CONTRIBUTIONS TO THE PRODUCTIVITY ASSESSMENT OF NATURA 2000 GRASSLAND HABITATS IN THE TRANSYLVANIAN PLAIN CONTINENTAL BIOREGION

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Abstract. *The permanent grasslands of the Transylvanian Plain are composed of three major Natura 2000 habitats, namely: 6210 [Semi-natural dry grassland and scrubland facies on calcareous substrates (Festuco-Brometea) (*important orchid sites)], 6240* [Sub- pannonic steppe grasslands] and 6440*[Alluvial meadows of the river valleys of the Cnidion dubii]. Habitat 6210, dominated by Festuca rupicola has a plant productivity of 9.38 t/ha green mass (GM) and 52.9 pastoral value index (PV), respectively animal productivity of 1,367 liters/ha cow milk or 127 kg/ha live weight gain in young bulls in 160 days grazing season. Habitat 6240* degraded by Dicanthium ischaemum has a lower productivity expressed as 3.43 t/ha GM; 24.7 PV; 415 L/ha milk or 39 kg/ha spore. Habitat 6440 dominated by Agrostis stolonifera has higher plant and animal productivity, respectively 8.29 t/ha GM; 45.2 PV; 1145 L/ha milk and 108 t/ha weight gain in cattle during the same 160-day grazing season.*

Keywords: Natura 2000 grassland habitats, 6210, 6240*, 6440, plant and animal productivity

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1. Introduction

In addition to knowing the floristic composition of a grassland, which expresses the normal or degraded state of the vegetation, concrete data on green mass production (GM) and forage quality are necessary for the preparation of pastoral arrangements and the efficient management of this agricultural use [3].

Determination of GM production is usually done by weighing on fenced sample areas in the case of grassland use through grazing and forage quality through laboratory chemical analysis.

These procedures are difficult to carry out in the field, requiring high costs, so a new method based on floristic survey was used [4].

Likewise, the floristic survey is the basis for determining the pastoral value (PV) which expresses the forage quality of the grassy carpet of a grassland.

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Through long-term experiments with animals during the grazing season, feed-animal product conversion indices were established, which completes the concept of productivity of a grassland.

By determining milk production and live weight gain in young cattle and their economic value, the productivity of a permanent pasture is more clearly outlined.

The present study complements our knowledge regarding the plant and animal productivity of Transylvanian grasslands.

2. Material and methods

To evaluate the productivity of grasslands in the Transylvanian Plain, the results of geobotanical research in this area were used [1].

The working method was based on the floristic composition of grassland habitats to which forage value and production indices were applied [4, 7].

Following this new method, many articles on vegetation productivity have been published in the Annals of the Romanian Academy of Sciences so far, so we will not return to its description [5, 6, 8, 11, 12].

Animal productivity, expressed in cow's milk and live weight gain in young bulls, was evaluated through other indicators established in long-term experiments with animals on pastures [9, 10].

Of particular importance are the conversion coefficients of green mass production into animal production, which are based on consumption indices for 1 liter of milk or 1 kg of live weight gain in cattle.

The green fodder consumption index for 1 liter (L) of milk was calculated using the formula:

GM consumption (kg) for 1 L milk = 9.5 – 0.05 x PV

in which:

GM (kg) = green fodder mass

PV (ind.) = pastoral value

This GM consumption for 1 liter of milk varies between 9 kg GM for those with very low PV to 4 kg GM for a PV index of 100.

Cow milk production per hectare was calculated using the formula:

Milk production (L/ha) = GM (kg/ha) / GM consumption (kg) for 1 L

The GM consumption index (kg) for 1 kg of live weight gain in young bulls was calculated according to the formula:

GM consumption (kg) for 1kg gain = 100 – 0.5 x PV

Similarly, the consumption of GM for 1 kg of live weight gain varies between 50 kg GM for the maximum PV index of 100 to 100 kg GM for the lowest PV index.

The production of growth (meat) in young bulls per hectare is calculated according to the formula:

Crop production (kg/ha) = GM (kg/ha) / GM consumption (kg) for 1 kg crop

After these calculations, depending on the category of cattle existing in the grazing season, dairy cows or young cattle, the economic value of a pasture can be assessed by multiplying milk production by 0.5 €/Liter and weight gain by 3.2 €/kg, final indicators necessary for calculating the economic efficiency of raising these animals [MADR 2026].

