EVALUATION OF THE PRODUCTIVITY OF PERMANENT GRASSLANDS FROM THE BELIȘ-FÂNTÂNELE RESERVOIR AREA (CLUJ COUNTY)

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RESEARCH ARTICLE

Abstract
This paper represents a case study regarding the evaluation of the productivity of permanent grasslands in the Beliș-Fântânele reservoir area based on the floristic relevées. The main types of grasslands studied in the area are Festuca rubra-Agrostis capillaris and Nardus stricta-Festuca rubra, located on lithological substrates formed by acidic rocks. Following the floristic study and the assessment of the participation weight of the component species in each type of grassland green mass production of 12.63 t/ha was determined, with an animal load of 0.98 livestock units UVM/ha in the case of Festuca rubra-Agrostis capillaris grasslands and a green mass production of 1.41 t/ha with a load of 0.16 livestock units UVM/ha in the case of Nardus stricta-Festuca rubra grasslands. The very poor productivity of grasslands consisting of Nardus stricta and Festuca rubra it is mostly due to the fact that they are not grazed by animals, being invaded by woody subshrub and shrub species. The data provided by the present study are useful in characterizing the pastoral quality of these grasslands in the context of the improvement and rational use of the pastoral fund.

Keywords: grasslands, green mass production, pastoral value, cargo with animals, floristic relevées
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INTRODUCTION

Considering the fact that determining the production of green mass of pastures by the classical method is quite difficult, a new method based on the floristic relevées with the percentage assessment of the species in the grass carpet was proposed (Maruşca, 2019).

The studies and researches regarding the vegetation of the grasslands in our country generally contain little information regarding their green mass production. These grasslands productivity studies are useful in determining the optimal grazing capacity, improvement and rational management of the pastoral fund.

At the present time, animal breeding systems based on the utilization of grasslands, have to cope with the growing needs of food. The production of fodder obtained from these areas must be consistent with the increasing demands for meat and milk, as well as with climate change (Maruşca et al., 2014).

The grasslands that are the subject of this study are located near the Beliș-Fâtânele reservoir in Cluj county. Beliș-Fântânele lake is located in the western part of Cluj county, in the northern area of the Apuseni Mountains, at the confluence of the Gilău Mountains to the east, the Vlădeasa Mountains to the west and the Mare Mountain to the south. The grasslands in the vicinity of the reservoir cover an area of 1450 ha, being generally formed by *Festuca rubra*, *Agrostis capillaris* and *Nardus stricta*.

MATERIAL AND METHOD

For the percentage assessment of the species in the grassy carpet (AD-abundance-dominance) the Braun-Blanquet scale was used, which has the following values: +-0.5%; 1-5.0%; 2-17.5%; 3-37.5%; 4-62.5%; 5-87.5% (Cristea et al., 2004). The botanical nomenclature used for the identified species is in accordance with the works elaborated by Ciocârlan (2009) and Sârbu et al. (2013). Considering the fact that large differences occur between abundance-dominance appreciation grades, which can be 25% between grades 4 to 5, 3 to 4, and 20% between grades 2 to 3, a new formula was adopted to transform AD intervals into participation percentages, taking into account the general frequency (K) of the respective species, presented in the works developed by

Maruşca, 2019; Maruşca et al., 2020; Păşcuţ & Maruşca, 2020.

The floristic relevées were carried out in the most representative points, the GPS coordinates, altitude, exposition, slope, relief form, grass vegetation cover and woody vegetation cover being reproduced for each separate survey. The ordering of species in the table which shows the floristic composition for each type of grassland begins with *Poaceae*, *Fabaceae* and other families. Relevées with an area of 400 m^2 were used in the study of the floristic composition of these grasslands.

After transforming the phytocoenological ratings into appreciation percentages, next to each species in the floristic survey, the fodder quality index (F) and useful phytomass index (M) are written (Păcurar & Rotar, 2014; Maruşca, 2019; Maruşca et al., 2019; Maruşca et al., 2020; Păşcuţ & Pantea, 2021). The fodder quality index (F) has the following values: F1-F3 (harmful species), F4-F9 (species with fodder value). Values for the forage phytomass index (M) range from M1-M9 for useful phytomass species and M0 for F1-F3 values.

