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Survey of some highlands pastures in central Slovakia

E. Uhliarová, M. Michalec and M. Zimková
Grassland and Mountain Agriculture Research Institute, Mládežnícka 36,
974 21 Banská Bystrica, Slovakia

SUMMARY – An area of 2095 ha of highland grassland was investigated in central Slovakia in 1999-2002. Plant inventories showed a very large diversity due to different types of geological substrata (e.g. limestone, volcanic minerals and dolomites) and micro-regional climatic conditions (e.g. mountain valley, hollow, plateau). The main grass alliances were: (i) *Cynosurion, Arrhenatherion* and *Polygono-Trisetion* present on volcanic substrata and the dry mesophilous sites; (ii) *Carduo-Brachypodion pinnati*, *Mesobromion* and *Seslerio-Festucion glaucae* found on limestone and dolomites; and (iii) *Calthion, Juncion effusi, Caricion rostratae*, *Caricion fuscae*, *Caricion davalianae* present on wetland sites. The main aim of the survey was to assess the abundance of all plant species, type of grassland management, grassland production and utilisation.

Key words: Grassland, plant species, pasture production and utilisation, afforestation.

RESUME *– "Enquête sur les pâturages de montagne en Slovaquie centrale". L'objectif principal de cette étude était d'évaluer la présence des espèces des plantes, la gestion des prairies et des pâturages, leur production et leur utilisation. Environ 2095 ha de prairies et de pâturages en montagne ont été évalués en Slovaquie centrale pendant 1999-2002. Concernant la composition botanique il y avait une très large diversité à cause des différents types de substrats géologiques (tels que le calcaire, les minéraux volcaniques, et les dolomites) et les conditions micro-régionales (vallée, creux, plateau). Les alliances des principaux végétaux étaient : (i)* Cynosurion*,* Arrhenatherion *et* Polygo-Trisetion *(sur substrats volcaniques aux sites mesophils secs); (ii)* Carduo-Brachypodion pinnati*,* Mesobromion *et* Seslerio-Festucion glaucae *qui ont été trouvés sur les calcaires et dolomites ; et (iii)* Calthion*,* Juncion effusi*,* Caricion rostratae*,* Caricion fuscae, Caricion davalianae *présents dans les sites humides.*

Mots-clés : *Prairies, espèces des plantes, utilisation, pâturages, production.*

Introduction

Grassland farming from a viewpoint of sustainable agricultural development needs to take into consideration the relationships between grazing, biodiversity, afforestation and socio-economical aspects of low-intensity farming. Unfortunately in the last decade the numbers of animals (potential grazers) declined (according to the Annual Statistical Book, 1990, 2000, 2002, Table 1.) as a result of insufficient grassland utilisation in highlands and, as afforestation becomes a problem.

Table 1. Number of animals (potential grazers) in Slovakia from 1990 to 2002

	1990	2000	2002
Cattle	1 563,000	646,000	607,835
Dairy cows	579,000	274,000	259,873
Sheep	600,000	348,000	316,028

Materials and methods

A total grassland area of 2095 ha was evaluated in two stages: in 1999 the whole area was investigated and the sites of similar character were chosen and marked in the maps. In the two following years (2000-2001) plant inventories were carried out (on areas of 4x4 m). Total number of releves was 173. Moreover, altitude, slope inclination, percentage of afforestation, way of utilisation and dry matter (DM) production per m^2 were assessed on 22 chosen sites. The previous grassland

utilisation (cutting, grazing, combination of cutting and grazing, folding) was assessed on the basis of inquiry discussion with grassland owners (private farmers or members of co-operative farms) and by observation of the sward. In 2002 the results of plant inventories were treated by programme TURBOVEG and TWINSPAN, and DM production analysed taking into account the number of animals in the area.

Results and discussion

Plant inventories on 22 sites showed a large diversity due to different types of geological substrata (e.g. limestone, volcanic minerals, dolomites) and micro-regional climatic conditions (e.g. mountain valley, hollow, plateau). The main grass alliances were: (i) *Cynosurion*, *Arrhenatherion* and *Polygo-Trisetion* (on volcanic substrata and the dry mesophilous sites); (ii) *Carduo-Brachypodion pinnati*, *Mesobromion* and *Seslerio-Festucion flaucae* were found on limestone and dolomites; and (iii) *Calthion*, *Juncion effusi*, *Caricion rostratae*, *Caricion fuscae*, *Caricion davalianae* were present on wetland sites.