3. Results and discussions

Following the analysis of grassland vegetation data, 3 grassland habitats corresponding to 3 phytosociological alliances were outlined [2]:

- H 6210 - Al. *Festucion valesiacae* Klika 1933
- H 6240* - Al. *Cynosurion* R.Tx 1947
- H 6440 – Al. *Agrostion albae* Soó 1943 (Table 1)

Table 1. Floristic composition and plant productivity of the main grassland habitats in the Transylvanian Plain

Species	Indices		Habitat		
	F	H	6210	6240*	6440
Grasses					
Festuca rupicola	5	5	15.0	16.0	
Agrostis capillaris	7	5	11.4		
Agrostis gigantea	7	7	7.5		
Lolium perenne	9	8	3.9		
Elymus hispidus	3	0	3.9	0.2	
Stipa capillata	3	0		16.0	
Dicanthium ischaemum	3	0		16.0	
Festuca valesiaca	5	3		5.5	
Agrostis stolonifera	7	6			32.3
Glyceria plicata	4	7			10.8
Cynodon dactylon	6	2	0.2	0.2	
Elymus repens	6	7	0.2	0.2	
Anthoxanthum odoratum	5	3	0.2		
Arrhenatherum elatius	8	8	0.2		
Briza media	5	2	0.2		
Bromus hordeaceus	5	5	0.2		
Bromus sterilis	3	0	0.2		

Cynosurus cristatus	7	4	0.2		
Dactylis glomerata	9	8	0.2		
Echinochloa crus-galli	5	7	0.2		0.2
Phleum phleoides	6	4	0.2		
Phleum pratense	9	8	0.2		
Festuca pratensis	9	8	0.2		0.2
Poa annua	7	2	0.2		
Agropyron cristatum	7	5		0.2	
Brachypodium pinnatum	5	7		0.2	
Melica ciliata	4	2		0.2	
Glyceria maxima	3	0			0.2
Legumes					
Trifolium repens	8	5	3.9		5.5
Trifolium pratense	8	7	3.9	0.2	0.2
Onobrychis viciifolia	8	8	3.9	0.2	
Lotus corniculatus	8	6	0.2	0.2	
Medicago falcata	7	6	0.2	0.2	
Medicago lupulina	8	3	0.2	0.2	
Medicago sativa	9	9	0.2	0.2	
Astragalus austriacus	5	5	0.2	0.2	
Astragalus monspessulanus	5	5	0.2	0.2	
Astragalus cicer	5	4	0.2		
Coronilla varia	1	0	0.2	0.2	
Trifolium alpestre	6	3	0.2		
Trifolium montanum	7	4	0.2		
Trifolium campestre	7	2		0.2	
Trifolium fragiferum	7	3			5.5
Trifolium hybridum	8	6			0.2
Other families					
Achillea millefolium	6	4	3.9	0.2	0.2
Fragaria viridis	4	1	3.9	5.5	
Galium verum	5	4	3.9	0.2	
Plantago media	6	2	3.9	0.2	
Teucrium chamaedrys	3	0	0.2	5.5	
Achillea collina	4	1		5.5	
Carex humilis	6	5		5.5	
Potentilla cinerea	3	0		5.5	
Carex distans	4	2			10.8
Carex riparia	3	0			10.8
Eleocharis carniolica	3	0			10.8
Ranunculus repens	1	0			5.6
Ajuga genevensis	4	2	0.2		
Capsella bursa-pastoris	4	3	0.2		
Carex vulpina	4	5	0.2		0.2
Centaurea phrygia	4	6	0.2	0.2	
Cichorium intybus	5	6	0.2	0.2	
Convolvulus arvensis	7	6	0.2	0.2	