In order to determine the pastoral value (PV) and the production of green forage (GM), we used the method proposed by Maruşca (2019) and applied in the previous manuscripts submitted and published by this journal (Maruşca et al., 2019; Maruşca, 2021; Maruşca & Păşcuţ, 2022), which we won't detail anymore. Based on these data, the optimal animal loading or grazing capacity (GC) expressed in large cattle unit (UL) per hectare is further determined according to the formula:

$$GC\ (UL/ha) = \frac{GM\ (kg/ha)}{RdxGd}$$

where: Rd - daily requirements for grass for 1 UL, 65 kg, respectively 50 kg + 15 kg (30% - season climatic fluctuations and unconsumed remains); Gd - number of grazing days (season).

For the grasslands in the area of the Beliş-Fântânele reservoir, the duration of the grazing season is 130 days.

RESULTS AND DISCUSSIONS

As a result of the study of the grasslands in the Beliş-Fântânele reservoir area, two main types of meadows were identified, namely *Festuca rubra-Agrostis capillaris* and *Nardus stricta-Festuca rubra*.

The floristic study of these grasslands was carried out in 2022, with a total of 16 relevées carried out, 9 relevées in *Festuca rubra* meadows with *Agrostis capillaris* and 7 relevées in *Nardus stricta* meadows with *Festuca rubra*.

The *Festuca rubra-Agrostis capillaris* grasslands type is present on slopes with generally sunny exposures (S, SE, SW), at altitudes of 1015-1265 m and terrain inclination of 0-15 degrees (table 1). In this type of grassland, the grassy vegetation has a high coverage (87-93%), being built up by *Festuca rubra* (50%) and in a smaller percentage by *Agrostis capillaris* (21.3%). In these grasslands there are also other species from the *Poaceae* family, *Nardus stricta* (11.3%), *Holcus lanatus* (2%), *Deshampsia flexuosa* (1.4%), with low fodder quality, the rest having an insignificant weight. The *Fabaceae* family is represented by *Trifolium repens, Trifolium montanum, Trifolium pratense, Lotus corniculatus*, with good fodder value but with a low percentage weight. Some toxic and harmful species for animals are also present in these meadows: *Hypericum maculatum*, *Ranunculus acris*, *Rumex conglomeratus*, *Pteridium aquilinum*, *Veratrum album*, *Carduus acanthoides*, *Colchicum autumnale*, *Rumex alpinus*.

Table 1

Floristic composition of the *Festuca rubra-Agrostis capillaris* grasslands

No. relevées		1	2	3	4	5	6	7	8	9	K	Participation P (%)	Indices	
Altitude (m.s.m.)		1145	1100	1125	1150	1240	1265	1040	1050	1015				
Exposition		SV, V	E	V, SV	S, SE	S	S	-	V	N				
Slope (°)		5	8	12	10	8	15	-	10	5				
Area		400	400	400	400	400	400	400	400	400				
GPS coordonates	Lat. N	46.68113	46.67664	46.67543	46.66844	46.67378	46.67886	46.64168	46.64689	46.65815				
	Long. E	23.05864	23.03060	22.99784	22.96795	22.95200	22.94407	22.85626	22.91456	22.93478				
General coverage (%)		100	100	97	98	97	99	100	100	100				
Grass vegetation cover (%)		89	89	89	88	87	91	93	92	91				
Woody vegetation cover (%)		11	11	11	12	13	9	7	8	9				
Molehills (%)		10	20	3	2	1	10	15	25	8				
Landform		side	side	side	side	side	side	plateau	side	side			F	M
0		*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*
Poaceae														
Festuca rubra		3	3	3	3	3	4	4	4	3	V	50	7	6
Agrostis capillaris		2	3	2	2	3	1	1	1	3	V	21.3	7	5
Nardus stricta		2	1	1	1	+	1	1	1	1	V	11.3	3	0