The most part of this area is managed by two cooperative farms and only a small part is used by private farmers or by inhabitants of villages or towns. Grassland utilisation depends on animal number, economical conditions and accessibility for machinery. A great part of grassland is only more or less extensively grazed and not fertilised (except for folding system on some small areas). Organised grazing in paddocks is used only for dairy cows and is rare because dairy cows are usually fed in stables. Cutting system of management used before 1960 (cutting:grazing = 3:1) has been gradually changed to grazing system (1:3).

As a result of extensive grassland management, the DM production was low (in average on 22 sites 3.41 t/ha/year, see Table 2), and the rate of afforestation and weed invasion (mainly by *Cirsium arvense, Calamagrostis epigeios* and *Brachypodium pinnatum*) increased. The area of afforested grassland has achieved 253 ha (12.22% of total investigated area) and the area of under-utilised and/or unused grassland comprised 627.1 ha (30.53%) in 2001 and is still increasing. The most rapidly spreading woody species were *Pinus sylvestris, Populus tremula, Prunus spinosa, Rubus caesius* and *Picea abies*.

From a plant biodiversity point of view, the most important types were semi natural meadows and pastures because of abundance of species (plus medicinal plants and protected species) but their area considerably decreased and is still decreasing.

Total number of animals in the area is very low: 351 dairy cows, 335 heifers and 1191 sheep, i.e. approximately 700 livestock units (LU), stocking rate being 0.33 LU/ha. According to the production potential of pastures the number of animals can be doubled and, in addition to dairy cows, heifers and sheep, also steers and goats can be reared in this area.

The problem of extensively used grassland versus potential animal production in central Slovakia has been also shown by Krajčovič *et al*. (1999) and Michalec *et al*. (2003). It seems that the relationship between grazing, open habitats, woods and biodiversity belongs to main agri-environmental European topics (Bignal and Jones, 2003).

Conclusions

The very low exploitation and/or the abandonment of highland pastures led to afforestation of 12.22% of their area and in the near future it could achieve 30% of the total area, if measures for an appropriate management are not considered. At present, the area of not properly used grassland comprises 627.1ha (30.53% of total area).

It took hundreds of years to make grasslands out of parts of forest and now it takes only a decade of insufficient utilisation and grassland turns into wood.

Certainly a complex of agri-environmental and socio-economical aspects has to be taken into account to support the sustainable agricultural as well as rural development in central Slovakia.

Table 2. Dry matter production in 2000-2001 (t/ha)

Site	Year		$\bar{x}$
	2000	2001	
1. Králiky – Ruskov	3.13	3.67	3.40
2. Králiky – Ruskov	1.93	3.83	2.88
3. Králiky – Ruskov	3.36	3.37	3.37
4. Králiky – Ruskov	1.97	2.76	2.37
5. Králiky – pod stádlom	3.45	2.86	3.16
6. Králiky – nad vlekom	3.16	3.21	3.19
7. Králiky – nad vlekom	3.97	3.66	3.82
8. Tajov – Predné	3.21	2.51	2.86
9. Tajov – Predné	2.91	3.17	3.04
10. Tajov – Predné	2.79	2.69	2.74
11. Tajov	2.24	4.59	3.42
12. Králiky – Ortutnô	5.09	3.07	4.08
13. Králiky – Ortutnô	3.28	2.89	3.09
14. Tajov – Zastávka	3.35	2.57	2.96
15. Banská Bystrica – Suchý vrch	4.55	5.83	5.19
16. Banská Bystrica – Suchý vrch	3.73	2.93	3.33
17. Banská Bystrica – Háj	3.32	2.66	2.99
18. Pršany	4.04	9.58	6.81
19. Pršany	3.42	2.09	2.76
20. Malachov – za malým vlekom	4.44	2.74	3.59
21. Malachov – pri malom vleku	3.68	2.35	3.02
22. Radvaň – Stupy	3.86	2.06	2.96

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