Crepis biennis	4	5	0.2	0.2	
Daucus carota	6	5	0.2	0.2	0.2
Hieracium pilosella	4	4	0.2	0.2	
Inula britannica	4	1	0.2	0.2	
Leucanthemum vulgare	5	5	0.2	0.2	
Leontodon autumnalis	5	3	0.2	0.2	
Leontodon hispidus	5	3	0.2	0.2	
Pimpinella saxifraga	5	3	0.2	0.2	
Plantago argentea	5	2	0.2	0.2	
Plantago lanceolata	6	1	0.2	0.2	
Plantogo major	5	3	0.2		0.2
Polygala amara	4	1	0.2		
Polygonum aviculare	5	3	0.2		
Potentilla erecta	5	2	0.2	0.2	
Prunella vulgaris	4	2	0.2		
Ranunculus polyanthemos	4	4	0.2		
Rumex acetosa	4	5	0.2		
Rumex obtusifolius	4	6	0.2		
Sanguisorba minor	6	3	0.2	0.2	
Symphytum officinale	5	5	0.2		
Taraxacum officinale	7	3	0.2		0.2
Thymus pulegioides	4	2	0.2	0.2	
Tragopogon orientalis	5	5	0.2		
Urtica dioica	5	7	0.2		
Verbena officinalis	4	4	0.2		
Veronica chamaedrys	4	2	0.2		
Crepis biennis	4	5			0.2
Other species (no. x 0.2)	3	0	19.8	12.0	7.8
Specification					
Participation of forage species (%)			75.7	44.6	64.8
Harmful species (%)			24.3	55.4	35.2
Pastoral value (ind)			52.9	24.7	45.2
Production of green mass (t/ha)			9.38	3.43	8.29

The most cormophyte species, 207, were recorded at H 6240* (*Cynosurion)* and the fewest, 46 species at H 6440 (*Agrostion albae)* [1].

The highest participation in the grassy carpet of 75% of forage species was recorded at H 6210 and the lowest of 44.6% at H 6240 *, which directly influences plant and animal productivity.

Thus, in H 6210, a green fodder mass production (GM) of 9.38 t/ha and a pastoral value index (PV) of 52.9 was evaluated, and in the case of H 6240, only 3.43 t/ha GM and 24.7 PV, respectively 2-3 times lower.

Based on the results regarding GM and PV plus the duration of the grazing season of 160 days, milk production and live weight gain in cattle were calculated (Table 2).

Table 2. Cattle productivity in the 160-day grazing season on the main grassland habitats of the Transylvanian Plain

Natura 2000 habitat	Pastoral value (ind.)	GM production (t/ha)	Animal loading (LU/ha)	GM consumption (kg)		Milk production		Growth production	
				1 L milk	1 kg extra	L/ha	%	Kg/ha	%
6210	52.9	9.38	0.90	6.86	74	1,367	140	127	140
6240*	24.7	3.43	0.33	8.26	88	415	43	39	43
6440	45.2	8.29	0.80	7.24	77	1,145	117	108	117
Average	**40.9**	**7.03**	**0.68**	**7.45**	**80**	**976**	**100**	**91**	**100**

The average milk production of the habitats was 976 L/ha, with 140% (1,367 L) at H 6210 and 43% (415 L) at H 6240, a difference of more than 3 times.

The same results were also evaluated for live weight gain, namely 91 kg/ha on average, with 127 kg/ha for H 6210 and 39 kg/ha for H 6240, also over 3 times less.

These economic results of milk production or weight gain serve as the final balance sheet of animal husbandry on grassland habitats used for grazing.

Conclusions

(1). The permanent grasslands of the Transylvanian Plain are particularly rich in cormophyte species.

(2). The average plant productivity of Habitats H 6210, H 6240 and H 6440 is 7 t/ha green fodder mass (GM) and 40.9 pastoral value index (PV) being considered average.

(3). The highest animal production was evaluated at H 6210 dominated by *Festuca rupicola,* with 1,367 L/ha of cow's milk or 127 kg/ha live weight gain in young bulls having 9.38 t/ha GM and 52.9 PV index, in a 160-day grazing season.

(4). Lower animal production was assessed at H 6240 * degraded by *Dicanthium ischaemum*, with only 415 L/ha milk or 39 kg/ha weight gain, at a production of 3.43 t/ha GM and 24.7 PV index.

(5). The results on livestock production continue to serve in calculations of economic efficiency of pastoral habitats.

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