0	1	2	3	4	5	6	7	8	9	10	11	12	13
Holcus lanatus	+	+	+	•	+	•	+	1	•	IV	2	6	6
Anthoxanthum odoratum	+	+	+	+	+	•	+	•	+	IV	0.4	5	3
Deshampsia flexuosa	•	•	1	•	+	1	+	•	•	III	1.4	4	3
Poa pratensis	+	+	•	•	+	•	•	+	+	III	0.3	8	6
Cynosurus cristatus	+	•	•	+	+	•	+	•	•	III	0.3	7	4
Danthonia decumbens	+	•	•	+	+	+	+	•	•	III	0.3	4	3
Deschampsia cespitosa	•	•	+	+	+	•	+	•	+	III	0.3	3	0
Lolium perenne	•	•	•	•	•	•	+	•	+	II	0.2	9	8
Phleum montanum	•	•	•	•	•	•	•	+	+	II	0.2	6	5
Briza media	•	•	+	•	•	•	•	+	•	II	0.2	5	2
Fabaceae													
Trifolium repens	+	+	+	+	+	•	+	+	+	V	0.5	8	5
Trifolium montanum	+	+	+	•	•	+	+	+	•	IV	0.4	7	4
Trifolium pratense	•	•	+	+	+	•	+	•	•	III	0.3	8	7
Lotus corniculatus	+	•	+	•	•	•	+	•	•	II	0.2	8	6
Anthyllis vulneraria	•	•	•	•	+	+	•	•	•	II	0.2	6	5
Genista sagittalis	+	•	•	•	•	+	+	•	•	II	0.2	3	0
Other families													
Thymus pulegioides	+	+	+	•	+	+	+	+	+	V	0.5	3	0
Achillea millefolium	+	+	•	1	+	•	+	+	+	IV	2	6	4
Alchemilla vulgaris	+	+	+	+	•	•	+	1	+	IV	2	6	4
Juncus conglomeratus	+	+	1	1	•	•	+	•	+	IV	2	3	0
Luzula luzuloides	•	•	+	1	+	+	+	+	•	IV	2	3	0
Plantago lanceolata	•	+	+	+	•	+	+	•	+	IV	0.4	6	1
Leontodon autumnalis	+	+	•	+	•	•	+	+	+	IV	0.4	5	3
Potentilla erecta	+	+	+	+	•	•	+	+	+	IV	0.4	5	2
Fragaria vesca	•	+	•	+	+	+	+	+	•	IV	0.4	5	1
Hieracium pilosella	•	+	+	•	+	+	•	+	+	IV	0.4	4	1
Viola canina	•	+	•	+	+	+	+	•	+	IV	0.4	4	1
Gnaphalium sylvaticum	+	•	+	+	+	+	+	•	•	IV	0.4	3	0
Plantago media	+	•	•	+	+	•	•	+	•	III	0.3	6	2
Bellis perennis	+	•	+	•	•	•	+	•	+	III	0.3	5	1
Carex pallescens	+	+	+	+	•	•	+	•	•	III	0.3	4	3
Prunella vulgaris	+	+	+	•	•	•	+	•	•	III	0.3	4	2
Veronica chamaedrys	•	•	+	•	+	•	•	+	+	III	0.3	4	2
Cerastium holosteoides	•	+	•	•	•	•	+	+	+	III	0.3	3	0
Cruciata glabra	•	•	+	+	•	•	+	+	•	III	0.3	3	0
Juncus tenuis	•	+	+	•	•	•	+	•	+	III	0.3	3	0
Veronica officinalis	+	+	•	•	•	+	+	+	•	III	0.3	3	0
Urtica dioica	+	•	+	•	•	•	+	•	•	II	0.2	5	7
Cichorium intybus	•	+	•	•	•	•	+	•	•	II	0.2	5	6
Leucanthemum vulgare	•	•	•	•	+	+	•	•	•	II	0.2	5	5
Filipendula vulgaris	•	•	+	•	+	•	•	•	•	II	0.2	5	4
Polygala vulgaris	•	•	•	•	•	•	•	+	+	II	0.2	4	1
Achillea distans	•	•	+	+	•	+	•	•	•	II	0.2	3	0
Campanula abietina	•	•	+	+	•	•	•	•	+	II	0.2	3	0
Campanula serata	•	•	•	•	•	+	+	•	•	II	0.2	3	0
Carlina acaulis	•	•	•	•	+	•	+	•	•	II	0.2	3	0
Centaurea phrygia	•	•	+	+	•	•	+	•	•	II	0.2	3	0
Euphrasia rostkoviana	+	•	•	•	+	•	•	•	+	II	0.2	3	0
Hypochaeris radicata	•	•	•	+	+	•	•	•	•	II	0.2	3	0
Luzula sylvatica	•	•	•	•	+	+	•	•	•	II	0.2	3	0
Rumex acetosella	•	+	•	•	•	•	+	•	•	II	0.2	3	0
Epilobium palustre	•	•	+	•	•	•	•	•	•	I	0.1	4	4
Luzula campestris	•	•	•	•	•	•	+	•	•	I	0.1	4	2
Angelica sylvestris	•	•	+	•	•	•	•	•	•	I	0.1	3	0
Carex nigra	•	•	+	•	•	•	•	•	•	I	0.1	3	0
Centaurium erythraea	•	+	•	•	•	•	•	•	•	I	0.1	3	0
Cirsium canum	•	•	+	•	•	•	•	•	•	I	0.1	3	0
Cirsium erisithales	•	•	+	•	•	•	•	•	•	I	0.1	3	0
Filipendula ulmaria	•	•	+	•	•	•	•	•	•	I	0.1	3	0
Juncus inflexus	•	•	•	•	•	•	+	•	•	I	0.1	3	0
Succisa pratensis	•	•	+	•	•	•	•	•	•	I	0.1	3	0
Shrubs, subshrubs and invasive young trees													
Picea abies	•	1	1	+	+	+	•	1	1	IV	2	3	0
Salix cinerea	•	•	1	+	+	+	•	+	+	IV	2	3	0
Betula pendula	•	•	+	•	+	+	•	•	+	III	0.3	3	0
Sorbus aucuparia	•	•	•	+	•	+	•	+	+	III	0.3	3	0
Sambucus racemosa	+	•	•	•	•	+	•	•	+	II	0.2	3	0
Vaccinium myrtillus	1	+	+	1	1	1	1	+	+	V	2.8	3	0
Vaccinium vitis-idaea	1	1	+	1	+	+	+	+	+	V	2.8	3	0
Calluna vulgaris	•	+	•	•	1	+	+	+	+	IV	2	3	0
Rubus idaeus	+	•	•	+	+	•	+	+	+	IV	2	3	0
Toxic and harmful plants													
Hypericum maculatum	1	+	+	•	+	+	+	+	•	IV	2	1	0
Ranunculus acris	+	+	+	•	+	•	+	•	+	IV	0.4	1	0
Rumex conglomeratus	•	•	+	+	•	•	+	+	•	III	0.3	2	0
Pteridium aquilinum	•	•	•	•	+	1	•	•	•	II	0.8	1	0
Veratrum album	•	•	+	•	•	+	•	•	•	II	0.2	1	0
Carduus acanthoides	•	•	+	+	•	•	+	•	•	II	0.2	2	0
Colchicum autumnale	•	•	+	+	•	•	•	•	•	II	0.2	1	0
Rumex alpinus	•	•	•	•	•	•	•	+	•	I	0.1	2	0

