis of the elements.

Results Selected mean data on DM and N uptake are presented in Table 1. The biomass DM of the components differed among the sward types with SG having the highest ZO, Ko and CB values. The lowest NB, Ko and CB values were for TG. The order of biomass DM was consistently Ko>ZO>NB for all sward types. The trend for the fertiliser treatments was for increased component biomass DM as fertilisation increased from nil to N_{180} P_{30} K_{60}. In terms of N production, the order of the sward types was SG>OG>TG and for fertiliser treatments, in line with level of applied N. For the other parameters of P, K, Ca and Mg (data not shown) CB biomass was similar for swards SG and OG with TG being lowest.

Table 1 Biomass dry matter (t/ha) and nitrogen (kg/ha) of sward components (sward type meaned over fertiliser treatment and fertiliser treatment meaned over sward type)

	Sward type			Fertiliser treatment			
Sward	SG	OG	TG	1	2	3	4
DM production							
NB	2.10	2.20	1.95	1.57	1.70	2.37	2.70
ZO	5.73	5.10	5.43	4.77	5.07	5.73	6.10
Ko	8.52	7.78	7.28	7.20	7.90	7.90	8.43
CB	16.36	15.08	14.66	13.54	14.67	16.00	17.23
N production							
NB	212	160	141	109	121	170	214
ZO	105	98	91	89	93	100	107
Ko	119	115	103	103	114	111	122
CB	436	370	335	301	328	381	443

Conclusions Treatment SG with its non disturbance had greater ZO and Ko than the other sward types. This treatment maintained a similar NB production to OG and TG. All swards responded positively to increased fertilisation. At upland sites, sward renovation may not be a better option than managing the existing seminatural sward whether for above-ground production or for maintaining a sward for a non-production function.

References

Jancovic, J. (1985). Vplyv hnojenia na korene travnych porastov. [Effects of fertiliser application on grassland roots.] *Agrochemia*, 25, 2, 43-45.