The localities and date where the relevées were carried out: 1-2 Beliș (12.10.2022); 3 – Bălcești (12.10.2022); 4-6 Dealul Botii (12.10.2022); 7 - Smida (12.10.2022); 8-9 Giurcuța de Sus (15.10.2022). Where: F – fodder quality indices; M – production indices; K – constancy; AD values **(**Abundance-Dominance**)***:* +-0.5%; 1-5.0%; 2-17.5%; 3-37.5%; 4-62.5%; 5-87.5%.

In these grasslands there are also some subshrub, shrubby and young invasive tree species (7-13%), of which the most representative are *Picea abies*, *Salix cinerea*, *Vaccinium myrtillus*, *Vaccinium vitis-idaea*, *Calluna vulgaris*, *Rubus idaeus.* Some sub-shrub and shrub species are located on molehills, which have a high weight in some relevées (1-25%) (figure 1).

a. **b.**

Figure 1 ***Festuca rubra-Agrostis capillaris*** **grasslands, with molehills and woody shrubby vegetation (a - Smida, relevée No. 7, b - Dealul Botii, relevée No. 5)**

Acidophilic grasslands of *Nardus stricta* and *Festuca rubra* were identified on slopes with different exposures (S, SE, SW, N, NE), at altitudes of 1100-1260 m on terrain with a gentle to strongly inclined slope (0-25 degrees) (table 2).

Grassy vegetation has a different coverage, ranging from 27-92%, the dominant species being *Nardus stricta* (40%), followed by *Festuca rubra* (9%). Among the species of the *Poaceae* family found in this type of meadow, we mention *Deshampsia flexuosa*, *Agrostis capillaris*, *Holcus lanatus*, *Anthoxanthum odoratum*, *Danthonia decumbens*, *Deschampsia cespitosa* which have a low participation rate.

From the *Fabaceae* family, *Trifolium repens, Trifolium montanum, Genista sagittalis, Trifolium alpestre, Genista tinctoria* are present, which have a total participation percentage of 1.3%, insignificant for increasing the forage quality of these grasslands.

In these grasslands there are also some toxic and harmful species present in small numbers, namely: *Hypericum maculatum*, *Pteridium aquilinum*, *Rumex alpinus*.

Table 2

Floristic composition of the *Nardus stricta-Festuca rubra* grasslands

No. relevées		1	2	3	4	5	6	7	K	Participation P (%)	Indices	
Altitude (m.s.m.)		1130	1140	1260	1115	1180	1115	1100				
Exposition		-	S	S	S	S, SE	N, NE	V, SV				
Slope (°)		-	15	25	12	18	10	20				
Area		400	400	400	400	400	400	400				
GPS coordonates	Lat. N	46.68015	46.66743	46.67627	46.66581	46.63482	46.64113	46.64577				
	Long. E	23.00835	23.01070	22.93871	22.91839	22.90711	22.91591	22.92627				
General coverage (%)		100	100	100	100	98	100	100				
Grass vegetation cover (%)		79	27	54	31	92	88	30				
Woody vegetation cover (%)		21	73	46	69	8	12	70				
Molehills (%)		25	10	35	30	30	5	25				
Landform		plateau	side	side	side	side	side	side			F	M
Poaceae												
Nardus stricta		4	2	3	2	4	4	2	V	40	3	0
Festuca rubra		1	+	1	1	2	2	1	V	9	7	6
Deshampsia flexuosa		+	+	1	+	+	•	+	V	2.8	4	3
Agrostis capillaris		+	•	•	•	+	+	•	III	0.3	7	5
Holcus lanatus		•	•	•	+	+	+	•	III	0.3	6	6
Anthoxanthum odoratum		+	•	•	+	+	+	•	III	0.3	5	3
Danthonia decumbens		+	•	+	•	+	+	•	III	0.3	4	3
Deschampsia cespitosa		+	•	•	•	+	•	•	II	0.2	3	0
Fabaceae												
Trifolium repens		+	•	•	•	+	+	•	III	0.3	8	5
Trifolium montanum		•	+	+	+	+	•	•	III	0.3	7	4
Genista sagittalis		+	+	•	•	•	+	+	III	0.3	3	0
Trifolium alpestre		+	•	•	+	•	•	•	II	0.2	6	3
Genista tinctoria		+	•	•	•	+	•	•	II	0.2	3	0
Other families												
Potentilla erecta		+	+	•	+	+	+	+	V	0.5	5	2
Luzula luzuloides		+	+	+	+	+	+	+	V	0.5	3	0

Hieracium pilosella	+	•	+	+	+	+	•	IV	0.4	4	1
Thymus pulegioides	•	+	+	+	+	•	+	IV	0.4	3	0
Veronica officinalis	+	+	+	+	+	•	•	IV	0.4	3	0
Viola declinata	+	+	•	+	+	•	+	IV	0.4	3	0
Alchemilla vulgaris	•	•	•	+	+	+	•	III	0.3	6	4
Fragaria vesca	+	•	+	•	+	+	•	III	0.3	5	1
Luzula campestris	+	•	+	+	+	•	•	III	0.3	4	2
Achillea distans	+	+	•	+	+	•	•	III	0.3	3	0
Campanula abietina	+	+	•	+	•	+	•	III	0.3	3	0
Campanula serata	•	•	+	•	+	•	+	III	0.3	3	0
Cerastium holosteoides	+	•	•	•	+	+	•	III	0.3	3	0
Euphrasia rostkoviana	+	•	+	•	•	•	+	III	0.3	3	0
Gnaphalium sylvaticum	+	+	•	+	•	•	+	III	0.3	3	0
Juncus conglomeratus	+	+	•	•	+	+	•	III	0.3	3	0
Luzula sylvatica	•	+	+	•	•	•	+	III	0.3	3	0
Carex pallescens	•	+	+	•	•	•	•	II	0.2	4	3
Veronica chamaedrys	•	+	•	•	•	•	+	II	0.2	4	2
Lycopodium clavatum	•	•	•	•	+	•	+	II	0.2	3	0
Plantago lanceolata	•	•	•	+	•	•	•	I	0.1	6	1
Carex nigra	+	•	•	•	•	•	•	I	0.1	3	0
Succisa pratensis	•	+	•	•	•	•	•	I	0.1	3	0
Shrubs, subshrubs and invasive young trees											
Calluna vulgaris	1	4	2	4	+	+	4	V	31.5	3	0
Vaccinium myrtillus	1	1	2	1	+	1	+	V	9	3	0
Vaccinium vitis-idaea	•	1	1	+	+	1	1	V	2.8	3	0
Picea abies	1	•	1	+	1	•	+	IV	2	3	0
Betula pendula	+	•	+	+	•	+	+	IV	0.4	3	0
Salix cinerea	1	+	•	•	+	•	+	III	1.4	3	0
Juniperus communis	•	•	•	•	+	+	•	II	0.2	3	0
Rubus idaeus	•	•	•	•	•	+	+	II	0.2	3	0
Sorbus aucuparia	+	•	+	•	•	•	•	II	0.2	3	0
Toxic and harmful plants											
Hypericum maculatum	+	+	+	+	+	+	+	V	0.5	1	0
Pteridium aquilinum	+	•	+	•	•	•	•	II	0.2	1	0
Rumex alpinus	•	+	•	•	+	•	•	II	0.2	2	0

The localities and date where the relevées were carried out: 1-2 Bălcești (12.10.2022); 3-4 Dealul Botii (12.10.2022); 5-7 Giurcuța de Sus (15.10.2022). Where: F - fodder quality indices; M - production indices; K - constancy**;** AD values (Abundance-Dominance)*:* +-0.5%; 1-5.0%; 2-17.5%; 3-37.5%; 4-62.5%; 5-87.5%.

In these grasslands, the shrubby, sub-shrub woody vegetation and young trees are quite well highlighted, with a rather high share in some cases (8-70%), in which *Calluna vulgaris* stands out (31.5%), which becomes dominant in some relevées (figure 2).

a. b.

Figure 2 ***Nardus stricta-Festuca rubra*** **grasslands, invaded by** ***Calluna vulgaris*** **(a. - Bălcești, relevée No. 2; b. - Dealul Botii, relevée No. 4)**

As a result of the calculations performed at the grassland type level, for the grasslands with the greatest spread in the area of the Beliș-Fântânele reservoir, it turned out that the most productive are those of *Festuca rubra* and *Agrostis capillaris* with a pastoral value (VP) of 64.72 (good), with a forage green mass (MV) production rated at 12.63 t/ha, supporting an animal load of 1.49 livestock units UVM/ha (table 3).

The least productive grasslands in the studied area are those of *Nardus stricta* and *Festuca rubra*, with a very poor pastoral value (VP) (10.68), a very low production of green mass (MV) (1.41 t/ha) and a livestock load rated at 0.16 livestock units UVM/ha.

Table 3

Productivity of grasslands identified in the Belis-Fântânele reservoir area

Grassland type	Pastoral value (VP)	Useful phytomass index (IM)	Green mass production (MV) (t/ha)	Cargo with animals (UVM/ha)
Festuca rubra-Agrostis capillaris	64.72 (Good)	4.68	12.63 (Medium-Good)	1.49
Nardus stricta-Festuca rubra	10.68 (Very thin)	0.74	1.41 (Very thin)	0.16

CONCLUSIONS

The permanent grasslands from the studied area have a great variability from an agro-productive point of view, with mezophytes, micro-mesothermophilous and acid-neutrophilous vegetation.

The *Festuca rubra* and *Agrostis capillaris* grasslands have the highest productivity, with good pastoral value (VP), medium to good production of green mass per hectare and an optimal loading of 1.49 livestock units UVM/ha at 130 days of grazing. At the opposite pole are the de *Nardus stricta* with *Festuca rubra* grasslands with low productivity very poor pastoral value (VP), very poor green mass (MV) production which allow an animal load of only 0.16 livestock units UVM/ha.

The low productivity of *Nardus stricta* grasslands is mainly due to the fact that these grasslands are abandoned, ungrazed, which leads to the encroachment of woody transgressive species from the neighboring forests.

In order to increase the productivity of these permanent grasslands, it is necessary to adopt some measures, such as the clearing of sub-shrub woody vegetation, shrubs and invasive arboreal youth, combating toxic and harmful plants, destroying and leveling of molehills, correcting the chemical reaction of the soil (correcting acidity), over-seeding, fertilizing. In addition to these measures, it is necessary to introduce these grasslands into the productive circuit and ensure a minimum load of 0.3 livestock units UVM/ha.

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